

**Patron**

**Dr. R. K. Mittal**

**Vice Chancellor**

Compiled and edited under the direction of

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**Disclaimer**

"The proceedings of the Research Advisory Committee for Kharif 2021 and Research progress Report is a compilation of the information received from respective departments and colleges for official purposes only. The publisher and editors are not responsible for any shortcoming or discrepancy in the compilation."

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## **Message from Hon'ble Vice Chancellor**

The foundation stone of the Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut is laid on the essence of academic pursuit and excellence. Excellence in any work can be achieved with utmost dedication, hard work, and perseverance. We, at SVPUA&T, have made this dictum our motto and our way of life in every single activity in the campus.

Research and development forms the backbone of our University. The staff and students are engaged in various path-breaking innovative research activities all throughout the year. Every college of our University work on contemporary and relevant topics in order to facilitate research in those areas which will lead to necessary transformations in modern agriculture.

The University from its inception, has been active in research and innovation and has setup an ambient ecosystem for its students and research scholars. The year 2020 was a challenging year considering the COVID-19 pandemic, affecting all aspects of research & development initiatives including health, travel and economy. In this year of uncertainty, fear and crisis, new strategies were undertaken to ensure continuation of ongoing research activities with increased focus on safety of researchers. Lockdown period was fully utilized by scientists and all the research and farm activities and farmers services were undertaken following COVID-19 guidelines and quarantine rules.

We got continuance guidance from our worthy Hon'ble Chancellor, and adequate support from the state government, Indian Council of Agricultural Research, New Delhi and other funding agencies. I express my earnest gratitude to all for expressing faith in our ability to fulfil our obligations towards our clients-students, farmers and others.

The Research Advisory Committee meeting organized by the Directorate of Research is another venture to provide a platform for researchers to discuss on contemporary trends and innovations in Agriculture and allied Sciences.

The proceedings contain the recommendations of the Research Advisory Committee, salient achievements carried out by the University in the fulfilment of its aims and objectives concerning research in agriculture and allied branches.

I place on record my appreciation to the Director Experiment Station Dr. Anil Sirohi and his team for compiling, editing and production of the proceedings.

I urge all participants to brainstorm on the various thrust areas recommended by the Advisory Committee.

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## Message from Director Research

On behalf of the Research Advisory Committee of Sardar Vallabhbhai Patel University of Agriculture of Technology, Meerut I am delighted to present the Report of Research activities carried and salient Research Achievements made during *Rabi*, 2019-20 and *Kharif*, 2020 and Action Plan for *Kharif* 2021 and recommendations of the Research Advisory Committee in the fulfilment of its aims and objectives concerning research in agriculture and allied fields.

The compilation and publication is a collective effort of all the constituent Colleges of the University. It was not possible for me to compile and present this report without the active cooperation of all the statutory officers, Heads of the departments, teachers/officers, employees of the University for which I am highly grateful.

I express my heartfelt thanks to Chairman of Research Advisory Committee (RAC), Dr. R. K. Mittal, Hon'ble Vice Chancellor for his constant interest, support, valuable suggestions, guidance and encouragement for various initiatives for strengthening research in the University and in bringing out this publication.

I express my sincere thanks to all the esteemed members of Research Advisory Committee Dr. S.K. Garg, Director, CAEHS, Meerut and Former Vice Chancellor, Uttar Pradesh Pandit Deen Dayal Upadhyaya Pashu Chikitsa Vigyan Vishwavidyalaya Evam Go-Anusandhan Sansthan, Mathura, Dr. Pitam Chandra, Prof. Biotechnology, School of Engineering and Technology, Sharda University, Noida, Dr. Umesh Shrivastava, Assistant Director General, Horticulture (Retd.) ICAR, New Delhi, Dr. A.P. Garg, Vice Chancellor, Shobhit University, Meerut and Dr. H.C. Sharma, Chief Agronomist, (Retd.), CCSHAU, Hisar, with gratitude for their valuable and consistent guidance in shaping the University's research programmes.

I am also thankful for time to time support, guidance and assistance received from Dr. N. S. Rana, Dean Agriculture, Prof. Samsher, Dean PGS, Dr. Rajbir Singh, Dean COVAS, Dr. Bijender Singh, Dean College of Horticulture and Dr. B. R. Singh Dean College of Technology in smoothly running the research activities. The help extended by Finance Comptroller of the university in managing routine affairs of the Directorate is thankfully acknowledged. The financial assistance received from different funding agencies mainly ICAR, State Government, Department of Biotechnology and UP council of Agriculture Research is thankfully acknowledged.

The efforts put in by Dr. Mukesh Kumar in compiling and editing report in the present shape is highly commendable. The compiling and computerization of report by Sh. Sudhir Vihan is also acknowledged.

I place on record my appreciation to all of them.

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**PROCEEDINGS OF THE RESEARCH ADVISORY COMMITTEE (RAC), SVPUA&T, MEERUT  
HELD ON 12-13 JULY 2021**

The Research Advisory Committee (RAC) meeting *Kharif* 2021 was held under the Chairmanship of Dr. R. K. Mittal, Hon'ble Vice Chancellor, SVPUA&T, Meerut in online mode on Zoom. The fourteen members of re-constituted RAC are as follows:

1-	Dr. R.K. Mittal, Vice Chancellor	Chairman
2-	Dr. S.K. Garg, Director, CAEHS, Meerut and Former Vice Chancellor, Uttar Pradesh Pandit Deen Dayal Upadhyaya Pashu Chikitsa Vigyan Vishwavidyalaya Evam Go-Anusandhan Sansthan, Mathura	Member
3-	Dr. Pitam Chandra, Prof. Biotechnology, School of Engineering and Technology, Sharda University, Noida	Member
4-	Dr. A.P. Garg, Vice Chancellor, Shobhit University, Meerut	Member
5-	Dr. H.C. Sharma, Chief Agronomist, (Retd.) CCSHAU, Hisar, C-160, Rahda garden colony, Meerut.	Member
6-	Dr. Umesh Shrivastava, ADG, Horticulture (Retd) ICAR, New Delhi	Member
7-	Dr. N.S. Rana, Dean College of Agriculture	Member
8-	Dr. Ravindra Kumar, Dean College of Biotechnology	Member
9-	Dr. Rajvir Singh, Dean College of Veterinary and Animal Sciences	Member
10-	Dr. Shamsher, Dean College of PGS/PHT	Member
11-	Dr. B.R. Singh, Dean College of Technology	Member
12-	Dr. Bijendra Singh, Dean College of Horticulture	Member
13-	Dr. Gopal Singh, Joint Director Extension	Member
14-	Dr. Anil Sirohi, Director Research	Member Secretary

In addition to above, the scientists of College of Agriculture, College of Biotechnology, College of Veterinary and Animal Sciences, College of Horticulture, College of Post Harvest Technology, College of Technology, Zonal Research Station, Nagina, Zonal Research Station, Ujhani and Zonal Research Station, Bulandshahr were present. The RAC deliberated on the work in progress and thrust areas of research keeping in view the mandate and vision of the University and made recommendations. The Agenda Notes, Results of *Rabi 2019-20* and *Kharif 2020* and Action Plan for *Kharif 2021* were circulated beforehand.

**AGENDA ITEMS FOR RAC (12-13 July, 2021)**

<b>Day 1 - 12/07/2021 Monday</b> <b>Zoom Meeting ID- 87043918696</b>		
10:00-10:10	Welcome and Overview – Research activity & on-going Projects	- Director Research
10:10-10:20	Chairman’s remarks	- Dr. R.K. Mittal, Hon’ble Vice Chancellor
10:20-6:00	All Departments of College of Agriculture	- College over view by Dean - Research activities of the department by HOD - Experiment wise presentation of results and action plan for coming season by concerned scientists
<b>Day-2 13/07/2021 Tuesday</b> <b>Zoom Meeting ID- 89871766484</b>		
09:00-11:00	All Departments of College of Biotechnology	- College over view by Dean - Research activities of the department by HOD - Experiment wise presentation of results and action plan for coming season by concerned scientists
11:00-12:00	All Departments College of Horticulture	- College over view by Dean - Research activities of the department by HOD - Experiment wise presentation of results and action plan for coming season by concerned scientists
12:00-12:45	College of Post Harvest & Technology	- College over view by Dean - Research activities of the department by HOD - Experiment wise presentation of results and action plan for coming season by concerned scientists
12:45-01:30	College of Technology	- College over view by Dean - Research activities of the department by HOD - Experiment wise presentation of results and action plan for coming season by concerned scientists
02:30-04:45	College of Veterinary and Animal Science	- College over view by Dean - Research activities of the department by HOD - Experiment wise presentation of results and action plan for coming season by concerned scientists
04:45-05:15	ZRS, Nagina	- ZRS over view by OIC - Experiment wise presentation of results and action plan for coming season by concerned scientists
05:15-05:45	ZRS, Ujhani	- ZRS over view by OIC - Experiment wise presentation of results and action plan for coming season by concerned scientists
05:45-06:15		- ZRS over view by OIC - Experiment wise presentation of results and action plan for coming season by concerned scientists
06:15-06:30	Progress of L.R.C.	- OIC, LRC
06:30-06:45	Seed Production	- G.M. Farm
06:45-07:00	Mega Seed Project	- Nodal Officer, Seed
07:00-07:15	Chairman’s remarks	- Dr. R.K. Mittal, Hon’ble Vice Chancellor
07:15-07:20	Vote of Thanks	- Dr. Anil Sirohi, Director Research

### **Welcome by the Member-Secretary:**

At the outset, Director Research, SVPUAT, Meerut, Member Secretary, RAC welcomed the Chairman Dr. R. K. Mittal, Hon'ble Vice Chancellor, SVPUA&T, Meerut, Members of the RAC and all Special Invitees of the RAC along with other scientists. He also apprised them about the new initiatives taken during last two years. In his introductory remarks, he briefly presented the salient achievements of the University.

Dr. S.K. Garg, Director, CAEHS, Meerut and Former Vice Chancellor, Uttar Pradesh Pandit Deen Dayal Upadhyaya Pashu Chikitsa Vigyan Vishwavidyalaya Evam Go-Anusandhan Sansthan, Mathura in his opening remarks, appreciated the progress made by the University in terms of research, teaching, extension, HRD and technology development. While congratulating the Vice Chancellor, SVPUA&T and his team he stated that University should continue to play the role of flagship Institution by pursuing research in frontier areas of Agriculture. He, however, felt that there was an obvious need to prioritize research programmes for meeting newer challenges. In this context, he mentioned that the University must formulate programmes to address some of the burning issues faced by Indian agriculture.

Dr. Pitam Chandra, Prof. Biotechnology, School of Engineering and Technology, Sharda University, Noida praised the overall research activities of the University and felt the structured efforts of the scientists have put the SVPUA&T on International map. He urged scientists to focus and explore the new innovative technologies in future like bioscience research, biotechnological research, nanotechnology, artificial intelligence, post-harvest management and value addition *etc.* He advised to make collaboration with global, national and industrial partners to improve the quality of research and for wider adoption of resulting technologies.

Dr. Umesh Shrivastava, ADG, Horticulture (Retd.), ICAR, New Delhi emphasised on issues relating to climate change, rain-fed agriculture, in-situ moisture conservation, poly-house protected cultivation technologies for quality planting and seed material of vegetables as well as other horticulture crops. He also mentioned that another brain storming session involving scientists of horticulture be organized for prioritizing the research agenda, targeting few crops and diseases of regional importance.

Dr. A.P. Garg, Vice Chancellor, Shobhit University, Meerut, in his address appreciated the efforts of scientific faculty for bringing recommendations to the farming and scientific communities and also requested to churn the new technical programmes with thorough discussion.

Dr. H.C. Sharma, Chief Agronomist, (Retd.), CCSHAU, Hisar drew attention of the house to the emerging challenges and issues. He emphasized the need for diversification of crop and to find alternative cropping systems that can be promoted in Western Uttar Pradesh. He emphasized the need for soil health maintenance and soil test based balanced fertilization with due importance to secondary, micro nutrients and use of biofertilizers for cost effectiveness.

### **Chairman's Remarks:**

Dr. R. K. Mittal, Hon'ble Vice Chancellor and Chairman of Research Advisory Committee in his remarks welcomed the Members of RAC. He appreciated the progress made in the University in recent years and emphasized on its augmentation. He said that the University has made lot of progress in the last few years. He highlighted several important issues related to soil health, nutrient use efficiency, conservation agriculture, soil microbial diversity and genomics, heavy metal pollution and climate change. He stressed on the needs to promote research as per the needs of the farmers. He also stressed that efforts should continue: to introduce new germplasm of field crops and horticultural crops and taking the technologies developed by

the University to the farmers for ensuring a stable income of farmers and other stakeholders. He presented the glimpse of the research achievements, skill development programmes organized, Research Projects received by the University during the past two years.

### **Major Recommendations:**

The following recommendations emerged during discussion on the following issues:

1. Research experiments should be designed based on the problems raised by the farmers related to cultivated crops in the particular area.
2. In each and every experiment crop variety grown in this area/ recommended practices shall be taken as check.
3. **Plant Exploration and Germplasm Collection:** To strengthen the crop improvement programme there is an urgent need to collect germplasm of important field crops and vegetable crops. Trait specific germplasm introduced /collected should be checked for its performance under field conditions and may be utilized in breeding programmes.
4. **New Plant Breeding Technologies:** To strengthen crop improvement programmes the new precise and time saving breeding technologies like Genome editing should be taken up on priority.
5. **Under Utilized Crops:** Considering the nutritional and industrial value of under-utilized crops like millets there is a need to evaluate the crops.
6. **Basmati Rice Improvement Programme:** Basmati Rice research programme along with Nagina centre needs to be strengthened as Zonal Research station has some improved Basmati genotypes in testing.
7. Development of short duration crop varieties like lentil, toria *etc.* for rice- wheat system.
8. **Focused Research:** The scientists should have focused area of research work to produce excellent results. The interaction of the institute with other institutions, will improve the research quality.
9. **Impact analysis of the technologies developed in the University:** The technology developed by the University must go to the end user. Each scientist should identify the area in which he want to work (within the University mandate) and work in the area until at least one or two products/ technologies are developed.
10. **Review of the Horticulture work:** The action plan of College of Horticulture needs to be discussed in smaller group to reorient the need based and action oriented research programmes.
11. Long term experiments on Integrated Nutrient Management, Integrated Pest Management and Integrated Water management needs to be framed to save money.
12. **Multidisciplinary Research:** In order to avoid duplications, integrated efforts across departments are required.
13. **Techno-economical Analysis:** For each and every experiment prior techno-economical analysis should be done.
14. **Cost Benefit Ratio:**
15. **Need based small research projects:** The faculty of College of Veterinary and Animal Sciences was advised to take up small research work in the College and collaborative research work with other colleges in the University to enhance the quality of research and publications as enough infrastructures have already been developed.
16. **Mobile Veterinary Clinical Services:** Facilities for Mobile Veterinary Clinical Services for Dairy Animals in Western Uttar Pradesh developed should initiate field visits using the mobile van as soon as possible as given in the mandate of the project to provide treatment facilities at village level.



- 17. Live stock Research Centre:** Measures to minimize the expenditures and maximize the income at live stock research centre should be taken up. A meeting along with dairy experts for formulation of strategies to minimize the expenditures at LRC may be organized.
- 18. Bio-control agents:** Progress of last three years to be reviewed.
- 19. Mushroom Research:** Mushrooms are important in area hence work on popular button mushroom should be taken up.
- 20. Post Harvest Technology:** Combination of Sorghum, small millets, buckwheat etc. should be tried for cookies and other post harvest products.
- 21.** On current alarming issues and technology based research brainstorming workshops should be organized.
- 22.** Awareness campaign based on socio-economic issues and waste management should be organized.
- 23.** Research recommendations of the experiments completed for two or more years should be documented.
- 24.** Development of projects from basic science department to unveil basic mechanisms behind basic physiological process like flowering should also be made.
- 25.** The research proposals based on environmental conservation issues, soil microbial health, export oriented agriculture aspects like food processing and dry foods, nutrient water interactions and cost effective research should be designed.

The meeting ended with the vote of thanks to the Chair, Members of the RAC and all others present in the meeting as well as all those who helped directly and indirectly for successful organization of the RAC Meeting.

## College of Agriculture

### Department of Agronomy:

#### Staff position:

S.No.	Name	Designation
1.	Dr. Vivek	Professor & Head
2.	Dr. N. S. Rana	Professor
3.	Dr. R. K. Naresh	Professor
4.	Dr. Rajvir Singh	Professor
5.	Dr. R. B. Yadav	Professor
6.	Dr. Adesh Kumar	Assistant Professor

### Progress Report for Rabi-2019-20

#### Experiment-1

**Title:** Effect of Integrated weed management practices on performance of Chickpea (*Cicer arietinum* L.) and associated weeds.

**Investigators:** Dr. Vivek, Dr. R.K. Naresh, Dr. R.B. Yadav & Dr. B.P. Dhyani.

**Year of Start:** 2019-20      **Design:** RBD      **Replications:** 03      **Variety:** WCG-3

#### Objective:

1. To evaluate the effect of weed management practices on weed flora and dry weight of weeds.
2. To assess the performance of weed management practices on growth, yield and yield attributes of chickpea.
3. To study the effect of weed management practices on nutrient uptake by chickpea crop and weeds.
4. To study the economic feasibility of various weed management practices for chickpea.

#### Treatments:

T <sub>1</sub>	Control (Weedy check)
T <sub>2</sub>	Weed free
T <sub>3</sub>	One hand weeding 25 DAS
T <sub>4</sub>	Two hand weeding 25 and 50 DAS
T <sub>5</sub>	Oxyfluorfen 100 g a.i./ha Pre emergence
T <sub>6</sub>	Oxyfluorfen 100 g a.i./ha Pre emergence + one hand weeding 25 DAS
T <sub>7</sub>	Imazethapyr 50 g a.i./ha Post emergence (25 DAS)
T <sub>8</sub>	Imazethapyr 50 g a.i./ha 25 DAS + one hand weeding 50 DAS
T <sub>9</sub>	Oxyfluorfen 100 g a.i./ha Pre emergence + Imazethapyr 50 g a.i./ha 25 DAS
T <sub>10</sub>	Oxyfluorfen 100 g a.i./ha Pre emergence + Imazethapyr 50 g a.i./ha 25 DAS + one hand weeding 50 DAS

#### Result:

Among the different herbicides the lowest total weed population and total dry weight of weeds at 90 DAS was recorded in Oxyfluorfen 100 g a.i./ha Pre emergence + Imazethapyr 50 g a.i./ha 25 DAS + one hand weeding 50 DAS. Highest weed control efficiency was also recorded in Oxyfluorfen 100 g a.i./ha Pre emergence + Imazethapyr 50 g a.i./ha 25 DAS + one hand weeding 50 DAS. Among the different herbicides the highest grain yield, straw yield of chickpea was recorded in Oxyfluorfen 100 g a.i./ha Pre emergence + Imazethapyr 50 g a.i./ha 25 DAS + one hand weeding 50 DAS. It was found at par with Imazethapyr 50 g a.i./ha 25 DAS + one hand weeding 50 DAS. Lowest grain and straw yield was recorded in control plot during year of experimentation. (Table 1 and Table 2)

**Table 1 Effect of Integrated nutrient management on total number of weeds, total weed dry weight and WCE at 90 DAS**

Treatments	No. of Total weeds (m <sup>-2</sup> ) 90 DAS	Total weed dry weight (g m <sup>-2</sup> ) 90 DAS	WCE at 90 days
Control (Weedy check)	119.1	181.4	0.00
Weed free	0.0	0.0	100.0
One hand weeding 25 DAS	77.1	97.1	46.47
Two hand weeding 25 and 50 DAS	52.6	64.6	64.38
Oxyfluorfen 100 g a.i./ha Pre emergence	82.9	89.7	50.55
Oxyfluorfen 100 g a.i./ha Pre emergence + one hand weeding 25 DAS	58.8	77.7	57.16
Imazethapyr 50 g a.i./ha Post emergence (25 DAS)	71.3	83.8	53.80
Imazethapyr 50 g a.i./ha 25 DAS + one hand weeding 50 DAS	46.6	74.2	59.10
Oxyfluorfen 100 g a.i./ha Pre emergence + Imazethapyr 50 g a.i./ha 25 DAS	65.3	69.6	61.63
Oxyfluorfen 100 g a.i./ha Pre emergence + Imazethapyr 50 g a.i./ha 25 DAS + one hand weeding 50 DAS	19.3	64.1	64.66
<b>SEm±</b>	<b>0.64</b>	<b>0.62</b>	<b>2.12</b>
<b>CD (P= 0.05)</b>	<b>1.85</b>	<b>1.80</b>	<b>6.12</b>

**Table 2 Effect of weed management treatment on grain and straw yield (q ha<sup>-1</sup>) of chickpea**

Treatments	Yield (q ha <sup>-1</sup> )	
	Grain	Straw
Control (Weedy check)	12.3	22.7
Weed free	24.8	35.6
One hand weeding 25 DAS	15.2	25.6
Two hand weeding 25 and 50 DAS	20.1	31.8
Oxyfluorfen 100 g a.i./ha Pre emergence	14.6	24.8
Oxyfluorfen 100 g a.i./ha Pre emergence + one hand weeding 25 DAS	17.2	27.9
Imazethapyr 50 g a.i./ha Post emergence (25 DAS)	16.1	26.5
Imazethapyr 50 g a.i./ha 25 DAS + one hand weeding 50 DAS	22.6	34.6
Oxyfluorfen 100 g a.i./ha Pre emergence + Imazethapyr 50 g a.i./ha 25 DAS	19.1	30.6
Oxyfluorfen 100 g a.i./ha Pre emergence + Imazethapyr 50 g a.i./ha 25 DAS + one hand weeding 50 DAS	23.7	35.3
<b>SEm±</b>	<b>0.70</b>	<b>1.10</b>
<b>CD (P= 0.05)</b>	<b>2.02</b>	<b>3.17</b>

### Experiment-2

**Title:** Effect of nutrient and weed management on weed dynamics, performance on wheat (*Triticum aestivum* L.) and monetary returns

**Investigators:** Dr. Vivek, Dr. N.S. Rana, Dr. R.K. Naresh, Dr. B.P. Dhyani & Dr. Raviendra Kumar

**Year of Start:** 2017-18      **Design:** Factorial RBD      **Replications:** 03      **Variety:** DBW-71

#### Objectives:

1. To study the effect of herbicides and nutrient management practices on weed dynamics
2. To assess the impact of herbicide and nutrient management practices on growth and yield of wheat crop
3. To work out the nutrient uptake by weed and wheat crop
4. To assess the economic feasibility of nutrient and weed management options.

**Factor A. Nutrient management:**

- (i) Control (No NPK)
- (ii) 100% NPK
- (iii) 100 % NPK + Bio-stimulant-G @ 25kg/ha (soil application)
- (iv) 100 % NPK + Bio-stimulant-L @ 625 ml/ha foliar spray each at 55 & 70 DAS

**Factor B. Weed management practices:**

- (i) Weedy check
- (ii) Two hand weeding
- (iii) Sulfosulfuron+ Metsulfuron Methyl @ 20 + 4 g a.i. ha<sup>-1</sup>
- (iv) Carfentrazone-ethyl + Sulfosulfuron @ 20 + 25 g a.i. ha<sup>-1</sup>

**Result:**

With the application of 100 % NPK + Bio-stimulant-L @ 625 ml/ha foliar spray each at 55&70 DAS recorded highest grain and straw yield and lowest total weed population and total dry weight of weeds at 90 DAS was recorded and Highest weed control efficiency was also recorded during both the years. Among the different herbicides the lowest total weed population and total dry weight of weeds at 90 DAS was recorded in Sulfosulfuron + Metsulfuron Methyl @ 20 + 4 g a.i. ha<sup>-1</sup>. Highest weed control efficiency was also recorded in Sulfosulfuron + Metsulfuron Methyl @ 20 + 4 g a.i. ha<sup>-1</sup>. Among the different herbicides the highest grain yield, straw yield of wheat was recorded in Sulfosulfuron + Metsulfuron Methyl @ 20 + 4 g a.i. ha<sup>-1</sup>. It was found at par with Carfentrazone-ethyl + Sulfosulfuron @ 20 + 25 g a.i. ha<sup>-1</sup>. Lowest grain and straw yield was recorded in Weedy check during both the year. (Table 1 and Table 2)

**Table: 1 Density of total weeds (number per m<sup>2</sup>), Dry weight of total weeds (g m<sup>-2</sup>) and weed control efficiency at 90 days as influenced by different nutrient and weed management practices**

Treatment	Total weeds density (No. per m <sup>2</sup> )		Total dry weight of weeds (g m <sup>-2</sup> )		Weed control efficiency	
	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20
<b>Nutrient Management</b>						
Control	79.46	96.80	50.76	60.87	48.75	47.53
100 % NPK	68.27	87.73	45.63	57.92	53.94	50.07
100 % NPK + Bio-stimulant-G @ 25kg/ha (soil application)	56.53	78.13	38.08	51.88	61.55	55.28
100 % NPK + Bio-stimulant-L @ 625 ml/ha foliar spray each at 55&70 DAS	46.40	65.07	31.49	43.23	68.21	62.53
<b>SEm(±)</b>	<b>0.18</b>	<b>0.18</b>	<b>0.09</b>	<b>0.08</b>	-	-
<b>C.D. (P=0.05)</b>	<b>0.51</b>	<b>0.52</b>	<b>0.27</b>	<b>0.23</b>	-	-
<b>Weed Management</b>						
Weedy check	150.66	179.33	99.06	116.01	0.00	0.00
Two hand weeding	13.66	19.00	9.15	12.45	90.76	89.27
Sulfosulfuron + Metsulfuron Methyl @ 20 + 4 g a.i. ha <sup>-1</sup>	35.66	57.33	23.45	37.48	76.32	67.69
Carfentrazone-ethyl + Sulfosulfuron @ 20 + 25 g a.i. ha <sup>-1</sup>	61.65	82.66	41.16	54.64	58.45	52.90
<b>SEm(±)</b>	<b>0.20</b>	<b>0.20</b>	<b>0.10</b>	<b>0.09</b>	-	-
<b>C.D. (P=0.05)</b>	<b>0.58</b>	<b>0.59</b>	<b>0.30</b>	<b>0.26</b>	-	-

**Table: 2 Effect of different nutrient and weed management practices on grain & straw yield (q ha<sup>-1</sup>) of wheat**

Treatments	Yield (q ha <sup>-1</sup> )			
	Grain		Straw	
	2018-19	2019-20	2018-19	2019-20
<b>Nutrient management</b>				
Control	25.9	26.2	58.01	60.32
100 % NPK	41.0	41.8	59.44	61.81
100 % NPK + Bio-stimulant-G @ 25kg/ha (soil application)	44.3	45.2	63.44	65.98
100 % NPK + Bio-stimulant-L @ 625 ml/ha foliar spray each at 55&70 DAS	46.2	46.8	66.08	68.72
<b>SE(m)±</b>	<b>0.79</b>	<b>0.80</b>	<b>0.60</b>	<b>0.62</b>
<b>C.D (P=0.05)</b>	<b>2.72</b>	<b>2.78</b>	<b>2.06</b>	<b>2.14</b>
<b>Weed management practices</b>				
Weedy check	27.83	28.23	44.24	46.05
Two hand weeding	47.25	48.37	72.59	75.49
Sulfosulfuron + Metsulfuron Methyl @ 20 + 4 g a.i. ha <sup>-1</sup>	44.75	45.18	67.68	69.68
Carfentrazone-ethyl + Sulfosulfuron @ 20 + 25 g a.i. ha <sup>-1</sup>	41.82	42.72	65.62	63.10
<b>SE(m)±</b>	<b>1.12</b>	<b>1.18</b>	<b>1.54</b>	<b>1.61</b>
<b>C.D (P=0.05)</b>	<b>3.28</b>	<b>3.45</b>	<b>4.52</b>	<b>4.70</b>

**RAC Comments: B/C ratio should be calculated and recommendation for package of practices be submitted as experiment has already been conducted for two years.**

### Experiment: 3

**Title:** Effect of doses and sources of nutrients on growth, yield and nutrient uptake in timely sown wheat (*Triticum aestivum* L.)

**Investigators:** Dr. N.S. Rana and Dr. Vivek

**Year of Start:** Rabi 2020-21

**Design:** RBD

**Replications:** 03

**Variety:** DBW-17

### Objectives:

- To assess effect of foliar application of Bio nano phosphorus, potassium, and zinc in wheat.
- To study the impact of applied Bio nano phosphorus, potassium and zinc fertilizers on soil health post- harvest of wheat
- To assess the economic feasibility of various treatments.

### Result

Application of Nano Zn in addition to 100% NPK resulted in an increase in effective tillers, ear length, spikeletes/spike, grains/spike and test weight. Further 75 % NPK + NPK Consortia + NPK spray (After I irrigation) + Bio-stimulant Spray (After I irrigation) + Nano Zn spray (After I irrigation) proved significantly better than 100% NPK. Application of 75 % NPK + NPK Consortia + Nano N spray (After I irrigation) + Nano Zn spray (After I irrigation) was also equally effective. The trend was almost similar in respect of all the yield attributes accept test weight, which exhibited non-significant improvement. (Table -1)

**Table1. Effect of doses and sources of nutrients on yield attributes**

Treatments	Yield attributes				
	Effective tillers per m <sup>2</sup>	Ear length (cm)	Spikelets per spike	Grains per spike	Test weight (g)
Control	224	8.1	14.1	37.1	33.5
NPK- (150:60:40)	273	10.6	16.8	47.2	37.6
100 % NPK + Nano Zn Spray (After I irrigation)	304	11.4	18.9	47.1	39.2
100 % NPK + Bio-stimulant Spray (After I irrigation)	299	11.3	18.5	47.2	39.0
75 % NPK + NPK Consortia	270	9.8	16.5	44.8	35.5
75 % NPK + NPK spray (After I irrigation)	271	9.9	16.7	45.8	35.9
75 % NPK + NPK Consortia + Nano N spray (After I irrigation)	278	10.7	16.9	46.0	38.1
75 % NPK + NPK Consortia + NPK spray (After I irrigation)	286	10.9	17.5	46.5	38.6
75 % NPK + NPK Consortia + NPK spray (After I irrigation) +Bio-stimulant Spray (After I irrigation)	287	11.1	17.8	47.5	38.8
75 % NPK + NPK Consortia + NPK spray (After I irrigation) + Bio-stimulant Spray (After I irrigation) + Nano Zn spray (After I irrigation)	301	11.4	18.6	46.9	39.1
75 % NPK + NPK Consortia + Nano Zn spray (After I irrigation)	281	10.8	17.2	46.2	38.5
75 % NPK + NPK Consortia +Nano N spray (After I irrigation) + Nano Zn spray (After I irrigation)	296	11.2	18.2	47.0	38.9
<b>SEm±</b>	<b>10.1</b>	<b>0.4</b>	<b>0.6</b>	<b>4.9</b>	<b>1.4</b>
<b>CD (P = 0.05)</b>	<b>30.2</b>	<b>1.1</b>	<b>1.9</b>	<b>1.6</b>	<b>N/S</b>

**Result**

Crop fertilized with 75 % NPK + NPK Consortia + NPK spray (After I irrigation) + Bio-stimulant Spray (After I irrigation) + Nano Zn spray (After I irrigation) remaining at par with one receiving 75 % NPK + NPK Consortia +Nano N spray (After I irrigation) + Nano Zn spray (After I irrigation) registered significantly increase over 100% NPK being 13.8% in case of grain yield and 2.5% in straw yield. Net return also followed the similar trend where the former fetched Rs. 9852 ha<sup>-1</sup> more than 100% NPK. (Table-2)

**Table 2. Effect of doses and sources of nutrients on yield**

Treatments	Yield (q ha <sup>-1</sup> )	
	Grain	Straw
Control	28.3	47.9
NPK (150:60:40)	49.1	71.9
100 % NPK + Nano Zn Spray (After I irrigation)	56.7	74.5
100 % NPK + Bio-stimulant Spray (After I irrigation)	55.8	73.6
75 % NPK + NPK Consortia	43.5	71.1
75 % NPK + NPK spray (After I irrigation)	45.1	72.0
75 % NPK + NPK Consortia + Nano N spray (After I irrigation)	49.4	72.1
75 % NPK + NPK Consortia + NPK spray (After I irrigation)	52.2	71.7
75 % NPK + NPK Consortia + NPK spray (After I irrigation) +Bio-stimulant Spray (After I irrigation)	53.5	71.7
75 % NPK + NPK Consortia + NPK spray (After I irrigation) + Bio-stimulant Spray (After I irrigation) + Nano Zn spray (After I irrigation)	55.9	73.7
75 % NPK + NPK Consortia + Nano Zn spray (After I irrigation)	50.6	71.5
75 % NPK + NPK Consortia +Nano N spray (After I irrigation) + Nano Zn spray (After I irrigation)	54.8	72.9
<b>SEm±</b>	<b>1.8</b>	<b>2.5</b>
<b>CD (P = 0.05)</b>	<b>5.5</b>	<b>7.5</b>

**Experiment: 4**

**Title:** Performance of wheat under crop establishment methods and organic fertilizer complemented with chemical n fertilizer on crop water productivity and soil health

**Investigators:** Dr. R.K. Naresh, Dr. Vivek, Dr. H.L. Singh and Dr. Yogesh Kumar

**Year of Start:** 2019-20      **Design:** SPD      **Replications:** 03      **Variety:** WB-02

**Objectives:**

- To evaluate the effect of crop establishment methods on growth, yield attributes yield and nutrient uptake of wheat crop,
- To find out the nutrient management strategy under crop establishment methods on soil health
- To access the economic feasibility of nutrient management strategy and crop establishment methods of wheat crop.

**Treatments Details:**

Treatments	
<b>Main Plot:</b>	
T <sub>1</sub>	Furrow Irrigated Raised Beds
T <sub>2</sub>	Rotovator tillage
T <sub>3</sub>	Reduced tillage
T <sub>4</sub>	Conventional tillage
<b>Sub Plot:</b>	
F <sub>1</sub>	Control (No fertilizer use)
F <sub>2</sub>	100% RDF
F <sub>3</sub>	100% RDF + NPK consortia + Bio-stimulant
F <sub>4</sub>	75% RDF + NPK consortia + Bio-stimulant
F <sub>5</sub>	100% RDF + NPK consortia + Bio-stimulant + NPK (18:18:18) spray after II irrigation
F <sub>6</sub>	75% RDF + NPK consortia + Bio-stimulant + NPK (18:18:18) spray after II irrigation

## Result:

The tillage crop establishment method highest grain & straw yield was recorded in Furrow Irrigated Raised Beds which was statistically at par with Conventional tillage. Among the different nutrient management the highest grain yield, straw yield of wheat was recorded in 100% RDF + NPK consortia + Bio-stimulant + NPK (18:18:18) spray after II irrigation. It was found at par with 100% RDF + NPK consortia + Bio-stimulant and 75% RDF + NPK consortia + Bio-stimulant + NPK (18:18:18) spray after II irrigation. Lowest grain and straw yield was recorded in control plot during year of investigation. (Table-1)

**Table 1 Performance of Wheat under Crop Establishment Methods and Organic Fertilizer Complemented with Chemical N Fertilizer on grain & straw yield (q ha<sup>-1</sup>) of wheat**

Treatments	Yield (q ha <sup>-1</sup> )	
	Grain	Straw
<b>(A) Crop Establishment Methods</b>		
Furrow Irrigated Raised Beds	44.28	68.18
Rotovator tillage	37.40	60.26
Reduced tillage	41.34	62.52
Conventional tillage	42.40	65.58
<b>SE(m)±</b>	<b>0.89</b>	<b>1.06</b>
<b>C.D (P=0.05)</b>	<b>3.08</b>	<b>3.69</b>
<b>(B) Nutrient Management</b>		
Control	25.65	41.25
100% RDF	41.34	63.60
100% RDF + NPK consortia + Bio-stimulant	45.54	70.22
75% RDF + NPK consortia + Bio-stimulant	42.53	65.96
100% RDF + NPK consortia + Bio-stimulant + NPK (18:18:18) spray after II irrigation	47.10	72.66
75% RDF + NPK consortia + Bio-stimulant + NPK (18:18:18) spray after II irrigation	44.06	68.27
<b>SE(m)±</b>	<b>1.16</b>	<b>1.31</b>
<b>C.D (P=0.05)</b>	<b>3.45</b>	<b>3.90</b>

## Progress Report for Kharif-2020

### Experiment: 1

**Title:** Effect of Nutrient Management Practices on Growth and Yield of Summer Moong Bean (*Vigna radiata* L.)

**Investigators:** Dr. N.S. Rana and Dr. Vivek

**Year of Start:** Kharif 2019-20

**Design:** RBD

**Replications:** 03

**Variety:** Pant Moong-5

### Objectives:

1. To study the effect of different nutrients management strategies on growth and yield of Moong Bean.
2. To determine the effect of nutrient management on nutrient uptake by crop.
3. To assess the economic feasibility of various treatments.

### Result

Highest number of pods plant<sup>-1</sup> were obtained with application of enhanced fertilizer doses viz., NPK-200 kg ha<sup>-1</sup> + FYM-10 t ha<sup>-1</sup> along with *Rhizobium* inoculation of mung bean and foliar spray of urea,



Bio-stimulant and FeSO<sub>4</sub> though it remained at par with FYM-10 t ha<sup>-1</sup> + DAP-100 kg ha<sup>-1</sup> + *Rhizobium* and foliar spray of urea + Bio-stimulant + FeSO<sub>4</sub> spray, FYM-10 t ha<sup>-1</sup> + DAP-100 kg ha<sup>-1</sup> + NPK Consortia along with Urea & Bio-stimulant spray, FYM-10 t ha<sup>-1</sup> + DAP-100 kg ha<sup>-1</sup> + NPK Consortia and foliar application urea + Bio-stimulant + FeSO<sub>4</sub>, FYM-10 t ha<sup>-1</sup> + DAP-100 kg ha<sup>-1</sup> + dual inoculation of *Rhizobium* inoculation & *PSB* along with foliar spray of urea + Bio-stimulant + FeSO<sub>4</sub> and FYM-10 t ha<sup>-1</sup> + NPK-150 kg ha<sup>-1</sup> + NPK Consortia and foliar spray of NPK + Bio-stimulant however significantly superior over rest of the treatments. The lowest number of pods plant<sup>-1</sup> was recorded in control. (Table 1)

**Table 1** Effect of nutrient management practices on number of pods plant<sup>-1</sup>, pod length and number of grains pod<sup>-1</sup>

Treatment	Yield attributes					
	No. of Pods plant <sup>-1</sup>		Pod length (cm)		No. of Grains pod <sup>-1</sup>	
	18	19	18	19	18	19
Control	11.0	11.3	4.2	4.3	5.2	5.3
Farmers Practice -DAP-100 kg ha <sup>-1</sup> (FP)	12.9	13.4	5.3	5.4	6.1	6.2
FYM + FP + <i>Rhizobium</i> (Rh)	13.3	13.8	6.1	6.3	6.3	6.5
FYM + FP + Rh + A <sub>1</sub>	13.5	14.0	6.7	7.0	6.4	6.6
FYM + FP + Rh + A <sub>2</sub>	14.3	14.9	7.1	7.3	6.7	6.9
FYM + FP + Rh + A <sub>3</sub>	15.0	15.5	8.8	9.0	6.9	7.1
FYM + FP + NPK Consortia + A <sub>1</sub>	14.0	14.4	6.9	7.1	6.6	6.8
FYM + FP + NPK Consortia + A <sub>2</sub>	14.6	15.0	8.3	8.6	6.8	7.0
FYM + FP + NPK Consortia + A <sub>3</sub>	15.4	16.0	8.8	9.1	7.1	7.3
FYM + FP + Rh + <i>PSB</i> + A <sub>3</sub>	15.7	16.1	8.9	9.1	7.2	7.4
FYM + FP + Rh + A <sub>4</sub>	13.8	14.1	6.1	6.3	6.5	6.7
FYM + FP + Rh + A <sub>5</sub>	14.4	14.9	8.2	8.5	6.7	6.9
FYM + NPK-150 kg ha <sup>-1</sup> + NPK Consortia + A <sub>5</sub>	14.8	15.3	8.8	9.1	6.9	7.1
FYM + NPK-200 kg ha <sup>-1</sup> + Rh + A <sub>3</sub>	16.0	16.6	9.4	9.7	7.4	7.6
<b>S Em (±)</b>	<b>0.5</b>	<b>0.5</b>	<b>0.3</b>	<b>0.3</b>	<b>0.3</b>	<b>0.3</b>
<b>C.D. (P=0.05)</b>	<b>1.5</b>	<b>1.6</b>	<b>0.8</b>	<b>0.9</b>	<b>0.7</b>	<b>0.9</b>

Higher grain yield plant<sup>-1</sup> was obtained among various nutrient management practices in comparison to control plot. Application of higher fertilizer doses viz., NPK-200 kg ha<sup>-1</sup> + FYM-10 t ha<sup>-1</sup> along with *Rhizobium* inoculation of mung bean and foliar spray of urea, Bio-stimulant and FeSO<sub>4</sub> resulted in highest grain yield plant<sup>-1</sup> which was statistically at par with FYM-10 t ha<sup>-1</sup> + DAP-100 kg ha<sup>-1</sup> + dual inoculation

with *Rhizobium* & *PSB* along with foliar application of urea + Bio-stimulant + FeSO<sub>4</sub> while significantly superior to rest of the treatments. Lowest grain yield plant<sup>-1</sup> was recorded in control. (Table-2)

**Table 2** Effect of nutrient management practices on grain yield plant<sup>-1</sup> and test weight

Treatment	Yield attributes			
	Grain yield (g plant <sup>-1</sup> )		1000 grain weight(g)	
	18	19	18	19
Control	1.8	1.9	31.5	32.3
Farmers Practice -DAP-100 kg ha <sup>-1</sup> (FP)	2.5	2.7	31.7	32.9
FYM + FP + <i>Rhizobium</i> (Rh)	2.7	3.1	31.9	33.1
FYM + FP + Rh + A <sub>1</sub>	2.8	3.0	32.2	33.4
FYM + FP + Rh + A <sub>2</sub>	3.1	3.3	32.9	34.5
FYM + FP + Rh + A <sub>3</sub>	3.5	3.8	33.8	35.0
FYM + FP + NPK Consortia + A <sub>1</sub>	3.0	3.3	32.7	33.8
FYM + FP + NPK Consortia + A <sub>2</sub>	3.3	3.6	33.3	34.4
FYM + FP + NPK Consortia + A <sub>3</sub>	3.7	4.0	34.1	35.0
FYM + FP + Rh + <i>PSB</i> + A <sub>3</sub>	3.9	4.2	34.5	35.3
FYM + FP + Rh + A <sub>4</sub>	2.9	3.1	32.5	33.5
FYM + FP + Rh + A <sub>5</sub>	3.2	3.5	33.1	34.2
FYM + NPK-150 kg ha <sup>-1</sup> + NPK Consortia + A <sub>5</sub>	3.4	3.7	33.5	34.6
FYM + NPK-200 kg ha <sup>-1</sup> + Rh + A <sub>3</sub>	4.1	4.5	34.8	35.9
<b>S Em (±)</b>	<b>0.1</b>	<b>0.1</b>	<b>1.2</b>	<b>1.3</b>
<b>C.D. (P=0.05)</b>	<b>0.4</b>	<b>0.3</b>	<b>NS</b>	<b>NS</b>

Farmers practice increased yield by 7.0 q ha<sup>-1</sup> (42.9 %) over control. Additional use of FYM and *Rhizobium* over farmers practice led to an increase of 8.0 q ha<sup>-1</sup> (14.3 %) though it was non-significant. Similarly spray of urea, bio-stimulant, iron, NPK and NPK + bio-stimulant increased grain yield over their respective control by 8.7 q ha<sup>-1</sup> (8.8 %), 9.7 q ha<sup>-1</sup> (11.5 %), 11 q ha<sup>-1</sup> (13.4 %), 9.1 q ha<sup>-1</sup> (13.8 %) and 9.8 q ha<sup>-1</sup> (22.5 %) being non-significant. However, their cumulative effect accounted to their combined use *i.e.* application of NPK-200 kg ha<sup>-1</sup> + FYM-10 t ha<sup>-1</sup> along with *Rhizobium* inoculation of mung bean and foliar spray of urea, Bio-stimulant and FeSO<sub>4</sub> led to significant increase of 13 q ha<sup>-1</sup> (165.3%) over control and (85.7%) over farmers practice. Almost similar trend was observed in respect of biomass yield and harvest index (Table 3).

**Table 3** Effect of nutrient management practices on grain, straw, biological yield and harvest index

Treatment	Yields (q ha <sup>-1</sup> )			
	Grain		Straw	
	18-19	19-20	18-19	19-20
Control	4.9	5.4	18.8	19.1
Farmers Practice -DAP-100 kg ha <sup>-1</sup> (FP)	7.0	7.3	25.7	26.4
FYM + FP + Rhizobium (Rh)	8.0	8.3	28.5	29.2
FYM + FP + Rh + A <sub>1</sub>	8.7	8.9	27.9	28.3
FYM + FP + Rh + A <sub>2</sub>	9.7	10.4	30.4	31.3
FYM + FP + Rh + A <sub>3</sub>	11.0	11.3	32.8	33.4
FYM + FP + NPK Consortia + A <sub>1</sub>	9.5	9.8	29.5	30.2
FYM + FP + NPK Consortia + A <sub>2</sub>	10.1	10.3	31.9	32.4
FYM + FP + NPK Consortia + A <sub>3</sub>	11.3	11.6	32.8	33.1
FYM + FP + Rh + PSB + A <sub>3</sub>	11.6	12.0	34.1	34.3
FYM + FP + Rh + A <sub>4</sub>	9.1	9.3	28.8	28.9
FYM + FP + Rh + A <sub>5</sub>	9.8	10.1	31.2	31.5
FYM + NPK-150 kg ha <sup>-1</sup> +NPK Consortia+ A <sub>5</sub>	10.4	10.8	32.1	33.0
FYM + NPK-200 kg ha <sup>-1</sup> + Rh + A <sub>3</sub>	13.0	13.5	35.0	38.0
<b>S Em (±)</b>	<b>0.4</b>	<b>0.5</b>	<b>1.1</b>	<b>1.0</b>
<b>C.D. (P=0.05)</b>	<b>1.1</b>	<b>1.4</b>	<b>3.2</b>	<b>3.0</b>

### Experiment: 2

**Title:** Effect of Different Establishment Methods and Nutrient Sources on Crop Productivity, Water footprint, Soil health and Grain quality of Rice in Vertisols under Rice-Wheat Cropping System

**Investigators:** Dr. R.K. Naresh, Dr. Vivek, Dr. S.P. Singh and Dr. Vivak

**Year of Start:** *Kharif* 2019 & 2020 **Design:** FRBD **Replications:** 03 **Variety:** Pusa Basmati 1509

#### Objective:

- To investigate and compare the effect of crop establishment methods and nutrient combinations on yield and nutrient concentration in rice.
- To evaluate the effect of crop establishment methods and nutrient combinations on soil health and water foot print.
- To access the economic feasibility of crop establishment methods and nutrient combinations practices of rice crop.

## Treatment Details :-

Treatments		Symbols Used
<b>Crop Establishment Methods:</b>		
T <sub>1</sub>	Conventional puddled transplanted rice (CT- TPR)	E <sub>1</sub>
T <sub>2</sub>	Wide bed Transplanted rice (W Bed-TPR)	E <sub>2</sub>
<b>Nutrient Sources :</b>		
T <sub>3</sub>	Control (No N,P,K)	N <sub>1</sub>
T <sub>4</sub>	100% RDF (150:60:40:: N:P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O kg ha <sup>-1</sup> ) + ZnSO <sub>4</sub> 25 kg ha <sup>-1</sup>	N <sub>2</sub>
T <sub>5</sub>	125% RDN (187.5:60:40:: N:P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O kg ha <sup>-1</sup> ) + ZnSO <sub>4</sub> 25 kg ha <sup>-1</sup>	N <sub>3</sub>
T <sub>6</sub>	STCR based NPK application + ZnSO <sub>4</sub> 25 kg ha <sup>-1</sup>	N <sub>4</sub>
T <sub>7</sub>	N <sub>2</sub> + FYM (5 t ha <sup>-1</sup> )	N <sub>5</sub>
T <sub>8</sub>	N <sub>2</sub> + FYM (5 t ha <sup>-1</sup> ) + PSB (5 kg ha <sup>-1</sup> ) + Azotobacter 20 kg ha <sup>-1</sup>	N <sub>6</sub>
T <sub>9</sub>	75% RDN (112.5: N kg ha <sup>-1</sup> ) + FYM (5 t ha <sup>-1</sup> ) + ZnSO <sub>4</sub> 25 kg ha <sup>-1</sup>	N <sub>7</sub>
T <sub>10</sub>	75% RDN (112.5: N kg ha <sup>-1</sup> ) + FYM (5 t ha <sup>-1</sup> ) + PSB (5 kg ha <sup>-1</sup> ) + Azotobacter 20 kg ha <sup>-1</sup> + ZnSO <sub>4</sub> 25 kg ha <sup>-1</sup>	N <sub>8</sub>
T <sub>11</sub>	Organic Practice @ FYM (30 t ha <sup>-1</sup> ) + PSB (5 kg ha <sup>-1</sup> ) + Azotobacter 20 kg ha <sup>-1</sup> + ZnSO <sub>4</sub> 25 kg ha <sup>-1</sup>	N <sub>9</sub>

**Result:** Effect of crop establishment recorded highest grain & straw yield in Conventional puddled transplanted rice (CT- TPR). Among the different nutrient sources, the highest grain yield & straw yield of wheat was recorded in N<sub>2</sub>+ FYM (5 t ha<sup>-1</sup>) + PSB (5 kg ha<sup>-1</sup>) + Azotobacter 20 kg ha<sup>-1</sup>. It was found at par with 125% RDN (187.5:60:40: N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O kg ha<sup>-1</sup>) + ZnSO<sub>4</sub> 25 kg ha<sup>-1</sup>. Lowest grain and straw yield was recorded in control plot during both the years. (Table-1)

**Table: 1. Effect of different crop establishment methods and nutrient sources on yield and harvest index of rice**

Treatment	Yield (q ha <sup>-1</sup> )			
	Grain		Straw	
	2019	2020	2019	2020
<b>Crop Establishment methods</b>				
E <sub>1</sub> : Conventional puddled transplanted rice (CT- TPR)	41.1	42.1	74.1	75.3
E <sub>2</sub> : Wide bed Transplanted rice (W Bed-TPR)	39.5	40.3	72.4	73.6
<b>SEm±</b>	<b>0.55</b>	<b>0.63</b>	<b>0.57</b>	<b>0.66</b>
<b>CD (p=0.05)</b>	<b>1.59</b>	<b>1.82</b>	<b>1.65</b>	<b>1.90</b>
<b>Nutrient sources</b>				
N <sub>1</sub> : Control (No N,P,K)	29.8	30.1	60.6	62.0
N <sub>2</sub> : 100% RDF (150:60:40:: N:P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O kg ha <sup>-1</sup> ) + ZnSO <sub>4</sub> 25 kg ha <sup>-1</sup>	39.6	40.3	74.1	75.3
N <sub>3</sub> : 125% RDN (187.5:60:40:: N:P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O kg ha <sup>-1</sup> ) + ZnSO <sub>4</sub> 25 kg ha <sup>-1</sup>	46.9	47.9	79.4	79.3
N <sub>4</sub> : STCR based NPK application + ZnSO <sub>4</sub> 25 kg ha <sup>-1</sup>	37.5	37.8	69.9	71.5
N <sub>5</sub> : N <sub>2</sub> + FYM (5 t ha <sup>-1</sup> )	43.8	44.9	77.3	78.4
N <sub>6</sub> : N <sub>2</sub> + FYM (5 t ha <sup>-1</sup> ) + PSB (5 kg ha <sup>-1</sup> ) + Azotobacter 20 kg ha <sup>-1</sup>	49.0	50.2	81.2	82.8
N <sub>7</sub> : 75% RDN (112.5: N kg ha <sup>-1</sup> ) + FYM (5 t ha <sup>-1</sup> ) + ZnSO <sub>4</sub> 25 kg ha <sup>-1</sup>	38.5	39.7	72.2	73.3
N <sub>8</sub> : 75% RDN (112.5: N kg ha <sup>-1</sup> ) + FYM (5 t ha <sup>-1</sup> ) + PSB (5 kg ha <sup>-1</sup> ) + Azotobacter 20 kg ha <sup>-1</sup> + ZnSO <sub>4</sub> 25 kg ha <sup>-1</sup>	42.3	43.4	75.6	77.2
N <sub>9</sub> : Organics Practices @ FYM (30 t ha <sup>-1</sup> ) + PSB (5 kg ha <sup>-1</sup> ) + Azotobacter 20 kg ha <sup>-1</sup> + ZnSO <sub>4</sub> 25 kg ha <sup>-1</sup>	35.8	36.6	69.1	69.9
<b>SEm±</b>	<b>1.18</b>	<b>1.35</b>	<b>1.22</b>	<b>1.40</b>
<b>CD (p =0.05)</b>	<b>3.38</b>	<b>3.87</b>	<b>3.50</b>	<b>4.02</b>

**RAC Comments:** Experiment conducted for two years submit recommendation for package of practices.

### Experiment: 3

**Title:** Effect of halo-priming and organic priming on germination, seed vigour and yield of Black gram (*Vigna mungo* L.)

**Investigators:** Dr. R.B. Yadav, Dr. R.K. Naresh, Dr. H.R.Singh and Dr Krishn Gopal

**Year of Start:** Zaid -2020

**Design:** RBD

**Replications:** 03

**Variety:** PU-35

#### Objectives:

- To evaluate the impact of seed priming on the germination, biomass and seedling vigour of Blackgram.
- To study effect of seed priming on performance of Blackgram.

#### Treatments:

1. Control (untreated dry seeds)
2. Hydropriming
3. Molybdenum 0.04%
4. Potassium nitrate 1%
5. Potassium chloride 1%
6. Phosphorous 0.62%
7. Salicylic acid 20 ppm
8. Manitol 3%
9. Aloe vera gel 10%
10. Coconut water 10%
11. Cow urine 10%
12. Trichoderma 0.08%

#### Results:

The highest germination percentage (89.6), seed vigour index (37.92) and seedling dry weight (0.258g) was recorded with Halo-priming of seed with Potassium Chloride @ 1% which was significantly higher than Organic Priming, hydration & control.

The highest grain yield (875 kg/ha) & harvest index (19.07) was obtained by the seed primed with Potassium Chloride @ 1% which was closely followed by priming with Molybdenum @ 0.04% and Potassium Nitrate @ 1%.

On an average 15 percent increase in germination percentage, Seed Vigour Index and grain yield over control while only 7 percent increase was recorded by hydration over control.

S. No.	Treatments	Germination (%)	Seedling Vigour Index	Seedling dry wt. plot <sup>-1</sup> (mg)	Grain yield (kg ha <sup>-1</sup> )	Straw yield (kg ha <sup>-1</sup> )	H. I.
1.	Control (untreated dry seeds)	77.6	19.34	166	713	4142	17.22
2.	Hydropriming	80.2	25.85	207	762	4212	18.09
3.	Molybdenum at 0.04%	88.8	36.50	230	868	4617	18.80
4.	Potassium Nitrate (1%)	87.3	35.74	227	844	4560	18.51
5.	Potassium Chloride (1%)	<b>89.6</b>	<b>37.92</b>	258	875	4589	19.07
6.	Phosphorus at 0.62%	87.4	36.01	226	852	4588	18.57
7.	Salicylic acid at 20 mg L <sup>-1</sup>	82.7	28.75	213	782	4287	18.24
8.	Methenol 3%	81.8	26.72	202	773	4235	18.25
9.	Aloe vera gel (10%)	81.3	26.99	198	765	4208	18.18
10.	Coconut water (10%)	80.7	26.01	211	770	4287	17.96
11.	Cow urine 10%	82.4	28.50	220	778	4533	18.11
12.	Tricoderma 8 g L <sup>-1</sup>	85.3	31.65	232	821	4450	18.45
	<b>SEm±</b>	1.061	1.39	10.862	16.317	85.855	0.271
	<b>CD at 5%</b>	3.12	4.12	31.5	48.3	257.2	0.81

## Experiment: 4

**Title:** Effect of crop establishment methods and weed management options on weed dynamics and performance of Basmati rice (*Oryza sativa* L.).

**Investigators:** Dr R.B.Yadav, Shipra, Dr Vivek, Dr R.K. Naresh, and Dr B.P. Dhyani

**Year of Start:** Kharif 2020 Second year      **Design:** Split Plot Design      **Replications:** 04

**Variety:** Pusa Basmati- 1509      **Date of Sowing:** 25-06-2020

### Objectives

1. To find out the suitable crop establishment method and weed management options for basmati rice.
2. To access the weed dynamics and performance of basmati rice under different crop establishment methods and weed management options

### Treatment details

#### A- Main Plot Treatment (Crop Establishment Methods)

E<sub>1</sub> - Puddled Conventional Transplanting (PCT)

E<sub>2</sub>- Unpuddled Flat (UP Flat)

E<sub>3</sub>- Furrow Irrigated Raised Beds(FIRB)

#### B- Sub Plot Treatment (Weed Management)

W<sub>1</sub>-Pretlachlor @ 0.75 kg ha<sup>-1</sup> PE + Bispyribac Sodium @ 20g a.i. ha<sup>-1</sup> POE 20 DAT

W<sub>2</sub>- Almix @ 4g a.i. ha<sup>-1</sup> + Bispyribac Sodium @ 20 g a.i. ha<sup>-1</sup> POE at 20 DAT

W<sub>3</sub>- Bispyribac Sodium @ 25g a.i. ha<sup>-1</sup> POE at 20 DAT

W<sub>4</sub>- Two hand weeding (at 25 and 45 DAT)

W<sub>5</sub> - Weedy check

### Results:

The data presented in table-1 reveals that the lowest weed density and dry weight was recorded in Puddled Conventional Transplanting (PCT), which was significantly lower than the other establishment methods during both the years, whereas the FIRB method recorded significantly higher weed density and dry matter than PCT and lower than UPF. A significant increase in weed control efficiency was recorded by PCT and FIRB system over UPF. Among the weed management option application of Pretilachlor @ 0.75 Kg ha<sup>-1</sup> PE + Bispyribac sodium @ 20 g a.i. ha<sup>-1</sup> POE at 20 DAT followed by Almix 4 g a.i. ha<sup>-1</sup> + Bispyribac sodium @ 20 g a.i. ha<sup>-1</sup> POE at 20 DAT produced significantly lower weed density and dry weight than the rest of the treatments during both the years, which was statistically at par to two hand weedings. The highest weed control efficiency was also recorded by Pretilachlor @ 0.75 Kg ha<sup>-1</sup> PE fb + Bispyribac sodium @ 20 g a.i. ha<sup>-1</sup> POE at 20 DAT, which was at par to two hand weeding and closely followed by Almix 4 g a.i. ha<sup>-1</sup> + Bispyribac sodium @ 20 g a.i. ha<sup>-1</sup> POE at 20 DAT during both the years. (Table -1)

**Table 1:** Effect of crop establishment methods and weed management on total weed density, dry weight ( $\text{gm}^{-2}$ ) and weed control efficiency at 60 days after transplanting.

Treatments	Density of total weed at 60 DAS ( $\text{no./m}^2$ )		Total weed dry weight at 60 DAS ( $\text{g m}^{-2}$ )		Weed control efficiency (%)	
	2019	2020	2019	2020	2019	2020
<b>(A) Crop Establishment Methods</b>						
E <sub>1</sub> - Puddled Conventional Transplanting (PCT)	9.04 (93)	9.68 (105)	6.71 (50.68)	6.72 (50.29)	57.39	54.13
E <sub>2</sub> -Unpuddled Flat (UPF)	11.17 (135)	11.59 (145)	7.75 (65.16)	8.15 (71.44)	49.99	49.18
E <sub>3</sub> -Furrow Irrigated Raised Beds (FIRBs)	10.28 (119)	10.57 (124)	7.62 (63.20)	7.79 (66.34)	55.50	54.32
<b>SE(m)±</b>	<b>0.21</b>	<b>0.22</b>	<b>0.16</b>	<b>0.17</b>	<b>1.32</b>	<b>1.01</b>
<b>C.D(P=0.05)</b>	<b>0.75</b>	<b>0.78</b>	<b>0.57</b>	<b>0.59</b>	<b>4.59</b>	<b>3.50</b>
<b>(B) Weed Management Options</b>						
W <sub>1</sub> -Pretilachlor @ 0.75 Kg ha <sup>-1</sup> PE fb Bispyribac sodium @ 20 g a.i. ha <sup>-1</sup> POE at 20 DAT	7.36 (54)	7.82 (61)	5.64 (31.50)	5.74 (32.87)	79.67	79.06
W <sub>2</sub> -Almix 4 g a.i. ha <sup>-1</sup> + Bispyribac sodium @ 20 g a.i. ha <sup>-1</sup> POE at 20 DAT	8.19 (68)	8.77 (77)	6.08 (37.07)	6.16 (37.93)	72.57	71.82
W <sub>3</sub> -Bispyribac sodium @ 25 g a.i. ha <sup>-1</sup> POE at 20 DAT	12.48 (156)	12.91 (167)	8.73 (75.99)	8.96 (80.19)	41.29	38.72
W <sub>4</sub> -Two hand weedings	7.02 (50)	7.51 (57)	5.01 (24.92)	5.39 (29.42)	77.94	73.11
W <sub>5</sub> -Weedy check	15.77 (250)	16.06 (259)	11.34 (128.91)	11.51 (133.03)	0.00	0.00
<b>SE(m)±</b>	<b>0.21</b>	<b>0.21</b>	<b>0.15</b>	<b>0.18</b>	<b>1.63</b>	<b>1.40</b>
<b>C.D(P=0.05)</b>	<b>0.62</b>	<b>0.62</b>	<b>0.46</b>	<b>0.54</b>	<b>4.86</b>	<b>4.18</b>

The data presented in the table 2 revealed that among the crop establishment methods the highest grain yield was recorded by PCT, which was significantly higher than UPF and statistically at par to FERB system during both the years. However among the weed management practices application of Pretilachlor @ 0.75 Kg ha<sup>-1</sup> PE fb Bispyribac sodium @ 20 g a.i. ha<sup>-1</sup> POE at 20 DAT produced the highest grain yield during both the years, which was at par with two hand weeding and Almix 4 g a.i. ha<sup>-1</sup> + Bispyribac sodium @ 20 g a.i. ha<sup>-1</sup> POE at 20 DAT. On an average 40% reduction in grain yield was recorded due to weed infestation. Harvest index was significantly influenced by the weed control options but not by the crop establishment methods. (Table-2)

**Table 2:** Effect of crop establishment methods and weed management on grain yield, harvest index, net return and B: C ratio.

Treatments	Grain Yield ( $\text{q ha}^{-1}$ )		Harvest index(%)		Net Return		B:C Ratio	
	2019	2020	2019	2020	2019	2020	2019	2020
<b>(A) Crop Establishment Methods</b>								
E <sub>1</sub> - Puddled Conventional Transplanting (PCT)	46.91	48.26	36.38	36.89	100460	101230	4.19	4.30
E <sub>2</sub> -Unpuddled Flat (UPF)	40.23	42.93	36.04	36.25	81432	88237	3.55	3.71
E <sub>3</sub> -Furrow Irrigated Raised Beds (FIRBs)	44.97	46.08	36.39	36.82	93353	95383	3.82	3.81
<b>SE(m)±</b>	<b>0.93</b>	<b>0.90</b>	<b>0.71</b>	<b>0.71</b>	--	--	--	--
<b>C.D(P=0.05)</b>	<b>3.24</b>	<b>3.13</b>	<b>N/A</b>	<b>N/A</b>	--	--	--	--
<b>(B) Weed Management Options</b>								
W <sub>1</sub> -Pretilachlor @ 0.75 Kg ha <sup>-1</sup> PE	49.69	51.82	37.75	38.04	106517	111571	4.28	4.36

<i>fb</i> Bispyribac sodium @ 20 g a.i. ha <sup>-1</sup> POE at 20 DAT									
W <sub>2</sub> -Almix 4 g a.i. ha <sup>-1</sup> + Bispyribac sodium @ 20 g a.i. ha <sup>-1</sup> POE at 20 DAT	48.54	49.90	37.42	37.77	104096	106768	4.26	4.25	
W <sub>3</sub> -Bispyribac sodium @ 25 g a.i. ha <sup>-1</sup> POE at 20 DAT	43.50	45.33	36.94	36.92	90455	94843	3.85	3.92	
W <sub>4</sub> -Two hand weedings	48.38	49.78	38.68	39.02	100530	100189	3.93	3.61	
W <sub>5</sub> -Weedy check	30.06	31.95	30.57	31.52	57133	61380	2.88	2.98	
<b>SE(m)±</b>	<b>0.93</b>	<b>0.89</b>	<b>0.68</b>	<b>0.68</b>	--	--	--	--	
<b>C.D(P=0.05)</b>	<b>2.76</b>	<b>2.64</b>	<b>2.02</b>	<b>2.03</b>	--	--	--	--	

The highest net return and B: C ratio was calculated by the application of Pretilachlor @ 0.75 Kg ha<sup>-1</sup> PE *fb* Bispyribac sodium @ 20 g a.i. ha<sup>-1</sup> POE at 20 DAT during both the years, whereas among the crop establishment methods PCT recorded highest net return and B: C ratio. On the basis of two year data it can be calculated that application of Pretilachlor @ 0.75 Kg ha<sup>-1</sup> PE *fb* Bispyribac sodium @ 20 g a.i. ha<sup>-1</sup> POE at 20 DAT and Puddled Conventional Transplanting (PCT) will be beneficial for the production of Basmati rice at the farmer's field.

**RAC Comments:** Experiment conducted for two years submit recommendation for package of practices.

### Experiment: 5

**Title:** Response of Basmati Rice to Iron and Boron Nutrition under varying Seedling Density

**Investigators:** Dr. Adesh Singh, Dr. Vivek, Dr. R.B. Yadav, Dr. Mukesh Kumar and Dr. U.P. Shahi

**Year of Start:** *Kharif*, 2019 & 2020      **Design:** SPD      **Replications:** 03

**Variety:** PB-1121      **Date of Sowing:** 23-06-2020 (S) 18-07-2020 (TP)

#### Objectives:

1. To study about the effect of Iron and Boron Agronomic Biofortification on rice
2. To assess the economic feasibility of various treatments.

#### Treatments Details:

S.N.	Treatments	Symbol
<b>A.</b>	<b>Planting Density</b> (seedlings/hill)	
1		P <sub>1</sub>
2		P <sub>2</sub>
3		P <sub>3</sub>
<b>B.</b>	<b>Iron and Boron Application</b>	
	Control (Water spray)	N <sub>1</sub>
	Foliar spray of FeSO <sub>4</sub> @ 0.5% and B @ 0.2% at MT stage	N <sub>2</sub>
	Foliar spray of FeSO <sub>4</sub> @ 0.5% and B @ 0.2% at PI stage	N <sub>3</sub>
	Foliar spray of FeSO <sub>4</sub> @ 0.5% at MT stage and B @ 0.2% at PI stage	N <sub>4</sub>
	Foliar spray of FeSO <sub>4</sub> @ 0.5% and B @ 0.2% at MT and PI stage	N <sub>5</sub>

#### Observations Recorded:

- Growth and developmental studies
- Yield and yield attributes



- Nutrient contents and their uptake
- Quality Parameters
- Economic studies

### Results:

Results revealed that PB-1121 planted 2/3 seedling/hills, being on par to each other gave the significantly higher yield and gross return/ ha than one seedling/hills during both the years. Although L:B ratio of hulled rice followed the similar trends but the variation was non-significant during both the years.

Foliar application of FeSO<sub>4</sub> @ 0.5% and B @ 0.2% at MT and PI stage (N<sub>5</sub>) was found significantly superior over control and foliar spray at MT stage only during both the years. However, this treatment out yielded control by 7.7 and 9.8 % and fetched Rs. 9472 and Rs. 10023 during 2019 and 2020, respectively. N<sub>5</sub>, which was at par with N<sub>4</sub> resulted into significantly taller plants than control N<sub>2</sub> and N<sub>3</sub> during both the years.

**Table 1:** Effect of varying seedling density & Iron and Boron on growth, yield and gross returns in basmati rice

Treatments	Plant height (cm)		Grain yield (t/ha)		L:B ratio of hulled rice		Gross return (Rs/ha)	
	2019	2020	2019	2020	2019	2020	2019	2020
<b>Planting Density (seedlings/hill)</b>								
1	109.9	110.2	4.56	4.62	4.95	4.75	105705	110853
2	115.1	115.6	4.97	5.04	5.15	4.82	115523	121123
3	105.1	105.8	5.02	5.11	5.19	4.90	116839	122848
<b>S Em±</b>	<b>1.4</b>	<b>1.3</b>	<b>0.08</b>	<b>0.07</b>	<b>0.12</b>	<b>0.08</b>	<b>1548</b>	<b>1572</b>
<b>C.D. (P=0.05)</b>	<b>5.6</b>	<b>5.4</b>	<b>0.32</b>	<b>0.30</b>	<b>NS</b>	<b>NS</b>	<b>6242</b>	<b>6338</b>
<b>Iron and Boron Application</b>								
Control (Water spray)	106.1	106.5	4.66	4.7	5.19	4.94	106813	112992
Foliar spray of FeSO <sub>4</sub> @ 0.5% and B @ 0.2% at MT stage	108.4	109.1	4.80	4.89	5.11	4.81	112244	116760
Foliar spray of FeSO <sub>4</sub> @ 0.5% and B @ 0.2% at PI stage	109.6	109.7	4.86	4.91	5.12	4.85	112916	117955
Foliar spray of FeSO <sub>4</sub> @ 0.5% at MT stage and B @ 0.2% at PI stage	112.5	112.9	4.97	5.04	5.07	4.80	115188	120653
Foliar spray of FeSO <sub>4</sub> @ 0.5% and B@0.2% at MT and PI stage	113.7	114.2	5.02	5.16	5.00	4.72	116285	123015
<b>S Em±</b>	<b>1.4</b>	<b>1.6</b>	<b>0.06</b>	<b>0.05</b>	<b>0.14</b>	<b>0.10</b>	<b>1220</b>	<b>974</b>
<b>C.D. (P=0.05)</b>	<b>4.2</b>	<b>4.7</b>	<b>0.18</b>	<b>0.15</b>	<b>NS</b>	<b>NS</b>	<b>3581</b>	<b>2861</b>

**RAC Comments:** Experiment conducted for two years submit recommendation for package of practices.

### Action Plan for Kharif-2021

#### Experiment- 1

**Title:** Effect of herbicides on weed dynamics, yield and monetary returns of rice (*Oryza sativa* L.)

**Investigators:** Dr. Vivek, Dr. R.K. Naresh, Dr. B.P. Dhyani & Dr. R.B. Yadav

**Year of Start:** 2020-21

**Design:** RBD

**Replications:** 03

**Variety:** PB-1

#### Objectives:

- To evaluate the effect of herbicide on weed flora in transplanted rice.
- To assess the impact of different herbicide on growth, yield and productivity of transplanted rice crop.
- To study the economic feasibility of rice crop under different treatments.

## Treatments details:

Treatments	Dose (g a.i.ha <sup>-1</sup> )	Time
Weedy check	-	-
Weed free	-	-
Bispyribac sodium @ 25 g a.i ha <sup>-1</sup>	-	Post-emergence
Penoxsulam @ 20 g a.i.ha <sup>-1</sup>	20	Post-emergence
Penoxsulam @ 25 g a.i.ha <sup>-1</sup>	25	Post-emergence
Penoxsulam @ 30 g a.i.ha <sup>-1</sup>	30	Post-emergence
Oxidiargyl@ 80 g a.i.ha <sup>-1</sup>	80	Pre-emergence
Oxidiargyl@100g a.i.ha <sup>-1</sup>	100	Pre-emergence
Oxidiargyl@120g a.i.ha <sup>-1</sup>	120	Pre-emergence
Ethoxy Sulfuron@20g a.i.ha <sup>-1</sup>	20	Pre-emergence
Ethoxy Sulfuron@25g a.i.ha <sup>-1</sup>	25	Pre-emergence
Ethoxy Sulfuron@30g a.i.ha <sup>-1</sup>	30	Pre-emergence

## Observations Recorded:

- Growth and developmental studies
- Yield and yield attributes
- Economic studies

**RAC Recommendation:** Experiment Approved.

## Experiment- 2

**Title:** Effect of doses and sources of nutrients on growth, yield and quality of transplanted rice (*Oryza sativa* L.)

**Investigators:** Dr. Vivek, Dr. Mukesh Kumar, Dr. B.P. Dhyani and Dr. Adesh Singh

**Year of Start:** 2020-21      **Design:** RBD      **Replications:** 03      **Variety-PB-1**

## Objectives:

- To study the effect of nutrient sources, dose and mode of application on growth and yield of rice.
- To find out the impact of nutrient management options on soil properties.
- To assess economic feasibility of various nutrient management practices in rice.

## Treatments details

S. No.	Treatments
1.	Control
2.	NPK- (150:60:40 kg ha <sup>-1</sup> )
3.	100 % NPK + Nano Zn Spray (After 30 days)
4.	100 % NPK + Bio-stimulant Spray (After 45 days)
5.	75 % NPK + NPK Consortia
6.	75 % NPK + NPK spray (After 30 days)
7.	75 % NPK + NPK Consortia + Nano N spray (After 30 days)
8.	75 % NPK + NPK Consortia + NPK spray (After 30 days)
9.	75 % NPK + NPK Consortia + NPK spray (After 30 days) +Bio-stimulant Spray (After 45 days)
10.	75 % NPK + NPK Consortia + NPK spray (After 30 days) + Bio-stimulant Spray (After 45 days) + Nano Zn spray (After 30 days)
11.	75 % NPK + NPK Consortia + Nano Zn spray (After 30 days)
12.	75 % NPK + NPK Consortia +Nano N spray (After 30 days) + Nano Zn spray (After 30 days)

**Observations Recorded:**

- Growth and developmental studies
- Yield and yield attributes
- Economic studies

**RAC Recommendation:** Experiment approved, however, name of the variety needs to be mentioned.

**Experiment - 3**

**Title:** Effect of planting system and weed management on performance of Black gram (*Vigna mungo* L.)  
*New*

**Investigators:** Dr. R.B.Yadav, Dr. Vivek, Dr. R.K. Naresh, and Dr. Krishn Gopal

**Year of Start:** *Kharif -2021*      **Design:** Split plot Design      **Replications:** 03      **Variety:** PU-31

**Objectives:**

- To evaluate the impact of weed management options on Blackgram under different planting system.
- To study effect of planting system and weed infestation on performance of Blackgram.
- Economic evaluation of the treatments.

**Treatments:****(A) Main factors: Planting system**

- a. Flat planting
- b. Zero till planting
- c. Reduced till planting
- d. Raised bed planting

**(B) Sub factors: Seed priming**

1. Imezathopoeer @ 0.1 kg ai/ha PoE
2. Quizalophop @ 0.1 kg ai/ha PoE
3. Imezathopoeer and Quizalophop each @ 0.1 kg ai/ha PoE
4. Weed free
5. Weedy check

**Observations to be Recorded**

- Growth and developmental studies
- Yield and yield attributes
- Economic studies

**RAC Recommendation:** Experiment approved.

**Experiment - 4**

**Title:** Long term impact of farming practices on performance of crops and soil health in predominant cropping system under western U.P.

**Investigators:** Dr. R.B. Yadav, Dr. U.P.Sahi and Dr. Adesh Singh, Dr. Kamal Khilari, Dr. Rajendra Singh and Dr. Ashok Yadav

**Year of Start:** *Kharif 2021*      **Design:** RBD      **Replications:** 03

**Varieties :** PU-31, Indra Urd-1, Shekhar-2

## Objectives:

- To evaluate the impact of farming practices on performance of crops.
- To evaluate the effect of farming practices on soil health.
- Economic evaluation of the treatments.

## Treatments:

### Main Plot: Farming practices

- Control
- Organic Farming Practices
- Zero budget natural farming

### Sub Plot: Crop

- Crop: Urd
- Green Manuring

*Note: At present Dhaicha is standing on field for green manuring.*

**Zero Budget Natural Farming (ZBNF)** is a **farming** practice that believes in **natural** growth of crops without adding any fertilizers and pesticides or any other foreign elements. At the same time, ZBNF crops helps in retaining soil fertility and is climate change resilient. Tripathi *et al.* (2018) revealed that zero budget natural farming is resource efficient as it minimises the use of financial and natural resources while increasing crop yield. By restoring the quality of soil and water-related ecosystems, it decouples agricultural productivity and growth from ecosystem degradation and biodiversity loss. This decoupling of growth and resource-use provides a sustainable livelihood to farmers and allied value chain actors. Zero budget natural farming eliminates chemical fertilisers and pesticides, and would help reduce ocean acidification and marine pollution from land-based activities. It might help to reduce the leaching of nitrogen and phosphorus from the soil into groundwater or surface water, and eventually into rivers and oceans. Mulching techniques used by ZBNF farmers improve the water retention capacity of the soil, reduce crop irrigation requirements and control the concentration of groundwater contaminants.

In India, Subhash Palekar reported that four aspects that are integral to ZBNF

- (1) **Beejamrutham**, or microbial coating of seeds using cow dung and urine based formulations
- (2) **Jeevamrutham**, or the application of a concoction made with cow dung, cow urine, jaggery, pulse flour, water and soil to multiply soil microbes;
- (3) **Mulching**, or applying a layer of organic material to the soil surface in order to prevent water evaporation, and to contribute to soil humus formation.
- (4) **Waaphasa**, or soil aeration through a favorable microclimate in the soil, for insect and pest management, ZBNF encourages the use of various kashayams (decoctions) made with cow dung, cow urine, lilac and green chillies.

## Organic farming

- Green manuring of Sesbania
- Seed treatment with biofertilizer i.e *Rhizobium* and PSB
- Vermicompost @ 10 t/ha

**RAC Recommendation:** Experiment approved.

## Experiment- 6

**Title:** Effect of Moisture Conservation Practices and Efficient Zinc Management on Growth and Productivity of *kharif* Maize (*Zea mays* L.)

**Investigators:** Dr. Adesh Singh, Dr. Vivek, Dr. R.B. Yadav, Dr. Mukesh Kumar & Dr. S.P. Singh

**Year of Start:** *Kharif*, 2021      **Design:** SPD      **Replications :** 03      **Variety :** P-3401

### Objectives:

1. To study the growth behavior and yield of maize as influenced by moisture conservation practices and efficient zinc management
2. To work out the effect of moisture conservation practices on soil moisture content and dynamics of soil, and

### Treatments Details:

S.No.	Treatments	Symbols
<b>A. Moisture conservation practices</b>		
1	Control	M <sub>1</sub>
2	Wheat straw mulch @ 5 t ha <sup>-1</sup>	M <sub>2</sub>
3	Mungbean straw mulch @ 5 t ha <sup>-1</sup>	M <sub>3</sub>
4	Mustard straw mulch @ 5 t ha <sup>-1</sup>	M <sub>4</sub>
<b>B. Zn Application</b>		
1	Control	Z <sub>1</sub>
2	Zn @ 2.5 kg ha <sup>-1</sup>	Z <sub>2</sub>
3	Zn @ 5.0 kg ha <sup>-1</sup>	Z <sub>3</sub>
4	Zn @ 7.5 kg ha <sup>-1</sup>	Z <sub>4</sub>

### Observations Recorded:

- Growth and developmental studies
- Yield and yield attributes
- Economic studies

**RAC Recommendation:** Experiment approved.

## Department of Agriculture Biotechnology

### Staff position:

S.No.	Name	Designation
1.	Dr. Pushpendra Kumar	Professor & Head
2.	Dr. R. S. Sengar	Professor
3.	Dr. Mukesh Kumar	Associate Professor
4.	Dr. Vaishali	Associate Professor
5.	Dr. Manoj Kr. Yadav	Associate Professor

### Progress Report for Rabi-2019-20

#### Experiment-1

**Title:** *In-silico* screening, characterization and structure prediction of Curcuminoid biosynthesis gene with bioactivity analysis of curcuminoids in turmeric

**Investigators:** Dr. Vaishali, Associate Professor, Biotechnology

**Year of Start:** 2019-20

#### Objective:

- *In silico* screening of curcuminoid biosynthesis genes
- Characterization and structure prediction of curcuminoid biosynthesis genes
- Bioactivity analysis of curcuminoids extracted from turmeric

#### Technical program:

**Antioxidant activity analysis:** Antioxidant activity was analysed using DPPH assay. 0.002% DPPH (1,1-diphenyl-2-picryl hydrazil) solution was prepared in methanol.

1 ml of extract added in 1.2 ml of DPPH solution. This was kept for 30 min in dark and absorbance were taken with each samples at 517 nm.

**Antimicrobial activity analysis:** Antimicrobial activity was analysed by disk diffusion method. Plates were prepared with nutrient agar media Microbial culture was spread on media and put filter paper disc (soaked in extracts) on this plates incubated at 37°C for overnight or 24 hr and zone of inhibition was measured.

***In-silico* Screening:** Three genes CURS1, CURS2 and CURS3 which involved in curcuminoid biosynthesis were searched and screened from NCBI. BLAST was performed and Phylogenteic analysis of protein and nucleotide sequences has been done for all 3 genes using Clustal omega. The amino acid composition of all three CURS genes was analyzed by PEPSTATS analysis tool. Physico-chemical properties were computed using ProtParam tool of the ExPASy proteomics server. Secondary structure prediction was performed using Network Protein Sequence. Analysis and 3D Protein structure model for CURS 1, CURS2 and CURS3 protein were designed using Swiss Model. The stereochemical validation of hypothetical model was done using Ramachandran plot (RAMPAGE).

#### Results:

*Curcuma longa* (Zingiberaceae) is one of the oldest known spices in the world and also known as the 'Golden Spice of life'. It is approximately 6-9 months crop. Indian turmeric is considered to be the best in the world market because of its high curcumin content. Curcumin is the naturally produced secondary metabolite which is the most active constituent of turmeric. Curcuminoids consist of curcumin (77%), demethoxycurcumin (DMC; 17%), bisdemethoxycurcumin (BDMC; 3%)

## Antioxidant activity analysis:

The DPPH free radical scavenging activity assay is the most significant and commonly used method for determining the free radical scavenging activity. Germplasm 20 and germplasm 28 shows higher antioxidant activity and found to be rich in curcumin. High curcumin content is related with antioxidant, anti-inflammatory and antimicrobial activity. The germplasm which shows a higher amount of curcuminoid also exhibits higher antioxidant activity. So in the turmeric germplasm, these might be the partial reason for the highest antioxidant activity.

**Table 1: Antioxidant activity of leaves and rhizome extract of turmeric germplasm**

S. no	Turmeric germplasm	DPPH Inhibition %	
		Leaves	Rhizomes
1	Germplasm 4	57.45	93.36
2	Germplasm 8	52.28	90.27
3	Germplasm 10	57.26	87.90
4	Germplasm 13	60.56	90.98
5	Germplasm 18	38.73	88.14
6	Germplasm 20	57.60	97.62
7	Germplasm 22	51.92	79.36
8	Germplasm 24	36.10	71.06
9	Germplasm 26	45.82	78.18
10	Germplasm 28	71.72	98.81

## Antibacterial activity of turmeric germplasm

The result of the present study clearly show that the leaves of turmeric plants also possess the antimicrobial activity like that of the rhizome which has proved evidence for its antimicrobial potential on standard microorganism strains *Bacillus subtilis*, *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa* and *Klebsiella pneumoniae*. The germplasm 28 exhibited in vitro antibacterial activity against all five tested bacteria. So this germplasm 28 can be utilized for manufacturing of the new drugs for treatment of various diseases.

**Table 2: Antibacterial activity in leaves samples of 10 turmeric germplasm.**

S.No	Germplasm	<i>E. coli</i>	<i>S. Aureus</i>	<i>P. Aeruginosa</i>	<i>K. Pneumoniae</i>	<i>B. Substills</i>
1	Germplasm 4	-	1.1	-	1.7	0.8
2	Germplasm 8	-	0.8	0.7	-	-
3	Germplasm 10	1.5	0.7	1.4	-	-
4	Germplasm 13	1.2	-	0.9	-	0.9
5	Germplasm 18	-	0.6	0.7	1.1	-
6	Germplasm 20	1.5	-	1.2	1.5	0.3
7	Germplasm 22	1.7	0.8	1.5	1.3	-
8	Germplasm 24	1	0.9	1.2	1.1	-
9	Germplasm 26	1.2	1.2	-	-	-
10	Germplasm 28	1.3	0.8	1.8	1.6	1.3

**Table 3: Antibacterial activity in rhizome samples of 10 turmeric germplasm.**

S.No	Germplasm	<i>E. coli</i>	<i>S. Aureus</i>	<i>P. Aeruginosa</i>	<i>K. Pneumoniae</i>	<i>B. Substills</i>
1	Germplasm 4	1.8	-	1.2	1.7	1.8
2	Germplasm 8	1.7	-	0.9	-	2.2
3	Germplasm 10	1.3	-	0.8	-	-
4	Germplasm 13	1.6	1.4	0.8	-	-
5	Germplasm 18	1.8	-	-	-	-
6	Germplasm 20	1.9	-	-	-	2.1
7	Germplasm 22	1.6	-	-	0.9	1.7
8	Germplasm 24	-	-	-	1.1	1.7
9	Germplasm 26	-	1.8	-	-	1.9
10	Germplasm 28	-	1.9	1.4	1.7	-

## *In silico* screening, characterization and structure prediction of curcuminoid biosynthesis gene:

*In-silico* analysis of CURS1, CURS2 and CURS3 genes provides an prospective platform to accomplish the structural and functional aspects of the protein which can be useful for structural analysis and modeling of protein.

**Table 4:** Percent Identity matrix of curcuminoid synthase for protein sequence by Clustal 2.1

	C6L7V8.1	AWK77186.1	BAW81545.1	AXQ39866.1	AJF45914.1	C6L7V9.1	AEU17692.1	AWK77185.1	AJF45913.1	C0SVZ6.1	3OV2_A
C6L7V8.1	100.00										
AWK77186.1	98.72	100.00									
BAW81545.1	98.72	98.98	100.00								
AXQ39866.1	81.75	81.75	81.49	100.00							
AJF45914.1	82.26	82.26	82.01	99.49	100.00						
C6L7V9.1	82.01	82.01	81.75	99.23	99.74	100.00					
AEU17692.1	77.38	77.63	77.38	81.23	81.49	81.23	100.00				
AWK77185.1	78.15	78.41	78.15	82.01	82.26	82.01	93.57	100.00			
AJF45913.1	78.41	78.66	78.41	82.26	82.52	82.26	93.83	99.49	100.00		
C0SVZ6.1	78.15	78.41	78.15	82.01	82.26	82.01	93.57	99.23	99.74	100.00	
3OV2_A	78.15	78.41	78.15	81.79	82.05	82.79	93.57	99.23	99.74	100.00	100.00

**Table 5:** Base composition of nucleotide sequence at CURS gene

	Nucleotide composition	AB495007.1 (CURS1)	KM880189.1	JN017185.1	MF402846.1	KM880190.1	KX154461.1	AB5067632.1 (CURS3)	LC064068.1 (CURS2)	MF987835.1	MF402847.1	AB535216.1
1	Length	1170	1170	1452	1240	1173	1173	1173	1176	1265	1288	1179
2	A	19.49	19.66	21.69	20.24	20.03	19.69	19.69	19.3	20.87	19.8	16.96
3	C	31.71	31.45	29.68	30.48	31.37	31.64	31.64	33.25	29.8	31.21	33.42
4	G	33.76	33.76	30.3	33.31	33.08	33.08	33.08	32.48	31.62	32.3	33.08
5	T	15.04	15.13	18.32	15.97	15.52	15.69	15.69	14.97	17.63	16.69	16.54
6	G+C	65.47	65.21	59.99	63.79	64.45	64.62	64.62	65.73	61.42	63.51	66.05
7	A+T	34.53	34.79	40.01	36.21	35.55	35.38	35.38	34.27	38.5	36.49	33.05

**Outcome of the experiment:**

- The two gemplasms *viz.* Germplasm 20 and germplasm 28 shows significant antioxidant activity and found to be rich in curcumin. High curcumin content is related with antioxidant, anti-inflammatory and antimicrobial activity.
- The result of the present study clearly show that the leaves of turmeric plants also posses the anti microbial activity like that of the rhizome which has proved evidence for its antimicrobial potential on standard microorganism strains *Bacillus subtilis*, *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa* and *Klebsiella pneumoniae*.
- The germplasm 28 exhibited invitro antibacterial activity against all five tested bacteria. So this germplasm 28 can be utilized for manufacturing of the new drugs for treatment of various diseases.
- *In-silico* analysis of CURS1, CURS2 and CURS3 genes provides an prospective platform to accomplish the structural and functional aspects of the protein which can be useful for structural analysis and modeling of protein

**Action Plan Khari 2021 :-** Expression profiling of curcuminoid biosynthesis gene.



## Experiment-2

**Title:** Isolation and Molecular Characterization of *Rhizoctonia solani* races causing sheath blight disease in Rice

**Investigators:** Dr. Mukesh Kumar, Associate Professor, Biotechnology

**Year of Start:** 2019-20

### Objective:

- Collection, isolation and Identification of pathogenic fungus *R. solani* isolate causing sheath blight in rice from different locations
- Morphological and molecular characterization of *R. solani* isolates
- Molecular Characterization of native *Rhizoctonia solani* isolates
- Determination of biocontrol potential (BCA) of *Trichoderma spp.* against *R. solani* isolates *in-vitro*

### Technical Programme:

- *R. solani* isolates were collected from rice (sheath blight disease) and potato fields of different geographical regions. 30 *Trichoderma* isolates were used for biocontrol activity.
- Morphological characterization of *R. solani* isolates have been done on the basis of colony morphology, sclerotia attachment, sclerotia size, sclerotia emergence, sclerotia colour etc.
- Molecular characterization of *R. solani* isolates was done by ITS-PCR using ITS1 and ITS4 markers
- The biocontrol efficacy of *Trichoderma* isolates was done by dual culture method

### Results:

#### Collection, isolation and identification of pathogenic fungus *R. Solani*

A total of 35 isolates of *R. solani* from rice (sheath blight disease) and two isolates of potato (potato scurf disease) field were isolated and collected from different geographical regions (Table 1).

**Table 1: *Rhizoctonia solani* isolates and source of collection**

Isolate acronym	Place/District	Geographical location	State	Host/variety
SVPRS1	SVPUA&T Farm/Meerut	28.98°N77.7°E	Uttar Pradesh	Rice/PB1
SVPRS2	SVPUA&T Farm/Meerut	28.98°N77.7°E	Uttar Pradesh	Rice/PB1121
SVPRS3	SVPUA&T Farm/Meerut	28.98°N77.7°E	Uttar Pradesh	Rice/PB1
SVPRS4	PDFSR Farm/Meerut	28.98°N77.7°E	Uttar Pradesh	Rice/Saket4
SVPRS5	PDFSR Farm/Meerut	28.98°N77.7°E	Uttar Pradesh	Rice/PS4
SVPRS6	Muzaffarnagar	27.12°N79.78°E	Uttar Pradesh	Rice/PB1
SVPRS7	Muzaffarnagar	27.12°N79.78°E	Uttar Pradesh	Rice/PB1121
SVPRS8	Muzaffarnagar	27.12°N79.78°E	Uttar Pradesh	Rice/PB1121
SVPRS9	Saharanpur	29.58°N77.33°E	Uttar Pradesh	Rice/PB1509
SVPRS10	Saharanpur	29.58°N77.33°E	Uttar Pradesh	Rice/PB1121
SVPRS11	Saharanpur	29.58°N77.33°E	Uttar Pradesh	Rice/PB1
SVPRS12	Shamli	29.45°N77.32°E	Uttar Pradesh	Rice/Sharbati
SVPRS13	Shamli	29.45°N77.32°E	Uttar Pradesh	Rice/PB1121
SVPRS14	Ghaziabad	28.67°N77.42°E	Uttar Pradesh	Rice/PB1121
SVPRS15	Ghaziabad	28.67°N77.42°E	Uttar Pradesh	Rice/PB1121
SVPRS16	Ghaziabad	28.67°N77.42°E	Uttar Pradesh	Rice/PB1
SVPRS17	Baghpat	28.95°N77.22°E	Uttar Pradesh	Rice/PB1
SVPRS18	Baghpat	28.95°N77.22°E	Uttar Pradesh	Rice/PB1121
SVPRS19	Baghpat	28.95°N77.22°E	Uttar Pradesh	Rice/PB1121
SVPRS20	Hapur	28.731°N77.776°E	Uttar Pradesh	Rice/PB1
SVPRS21	Hapur	28.731°N77.776°E	Uttar Pradesh	Rice/PB1
SVPRS22	Faizabad	26.773°N82.146°E	Uttar Pradesh	Rice/NDR97
SVPRS23	Kanpur	26.467°N80.350°E	Uttar Pradesh	Rice/Sarjoo52
ITCC	IARI, New Delhi			

SVPRS24	Haridwar	29.87°N77.88°E	Uttarakhand	Rice/PB1121
SVPRS25	Haridwar	29.87°N77.88°E	Uttarakhand	Rice/Sharbati
SVPRS26	Haridwar	29.87°N77.88°E	Uttarakhand	Rice/PB1121
SVPRS27	Dehradun	30.318°N78.029°E	Uttarakhand	Rice/Pakistani basmati
SVPRS28	Dehradun	30.318°N78.029°E	Uttarakhand	Rice/Sharbati
SVPRS29	Patiala	30.34°N76.38°E	Punjab	Rice/PB1121
SVPRS30	Ludhiana	30.91°N75.85°E	Punjab	Rice/PB1121
SVPRS31	Jalandhar	31.326°N75.576°E	Punjab	Rice/PB1121
SVPRS32	Sonepat	28.990°N77.022°E	Haryana	Rice/PB1121
SVPRS33	Karnal	29.69°N76.98°E	Haryana	Rice/PB1121
SVPRS34	Hisar	29.09°N75.43°E	Haryana	Rice/PB1121
SVPRS35	Ambala	30.38°N76.39°E	Haryana	Rice/PB1121
SVPPRS36	PDFSR Farm Meerut	28.98°N77.7°E	Uttar Pradesh	Potato
SVPPRS37	CPRI Farm Meerut	28.98°N77.7°E	Uttar Pradesh	Potato

Morphological characterization of 37 *R. solani* isolates have been done on the basis of colony morphology, sclerotia attachment, sclerotia size, sclerotia emergence, sclerotia colour etc.

**Table 2: Culture and Morphological variations of field isolates of *R. Solani***

Cultural and Morphological feature	Variation	Number of <i>R. Solani</i> isolates showing variation	Percentage of variation
Mycelial growth	Fast growers	20	52.63
	Medium growers	12	31.58
	Slow growers	6	15.79
Colony colour	Light brown	5	13.16
	Yellowish brown	7	18.42
	Whitish brown	15	39.47
	Dark brown	7	18.42
	Pale brown	4	10.53
Growth patterns	Abundant	13	34.21
	Moderate	17	44.74
	Slight	8	21.05
Hyphal length between two septation	Short	3	7.89
	Medium-short	11	28.95
	Medium-long	18	47.37
	Long	6	15.79
Hyphal width	Narrow	2	5.27
	Moderate-wide	21	55.26
	Wide	15	39.47

**Table 3: Sclerotial variation of field isolates of *R. solani***

Sclerotial feature	Variation	Number of <i>R. Solani</i> isolates showing variation	Percentage of variation
Sclerotial emergence	Very fast (3 days)	8	21.05
	Fast (4 days)	21	55.28
	Moderate (5 days)	5	13.15
	Slow (7 days)	4	10.52
Sclerotial attachment	Firm	25	65.8
	Loose	13	34.2
Sclerotial colour	Light brown	9	23.68
	Dark brown	15	39.48
	Olive brown	6	15.79
	Dark yellowish brown	8	21.05
Sclerotial size	Macro	20	52.63
	Micro	11	34.21

Sclerotial shape	Macro+ Micro	5	13.26
	Spherical	19	50.00
	Tiny	10	26.32
Sclerotial distribution	Irregular	9	23.68
	Surface	24	63.16
	Aerial	2	5.26
Clump formation	Surface + Aerial	10	26.32
	More	10	26.32
	Moderate	12	31.58
	Less	11	28.95
Sclerotial secretion	Absent	5	13.15
	Positive	23	60.5
Sclerotia pattern and distribution	Negative	15	39.5
	Scattered and Sparse	7	18.42
	Scattered and Enormous	8	21.05
	Centrally concentrated and enormous	5	13.18
	Centrally concentrated and sparse	4	10.52
	Concentrated at rim and enormous	5	13.18
	Concentrated at rim and sparse	5	13.18
	Concentric ring and sparse	1	2.61
	Concentric ring and enormous	1	2.61
	Ring towards periphery and enormous	2	5.25
	Sclerotia number	No sclerotia	2
Low		4	10.52
Moderate		10	26.32
High		16	42.11
Very high		6	15.79
Sclerotia texture	Smooth	2	5.27
	Smooth+Pittete	7	18.42
	Rough	8	21.05
	Rough+Pittete	19	50.00

**Action Plan Kharif 2021 :- Molecular Characterization of native *Rhizoctonia solani* isolates**

- Molecular characterization of *R. solani* isolates will be done by ITS-PCR using ITS1 and ITS4 markers.

## Department of Entomology

### Staff Possition:

S.No.	Name	Designation
1.	Dr. D. N. Mishra	Professor & Head
2.	Dr. Gaje Singh	Professor
3.	Dr. D. V. Singh	Professor
4.	Dr Hem Singh	Associate Professor
5.	Dr. Rajendra Singh	Associate Professor

### Progress Report for Rabi-2019-20

#### Experiment- 1

**Title:** Efficacy of *Chlorantraniliprole* 0.4% GR against Top Borer (*Scirpophaga excerptalis*) of Sugarcane

**Investigators:** Dr. Gaje Singh.

**Year of Start:** 2019-20      **Design:** Randomized Block Design (RBD)      **Replications:** 03

**Variety:** Co-0238      **Date of Sowing:** 15.05.2018      **Date of Harvest:** 20.03.2019

### Objectives:

1. Efficacy of *Chlorantraniliprole* 0.4% GR against Top Borer in Sugarcane.
2. To record marketable yield in MT/ha basis

### Details of insecticides tested:

S.N	Treatment	Dosage (g a.i. ha <sup>-1</sup> )	Dose formulated product (ml or g ha <sup>-1</sup> )
1	Chlorantraniliprole 0.4% GR(CILsample)	50	12.5 Kg
2	Chlorantraniliprole 0.4% GR(CILsample)	75	18.75 Kg
3	Chlorantraniliprole 0.4% GR(CILsample)	100	25 Kg
4	Chlorantraniliprole 0.4% GR	75	18.75 Kg
5	Carbofuran 3% CG	1000	33.30 Kg
6	Chlorpyriphos 20% EC	300	1500 ml
7	Untreated control	-	-

**Plot size** : 50m<sup>2</sup> (5m x 10m)

**Quantity of spray solution used only for** : 500lit./ ha

### Chlorpyriphos 20 EC

**Methodology:** Granular formulations were applied as broadcast near the cane in the rows and the liquid formulation applied as soil drench along the cane in row before 1<sup>st</sup> irrigation.

**Observations on bio-efficacy of chemicals-** The top shoot Dead hearts of *Scirpophaga excerptalis* was recorded from the five inner rows of ten meter length at 30, 45, 60, 90 and 120 days after application of insecticide. The data of cane height (cm), girth (cm), number of millable cane and yield (mt/ha) of sugarcane were taken at the time of harvest.

**Results-** The bio-efficacy of *Chlorantraniliprole* 0.4 % GR @ 50, 75, and 100 g a.i./ha was studied against top borer, *Scirpophaga excerptalis* of sugarcane. The efficacy of this insecticide was compared with standard checks *Carbofuran* 3% CG @ 1000g.a.i./ha and standard *Chlorpyriphos* 20% EC@ 300g.a.i./ha. Experiments were also conducted to study the phytotoxicity of *Chlorantraniliprole* 0.4 % GR @ 75 and 150g.a.i./ha.

### **30 days after application-**

The result presented in Table 1 indicated that population of *Scirpophaga excerptalis* was significantly reduced in treated plots as compared to untreated plot after 30 DAA. The minimum infestation (1.89 %) was recorded in *Chlorantraniliprole* 0.4 % GR @100 g.a.i /ha followed by *Chlorantraniliprole* 0.4 % GR @ 75 g.a.i /ha (2.09 %) (CIL sample) and *Chlorantraniliprole* 0.4 % GR @ 75 g.a.i /ha (2.13%) (Market Sample). These treatments were found at par with each other and significantly superior over rest of treatments. The maximum (3.13%) infestation was observed with *Chlorpyrifos* 20% EC @ 300 g.a.i/ha.

### **45 days after application-**

The observation recorded on 45 DAA showed that all the treatments maintained their better efficacy over control. The most effective treatment for the control of top borer (1.57 %) was *Chlorantraniliprole* 0.4 % GR @100 g.a.i/ha which was followed by *Chlorantraniliprole* 0.4 % GR@75 g.a.i/ha (1.70 %) (CIL sample) and *Chlorantraniliprole* 0.4 % GR @75 gai/ha (1.72 %) (Market Sample). These doses were significantly superior over all the other treatments and UTC (Table-1).

### **60 days after application-**

The same pattern was recorded from statistically analysed data showed in Table-1. The *Chlorantraniliprole* 0.4 % GR @ 100 g.a.i/ha has lowest infestation (1.24%) and it was on par with *Chlorantraniliprole* 0.4 % GR @ 75 g.a.i/ha (1.36%) (CIL sample) and *Chlorantraniliprole* 0.4 % GR @75 g.a.i/ha (1.38%) (Market Sample). The maximum (2.61 %) infestation was observed with *Chlorpyrifos* 20% EC @ 300 g.a.i/ha.

### **90 days after application-**

Data recorded on 90 DAA of treatments revealed that all the treatments were found significantly superior over control and population of top borer varies from 1.14 to 4.15 percent. The minimum top borer infestation (1.14 %) was observed in *Chlorantraniliprole* 0.4 % GR @ 100 g.a.i/ha and it was at par with *Chlorantraniliprole* 0.4 % GR @ 75 g.a.i/ha (CIL sample) and *Chlorantraniliprole* 0.4 % GR @ 75 g.a.i/ha (Market Sample) with 1.19 and 1.22 percent, respectively (Table-1).

### **120 days after application-**

The statistically analysed data (Table-1) revealed that after 120 DAA *Chlorantraniliprole* 0.4 % GR @ 100 g.a.i/ha again showed lowest infestation (1.08 %) and it was at par with *Chlorantraniliprole* 0.4 % GR @ 75 g.a.i/ha (CIL sample) and *Chlorantraniliprole* 0.4 % GR @ 75 gai/ha (Market Sample) with 1.11 and 1.10 percent, respectively. All these three treatments were found significantly superior over all the other treatments including untreated control.

### **Height and Girth of the cane-**

The statistically analysed data from table-2 revealed that maximum height (205.8 cm) and girth (2.76 cm) was recorded at the time of harvesting in *Chlorantraniliprole* 0.4 % GR @ 100 g.a.i/ha but it was significantly at par with *Chlorantraniliprole* 0.4 % GR @ 75 g.a.i/ha (CIL sample) and *Chlorantraniliprole* 0.4 % GR @ 75 gai/ha (Market Sample) with 204.9, 204.8 and 2.73, 2.72 cm, respectively.

### **Number of millable cane-**

At the time of harvesting maximum number of millable cane (541) was recorded in *Chlorantraniliprole* 0.4% GR @ 100 g.a.i/ha and it was at par with *Chlorantraniliprole* 0.4% GR @ 75 g.a.i/ha (CIL sample) and *Chlorantraniliprole* 0.4%GR @ 75 g.a.i/ha (Market Sample) with 539 and 536 number of canes, respectively. These all three treatments were significantly superior over all the other treatments.

## Yield

The highest yield 74.76 MT/ha were recorded from *Chlorantraniliprole* 0.4 % GR @100 g.a.i/ha treated plots and it was statically similar with *Chlorantraniliprole* 0.4 % GR @ 75 g.a.i/ha (CIL sample) and *Chlorantraniliprole* 0.4 % GR @ 75 g.a.i/ha (Market Sample) with 73.93 and 73.86 mt/ha, respectively and were significantly superior over all the other treatments and untreated control.

**Table 1: Efficacy of insecticides against Top Borer in sugarcane.**

Treatment No.	Treatment Name	Dose g a.i./ha	% dead hearts caused by Top borer					
			Pre	30 DAA	45 DAA	60 DAA	90 DAA	120 DAA
T1	<i>Chlorantraniliprole</i> 0.4% GR (CIL Sample)	50	12.18 (3.67)	5.9 (2.62)	4.62 (2.36)	3.59 (2.14)	2.17 (1.78)	1.93 (1.71)
T2	<i>Chlorantraniliprole</i> 0.4% GR (CIL Sample)	75	13.04 (3.72)	3.39 (2.09)	1.92 (1.70)	0.86 (1.36)	0.42 (1.19)	0.24 (1.11)
T3	<i>Chlorantraniliprole</i> 0.4% GR (CIL Sample)	100	12.98 (3.71)	2.61 (1.89)	1.48 (1.57)	0.55 (1.24)	0.32 (1.14)	0.17 (1.08)
T4	<i>Chlorantraniliprole</i> 0.4% GR (Market Sample)	75	12.75 (3.69)	3.54 (2.13)	1.97 (1.72)	0.93 (1.38)	0.51 (1.22)	0.22 (1.10)
T5	<i>Carbofuran</i> 3% CG	1000	11.05 (3.51)	7.92 (2.85)	5.7 (2.58)	4.82 (2.43)	4.11 (2.13)	2.25 (1.80)
T6	<i>Chlorpyriphos</i> 20% EC	300	10.16 (3.47)	9.1 (3.13)	6.99 (2.82)	5.89 (2.61)	4.65 (2.36)	3.09 (2.00)
T7	Untreated control	-	9.70 (3.42)	11.68 (3.55)	13.15 (3.76)	14.23 (3.90)	16.23 (4.15)	12.29 (3.64)
CD at 5%			N/A	0.29	0.22	0.27	0.32	0.25

Data in parentheses are sign transformed value

**Table-2. Effect of treatments on height, girth, millable cane and yield of sugarcane.**

Treatment N0.	Treatment Name	Dose g a.i./ha	Height of cane	Girth of cane	Millable cane	Yield (MT/ha)
T1	<i>Chlorantraniliprole</i> 0.4% GR (CIL Sample)	50	198.3	2.52	511	69.33
T2	<i>Chlorantraniliprole</i> 0.4% GR (CIL Sample)	75	204.9	2.73	539	73.93
T3	<i>Chlorantraniliprole</i> 0.4% GR (CIL Sample)	100	205.8	2.76	541	74.76
T4	<i>Chlorantraniliprole</i> 0.4% GR (Market Sample)	75	204.8	2.72	536	73.86
T5	<i>Carbofuran</i> 3% CG	1000	194.5	2.39	501	66.43
T6	<i>Chlorpyriphos</i> 20% EC	300	186.8	2.27	486	64.33
T7	Untreated control	-	173.16	2.18	458	54.68
CD at 5%			10.08	0.14	11.50	3.29

Data in parentheses are sign transformed value -

**Conclusion:** It is evident from experiment of bio efficacy studied against Top borer, the *Chlorantraniliprole* 0.4%GR @ 100 g.a.i/ha was broadcasted near the cane in furrow before 1<sup>st</sup> irrigation and found on par with

Chlorantraniliprole 0.4%GR @ 75 g.a.i/ha, gave best control on top borer larvae populations as compare to the standard check and untreated control. The Chlorantraniliprole 0.4% GR did not produce any phytotoxic symptoms on sugarcane crop even at maximum higher dose *i.e.* 150 g.a.i/ha.

## Experiment- 2

**Title:** Efficacy of Chlorantraniliprole 0.4% GR against Early shoot Borer (*Chilo infuscatellus*) of Sugarcane

**Investigators:** Dr. Gaje Singh.

**Year of Start:** 2019-20 **Variety:** Co-0238

### Objectives:

1. Efficacy of Chlorantraniliprole 0.4% GR against Early Shoot Borer in Sugarcane.
2. To record marketable yield in mt/ha basis

### Details of insecticides tested:

S.N	Treatment	Dosage (g a.i. ha <sup>-1</sup> )	Dose formulated product (ml or g ha <sup>-1</sup> )
1	<i>Chlorantraniliprole</i> 0.4%GR(CILsample)	50	12.5 Kg
2	<i>Chlorantraniliprole</i> 0.4%GR(CILsample)	75	18.75 Kg
3	<i>Chlorantraniliprole</i> 0.4%GR(CILsample)	100	25 Kg
4	<i>Chlorantraniliprole</i> 0.4%GR	75	18.75 Kg
5	<i>Carbofuran</i> 3% CG	1000	33.30 Kg
6	<i>Chlorpyrifos</i> 20% EC	300	1500 ml
7	Untreated control	-	-

**Experimental Design** : Randomized Block Design (RBD)

**Plot size** : 50m<sup>2</sup> (5m x 10m)

**Replications** : Three

**Date of sowing** : 15.05.2018

**Date of Harvest** : 20.03.2019

**Quantity of spray solution used only for** 500 lit./ ha

**Chlorpyrifos 20 EC**

**Methodology:** Granular formulations were applied as broadcast over the cane setts and the liquid formulation applied as soil drench over the cane setts in row at the time of transplanting.

**Observation on bioefficacy:** Dead hearts of *Chilo infuscatellus* was recorded from the five inner rows of ten meter length at 30, 45, 60, 90 and 120 days after application of insecticide. The height (cm), girth (cm), number of millable cane and yield (mt/ha) of sugarcane was also calculated at the time of harvest.

**Results-**The bio-efficacy of *Chlorantraniliprole* 0.4% GR was studied against *Chilo infuscatellus* of sugarcane @ 50, 75, and 100 g.a.i/ha. The efficacy of this insecticide was compared with standard checks *Thiamethoxam* 75% w/w SG @ 120 g.a.i./ha and *Fipronil* 0.3% GR @ 100 g.a.i./ha. Experiments were also conducted to study the phytotoxicity of *Chlorantraniliprole* 0.4% GR @ 75 and 150 g.a.i./ha.

### 30 days after application-

The result presented in Table 1 indicated that all the treatments were significantly superior over control while *Chlorantraniliprole* 0.4% GR @ 100gm a.i./ha applied after 30 DAA has lowest (2.22%) infestation and statistically on par with *Chlorantraniliprole* 0.4% GR @ 75 g.a.i./ha (CIL sample) and *Chlorantraniliprole* 0.4% GR @ 75 g.a.i./ha (Market Sample) with 2.46 and 2.47 percent, respectively. The maximum infestation (10.49%) was recorded in *Fipronil* 0.3% GR @ 100 g.a.i./ha.

### 45 days after application -

The same pattern was observed again *Chlorantraniliprole* 0.4% GR @ 100gai/ha has lowest (2.03%) infestation and it was statistically par with the *Chlorantraniliprole* 0.4% GR @ 75 gm a.i./ha (CIL sample) and *Chlorantraniliprole* 0.4% GR @ 75 g.a.i./ha (Market Sample) with 2.12 and 2.25 percent, respectively and was significantly superior over all the treatments. The maximum infestation (15.36%) was again observed in *Fipronil* 0.3% GR @ 100 gm a.i./ha (Table-1).

### 60 days after application-

The minimum (1.49%) infestation was recorded with the treatment *Chlorantraniliprole* 0.4% GR @ 100 gai/ha and it was statistically at par with the *Chlorantraniliprole* 0.4% GR @ 75 g.a.i./ha (CIL sample) and *Chlorantraniliprole* 0.4% GR @ 75 g.a.i./ha (Market Sample) with 1.64 and 1.61 percent, respectively. Whereas *Chlorantraniliprole* 0.4% GR @ 50 gai/ha with (2.35%) and it was statistically at par with Thiamethoxam 75% @ 120 g.a.i/ha with (2.55%) infestation (Table-1).

### 90 days after application-

The same pattern was recorded *Chlorantraniliprole* 0.4 % GR @ 100 g.a.i/ha has lowest infestation (1.26 %) and it was at par with *Chlorantraniliprole* 0.4% GR @ 75 g.a.i./ha (CIL sample) and *Chlorantraniliprole* 0.4% GR @ 75 g.a.i./ha (Market Sample) with 1.37 and 1.32 percent, respectively. All these three treatments were found significantly superior over all the treatments including untreated control (Table-1).

### 120 days after application-

The observation recorded on 120 DAA showed that all the treatments maintained their better efficacy over control. The most effective (1.13%) treatment for the control of ESB was *Chlorantraniliprole* 0.4% GR @ 100 g.a.i./ha which was followed by *Chlorantraniliprole* 0.4% GR @ 75 g.a.i./ha (1.19 %) (CIL sample) and *Chlorantraniliprole* 0.4% GR @ 75 gai/ha (1.21 %) (Market Sample) these doses were significantly superior over all the other treatments and untreated control (Table-1).

### Height and Girth of the cane-

At the time of harvesting maximum height (206.1 cm) and girth (2.65 cm) was recorded in *Chlorantraniliprole* 0.4% GR @ 100 gai/ha but it was significantly at par with *Chlorantraniliprole* 0.4% GR @ 75 g.a.i./ha (CIL sample) and *Chlorantraniliprole* 0.4% GR @ 75 g.a.i./ha (Market Sample) with 205.2, 204.9 and 2.62, 2.61 cm respectively (Table-2).

### Number of millable canes

At the time of harvesting maximum number of miliable (553) cane was recorded in *Chlorantraniliprole* 0.4% GR @ 100 g.a.i/ha was at par with *Chlorantraniliprole* 0.4% GR @ 75 g.a.i/ha (CIL sample) and *Chlorantraniliprole* 0.4% GR @ 75 g.a.i/ha (Market Sample) with 550 and 545 number of cane, respectively. All these three treatments were significantly superior over all the other treatments (Table-2).

### Yield

The highest yield 74.35 MT/ha were recorded with *Chlorantraniliprole* 0.4% GR @ 100 g.a.i/ha treated plot and it was found statically on par with *Chlorantraniliprole* 0.4% GR @75 g.a.i/ha (CIL sample) and *Chlorantraniliprole* 0.4% GR @ 75 g.a.i/ha (Market Sample) with 73.71 and 73.50 MT/ha respectively and were significantly superior over all the other treatments and untreated control (Table-2).

**Table 1: Efficacy of insecticides against Early Shoot Borer in sugarcane.**

Treatment No.	Treatment Name	Dose g a.i./ha	% dead heart caused by Top borer					
			Pre	30 DAA	45 DAA	60 DAA	90 DAA	120 DAA
T1	<i>Chlorantraniliprole</i> 0.4% GR (CIL Sample)	50	12.18	5.9	4.62	3.59	2.17	1.93
			(3.67)	(2.62)	(2.36)	(2.14)	(1.78)	(1.71)
T2	<i>Chlorantraniliprole</i> 0.4% GR (CIL Sample)	75	13.04	3.39	1.92	0.86	0.42	0.24
			(3.72)	(2.09)	(1.7)	(1.36)	(1.19)	(1.11)
T3	<i>Chlorantraniliprole</i> 0.4% GR (CIL Sample)	100	12.98	2.61	1.48	0.55	0.32	0.17
			(3.71)	(1.89)	(1.57)	(1.24)	(1.14)	(1.08)
T4	<i>Chlorantraniliprole</i> 0.4% GR (Market Sample)	75	12.75	3.54	1.97	0.93	0.51	0.22
			(3.69)	(2.13)	(1.72)	(1.38)	(1.22)	(1.1)
T5	Carbofuran 3% CG	1000	11.05	7.92	5.7	4.82	4.11	2.25
			(3.51)	(2.85)	(2.58)	(2.43)	(2.13)	(1.8)
T6	Chlorpyriphos 20% EC	300	10.16	9.1	6.99	5.89	4.65	3.09
			(3.47)	(3.13)	(2.82)	(2.61)	(2.36)	(2.0)
T7	Untreated control	-	9.7	11.68	13.15	14.23	16.23	12.29
			(3.42)	(3.55)	(3.76)	(3.9)	(4.15)	(3.64)
	CD at 5%		N/A	0.29	0.22	0.27	0.32	0.25

Data in parentheses are sign transformed value



**Table-2. Effect of different treatments on height, girth, millable canes and yield of sugarcane.**

Treatment NO.	Treatment Name	Dose g a.i./ha	Height of cane in cm	Girth of cane In cm	Millable cane from 5 inner rows	Yield (MT/ha)
T1	<i>Chlorantraniliprole</i> 0.4% GR (CIL sample)	50	199.7	2.51	534	70.17
T2	<i>Chlorantraniliprole</i> 0.4% GR (CIL sample)	75	205.2	2.62	550	73.71
T3	<i>Chlorantraniliprole</i> 0.4% GR (CIL sample)	100	206.1	2.65	553	74.35
T4	<i>Chlorantraniliprole</i> 0.4% GR (Market Sample)	75	204.9	2.61	545	73.50
T5	Thiamethoxam 75% w/w SG	120	196.76	2.49	525	70.16
T6	Fipronil 0.3% GR	100	192.73	2.41	516	68.13
T7	Untreated control	-	182.33	2.32	492	58.20
	CD at 5%		3.37	0.09	10.75	1.12

Data in parentheses are sign transformed value

### Conclusions:

It is evident from experiment of bio efficacy studied against Early shoot borer, the *Chlorantraniliprole* 0.4% GR @ 100 g.a.i/ha was broadcasted over the cane setts in furrow at planting time and found on par with *Chlorantraniliprole* 0.4% GR @ 75 g.a.i/ha, gave best control on ESB larvae populations as compare to the standard check and untreated control. The *Chlorantraniliprole* 0.4% GR did not produce any phytotoxic symptoms on sugarcane crop even at maximum higher dose *i.e.* 150 g.a.i/ha.

### Experiment:3

**Title:** To study the Life table of mulberry silkworm (*Bombyx mori* L.)

**Investigators:** Dr. Hem Singh.

**Year of Start:** 2019-20

### Objective:

- To study of age specific table
- To study of stage specific life table
- To study of Life and fertility table

### Results:

The data obtained for age specific life table demonstrated that the age specific survivorship ( $l_x$ ) on the three bivoltine hybrids races of mulberry silkworm  $SH_6 \times NB_4D_2$  roughly the identical pattern. There was an initial tumble in survivorship followed by an intermittent steadfast declined with long pauses till the emergence of adult. At adult stage, the sharp digressive was recorded on this bivoltine hybrid races of mulberry silkworm at both the conditions (control and room temperature) until each generation was expelled. The bivoltine hybrid race  $NB_4D_2 \times SH_6$  eliminated at control and room temperature in 39 days. (Table No.1)

**Table- 1. Age specific life table of mulberry silkworm (*Bombyx mori* L.) race SH<sub>6</sub>×NB<sub>4</sub>D<sub>2</sub> at 28±1°C**

**1. To study of age specific table**

<b>X</b>	<b>lx</b>	<b>dx</b>	<b>100qx</b>	<b>Lx</b>	<b>Tx</b>	<b>ex</b>
0	100	0	0.00	100.00	2953.50	29.54
1	100	0	0.00	100.00	2853.50	28.54
2	100	0	0.00	100.00	2753.50	27.54
3	100	10	10.00	95.00	2653.50	26.54
4	90	2	2.22	89.00	2558.50	28.43
5	88	1	1.14	87.50	2469.50	28.06
6	87	2	2.30	86.00	2382.00	27.38
7	85	1	1.18	84.50	2296.00	27.01
8	84	0	0.00	84.00	2211.50	26.33
9	84	3	3.57	82.50	2127.50	25.33
10	81	1	1.23	80.50	2045.00	25.25
11	80	1	1.25	79.50	1964.50	24.56
12	79	1	1.27	78.50	1885.00	23.86
13	78	2	2.56	77.00	1806.50	23.16
14	76	1	1.32	75.50	1729.50	22.76
15	75	1	1.33	74.50	1654.00	22.05
16	74	2	2.70	73.00	1579.50	21.34
17	72	0	0.00	72.00	1506.50	20.92
18	72	1	1.39	71.50	1434.50	19.92
19	71	1	1.41	70.50	1363.00	19.20
20	70	1	1.43	69.00	1292.50	18.46
21	69	0	0.00	69.00	1223.50	17.73
22	69	2	2.90	68.00	1154.50	16.73
23	67	0	0.00	67.00	1086.50	16.22
24	67	0	0.00	67.00	1019.50	15.22
25	67	2	2.99	66.00	952.50	14.22
26	65	0	0.00	65.00	886.50	13.64
27	65	0	0.00	65.00	821.50	12.64
28	65	0	0.00	65.00	756.50	11.64
29	65	0	0.00	65.00	691.50	10.64
30	65	0	0.00	65.00	626.50	9.64
31	65	0	0.00	65.00	561.50	8.64
32	65	0	0.00	65.00	496.50	7.64
33	65	0	0.00	65.00	431.50	6.64
34	65	0	0.00	65.00	366.50	5.64
35	65	0	0.00	65.00	301.50	4.64
36	65	0	0.00	65.00	236.50	3.64
37	65	10	15.38	60.00	171.50	2.64
38	55	11	20.00	49.50	111.50	2.03
39	44	14	31.82	37.00	62.00	1.41
40	30	20	66.67	20.00	25.00	0.83
41	10	10	100.00	5.00	5.00	0.50

**Table- 2. Age specific life table of mulberry silkworm (*Bombyx mori* L.) race SH<sub>6</sub>×NB<sub>4</sub>D<sub>2</sub> at room temperature**

<b>X</b>	<b>lx</b>	<b>dx</b>	<b>100qx</b>	<b>Lx</b>	<b>Tx</b>	<b>ex</b>
0	100	0	0.00	100.00	2960.50	29.61
1	100	0	0.00	100.00	2860.50	28.61
2	100	12	12.00	94.00	2760.50	27.61
3	88	0	0.00	88.00	2666.50	30.30
4	88	1	1.14	87.50	2578.50	29.30
5	87	1	1.15	86.50	2491.00	28.63
6	86	1	1.16	85.50	2404.50	27.96
7	85	0	0.00	85.00	2319.00	27.28
8	85	2	2.35	84.00	2234.00	26.28
9	83	1	1.20	82.50	2150.00	25.90
10	82	0	0.00	82.00	2067.50	25.21
11	82	1	1.22	81.50	1985.50	24.21
12	81	1	1.23	80.50	1904.50	23.51
13	80	2	2.50	79.00	1824.00	22.80
14	78	2	2.56	77.00	1745.00	22.37
15	76	1	1.32	75.50	1668.00	21.95
16	75	0	0.00	75.00	1592.50	21.23
17	75	1	1.33	74.50	1517.50	20.23
18	74	1	1.35	73.50	1443.00	19.50
19	73	1	1.37	72.50	1369.50	18.76
20	72	0	0.00	72.00	1297.00	18.01
21	72	1	1.39	71.50	1225.00	17.01
22	71	1	1.41	70.50	1153.50	16.25
23	70	2	2.86	69.00	1083.00	15.47
24	68	1	1.47	67.50	1014.00	14.91
25	67	1	1.49	66.50	946.50	14.13
26	66	0	0.00	66.00	880.00	13.33
27	66	3	4.55	64.50	814.00	12.33
28	63	0	0.00	63.00	749.50	11.90
29	63	0	0.00	63.00	686.50	10.90
30	63	0	0.00	63.00	623.50	9.90
31	63	0	0.00	63.00	560.50	8.90
32	63	0	0.00	63.00	497.50	7.90
33	63	0	0.00	63.00	434.50	6.90
34	63	0	0.00	63.00	371.50	5.90
35	63	0	0.00	63.00	308.50	4.90
36	63	0	0.00	63.00	245.50	3.90
37	63	7	11.11	59.50	182.50	2.90
38	56	8	14.29	52.00	123.00	2.20
39	48	12	25.00	42.00	71.00	1.48
40	36	25	69.44	23.50	29.00	0.81
41	11	11	100.00	5.50	5.50	0.50

The life expectancy also demonstrated the same tendency for hybrid races of mulberry silkworms. It lessen initially and then followed by an easefully drop in the values up to termination of generation.

## 2. To study of stage specific life table:

The data receive from stage specific life table exhibited that into the species of mulberry silkworm, the highest apparent mortality (23.33%) at late larval stage was recorded on NB<sub>4</sub>D<sub>2</sub>×SH<sub>6</sub> at control temperature. It was consider that apparent mortality has recorded at early instar larval stage on the overall three hybrid races of mulberry silkworm with some alteration at all pre- pupal and pupal stages. As far as the survival fraction was affined highest at early instars larval stage and in all the egg, late larval, pre-pupal and pupal stages. However, there was the little variation in the value obtained at diverse developmental stage

**Table-1.** Stage specific life table of mulberry silkworm (*Bombyx mori* L.) race SH<sub>6</sub>×NB<sub>4</sub>D<sub>2</sub> at 28±1°C

Stage	No. of surviving of the stage (lx)	No. of dying in each stage (dx)	Apparent mortality	Survival fraction	Mortality/Survival Ratio	Indispensable Mortality		
(x)	Lx	dx	100qx	(Sx)	MSR	(IM)	log lx	K-Values
Egg	100	10	10.00	0.90	0.11	6.05	2	0.0458
Early Instars								
Larvae	90	21	23.33	0.77	0.34	18.7	1.9542	0.1154
Late Instars								
Larvae	69	2	2.90	0.97	0.04	2.2	1.8388	0.0128
Pre Pupa	67	2	2.99	0.97	0.05	2.75	1.826	0.0131
Pupa	65	10	15.38	0.85	0.28	15.4	1.8129	0.0726
Adult	55	55	100.00	...	.....	.....	1.7403	0
							K=	0.2597

The maximum mortality survival ratio exhibited at early instars larval stage and minimum pre pupal stage in all cases. In case of mortality survival ratio on NB<sub>4</sub>D<sub>2</sub>×SH<sub>6</sub> it was highest at early instar larval stage (0.35) at control and room temperature.

**Table- 2.** Stage specific life table of mulberry silkworm (*Bombyx mori* L.) race SH<sub>6</sub>×NB<sub>4</sub>D<sub>2</sub> at room temperature

Stage	No. Of surviving of the stage (lx)	No. Of dying in each stage (dx)	Apparent mortality	Survival fraction	Mortality/Survival Ratio	Indispensable Mortality		
(x)	Lx	dx	100qx	(Sx)	MSR	(IM)	log lx	K-Values
Egg	100	12	12.00	0.88	0.14	7.84	2.00	0.0556
Early Instars								
Larvae	88	17	19.32	0.81	0.27	15.12	1.9444	0.0932
Late Instars								
Larvae	71	5	7.04	0.93	0.11	6.16	1.8512	0.0317
Pre Pupa	66	3	4.55	0.95	0.07	3.92	1.8295	0.0202
Pupa	63	7	11.11	0.89	0.20	11.2	1.8093	0.0512
Adult	56	56	100.00	.....	....	....	1.7581	0
							K=	0.2519

The k-values obtained at the different developmental stages were of different significance. The summation of all the K- values in all the cases revealed that the total generation mortality was maximum 0.2597 on SH<sub>6</sub>×NB<sub>4</sub>D<sub>2</sub> at control temperature.

## To study of Life and fertility table:

The data obtained for life and fertility table revealed that the females of mulberry silkworm (*B. mori* Linn.) SH<sub>6</sub>×NB<sub>4</sub>D<sub>2</sub> exhibited highest potential fecundity 309.00 at control temperature. The intrinsic rate of increase, finite rate of increase and also the doubling time are also found in same manner. Unless, mean length of generation was found to be lowest 37.92 days on NB<sub>4</sub>D<sub>2</sub>×SH<sub>6</sub> at control temperature.

**Table-3. Life and fertility table of mulberry silkworm (*Bombyx mori* L.) race SH<sub>6</sub>×NB<sub>4</sub>D<sub>2</sub> at 28±1<sup>0</sup>C**

Pivotal Age in days	Age specific female survivorship	Natality rate	Net Reproductive Rate		Value of e <sup>-rx</sup> .lxmx when	% Contribution of each age group towards
(x)	(lx)	(mx)	(Lxmx)	Lxmx.x	r =0.120647721	(r)
<b>0.5 to 36.5 immature stages and pre-ovipositor period</b>						
37.5	0.39	73	28.47	1067.63	0.3052	30.52
38.5	0.37	88	32.56	1253.56	0.3114	31.14
39.5	0.34	72	24.48	966.96	0.2071	20.71
40.5	0.31	76	23.56	954.18	0.1763	17.63
Sum		309	109.07	4242.33	1.0000	100

**Table-4. Life and fertility table of mulberry silkworm (*Bombyx mori* L.) race SH<sub>6</sub>×NB<sub>4</sub>D<sub>2</sub> at room temperature**

Pivotal Age in days	Age specific female survivorship	Natality rate	Net Reproductive Rate		Value of e <sup>-rx</sup> .lxmx when	% Contribution of each age group towards
(x)	(lx)	(mx)	(Lxmx)	Lxmx.x	r =0.120647721	(r)
<b>0.5 to 36.5 immature stages and pre-ovipositor period</b>						
37.5	0.38	73	27.74	1040.25	0.3277	32.77
38.5	0.35	78	27.3	1051.05	0.2817	28.17
39.5	0.31	69	21.39	844.905	0.2003	20.03
40.5	0.29	79	22.91	927.855	0.1903	19.03
Sum		299	99.34	3864.06	1.0000	100

**RAC Recommendations:** Since no technology on mulberry has been developed and least no of farmers are interested in mulberry farming hence experiment not approved. It was directed that scientist may discuss in departmental group and Dean of the college and plan something important on crop based research and submit to Directorate of Research.

#### **Experiement-4**

**Title:** Population fluctuation of mango fruit fly in methyle eugenol traps and mango leaf hopper.

**Investigators:** Rajendra Singh.

**Year of Start:** 2019-20

**No. of Trees:** 50

**Location:** Farmer field at Validpur, Daurala District, Meerut.

**Objectives:**

- To study the population fluctuation of mango fruit fly
- To study the population fluctuation of mango leaf hopper

**Installation of Traps:** The Methyl Eugenol Traps were installed in the mango orchards

**Materials and methods:**

The Studies on population fluctuation of mango fruit fly were conducted at Farmer field of Validpur, Daurala District, Meerut (U.P.) during 2020-2021. Standardized Methyl Eugenol Traps were used for monitoring the pest population. The trap and tree ratio were 1:5 at all 50 selected plant treatment. Traps were charged with 0.4 ml Methyl Eugenol and 1 ml Malathion and run throughout the study period. The mango leaf hopper observed with the help of polythene bag on 5 no of panicles and trunk.

## Results:

The data presented (Table 1) indicates the fruit fly trapped in farmer field Validpur daurala, Meerut of Western plain zone of Uttar Pradesh. Fruit flies viz. *Bactocera dorsalis*, was identified by using methyl eugenol trap on mango orchards *B. dorsalis* was active and dominant during January to June among all of the trapped fruit flies species. The activities of fruit fly were noticed for the first time in the January during the years 2020 (Table1.). Population was steadily increased in the field up to February. The population showed fluctuating trends during the entire crop period and reached to its maximum level of 663.9 fruitflies/5 traps on June 2021 at the temperature 31.33°C and RH 46.7 per cent during the year 2021.

**Table - 1 Population fluctuations of fruit fly during January to December, 2020-21 in mango orchards of district Meerut**

Month	Mean no. of flies/5 trap	Temperature (°C)			Relative humidity (%)			Rainfall (mm)
		Max	Min	Mean	Max	Min	Mean	
August 2020	429.9	33.3	25.4	29.4	85.3	73.3	79.5	4.8
September 2020	294.1	35.4	26.4	30.9	78.7	58.3	68.5	0.3
October 2020	60.4	33.8	19.0	25.4	83.7	49.5	66.6	0.0
November 2020	25.6	27.2	10.3	18.8	83.2	47.5	65.3	0.1
December 2020	15.2	22.2	6.3	14.3	87.5	49.9	68.7	0.2
January 2021	11.28	18.7	6.4	12.6	92.4	68.8	77.1	0.8
February 2021	18.70	26.7	10.1	18.4	84.0	47.2	65.6	0.2
March 2021	98.80	32.3	15.6	24.0	73.3	35.9	54.6	0.0
April 2021	133.5	37.0	19.8	28.4	42.6	24.8	33.7	0.1
May 2021	528.4	35.9	22.9	29.4	58.2	37.6	47.9	3.7
June 2021	663.9	36.6	26.0	31.3	59.9	33.5	46.7	2.1

## 2. Seasonal incidence of mango hopper on mango tree.

The studies on the population dynamics of mango leaf hopper *Amaritodus atkinsoni*, were carried out on mango hopper on tree trunk and panicles. The mango leaf hopper started appearing on the tree trunk with the population of 0.03 hopper/tree trunk (mean temperature 14.3°C and RH 68.7 per cent during) 2020-21 (Table 2). The population increased and reached 1.21 mango hopper/trunk in the month of January 2020 at the mean temperature of 12.6°C and RH 77.1 per cent during 2020-21 (Table 2). The maximum mango leaf hopper population was observed in the month of October 2020 on the tree trunk 25.89 at the temperature 26.4 and Relative humidity 66.6%. The hopper population on panicles was appeared first on December (0.40 hopper/ 5 panicles). The population of hopper increased gradually and reached its peak (43.25 hopper/5 panicles) during month of March 2021 with temperature 24.0°C and R.H 54.6 per cent during 2020-21.

**Table 2: Population fluctuations of mango leaf hopper during, 2020-21 in mango orchards.**

Month	No. of leaf hoppers/ 5 panicles	No of leaf hoppers/ Trunk	Temperature (°C)			Relative humidity (%)			Rainfall (mm)
			max	min	Mean	max	Min	Mean	
August 2020	38.65	23.29	33.3	25.4	29.4	85.3	73.7	79.5	4.8
Sept. 2020	7.04	15.19	35.4	26.4	30.9	78.7	58.3	68.5	0.3
October 2020	1.72	25.89	33.8	19.0	26.4	83.7	49.5	66.6	0.0
Nov. 2020	6.28	1.81	27.2	10.3	18.8	83.2	47.5	65.3	0.1
Dec. 2020	0.40	0.03	22.2	6.3	14.3	87.5	49.9	68.7	0.2
January 2021	1.35	1.21	18.7	6.4	12.6	92.4	61.8	77.1	0.8
February 2021	22.54	1.35	26.7	10.1	18.4	84.0	47.2	65.6	0.2
March 2021	43.35	1.37	32.3	15.6	24.0	73.3	35.9	54.6	0.0
April 2021	25.71	1.38	37.0	19.8	28.4	42.6	24.8	33.7	0.1
May 2021	11.76	1.82	35.9	22.9	29.4	58.2	37.6	47.9	3.7
June 2021	14.04	8.23	36.6	26.0	31.3	59.9	33.5	46.7	2.1

## Action Plan Kharif 2021

### **Experiment: 1**

**Title:** Bioefficacy of botanical powders against *Sitophilus oryzae* in stored wheat grains.

**Investigators:** Dr. Gaje Singh

**Year of Start:** 2021

#### **Objectives-**

1. To evaluate the bioefficacy of botanical powders against *S.oryzae*.
2. To calculate the physical damage, weight loss under different treatments.
3. To evaluate the effect of different treatments on seed germination.

#### **Treatments-**

1. Neam leaf powder@5g/100g seed
2. Eucalyptus leaf powder @5g/100g seed
3. Lemon grass leaf powder @5g/100g seed
4. Bassil leaf powder @5g/100g seed
5. Citrus leaf powder @5g/100g seed
6. Tobacco leaf powder @5g/100g seed
7. Control

#### **Materials and Methods-**

- The experiment will be was conducted in the laboratory of the Department of Entomology at room temperature and humidity during rainy season.
- **Preparation of treatments :**
- To prepare botanical powders the leaves of neem , Eucalyptus, lemon grass, Basil, Citrus and tobacco will be collected locally, will be dried in the shade, and will be powdered using a grinder.

#### **Collection, Mass Rearing, and release of *S. Oryzae*-**

- The initial stock of adult weevils will be collected from locally. Mass rearing of weevils will be done to achieve uniform aged weevil stock of the second generation. One hundred grams of the sample wheat will be treated with botanical powder at 5g/100g of grains. The treated grains will be taken in a plastic container (capacity 250g), and 10 pairs of *S. oryzae* belonging to the second generation will be released per treatment. The three replications of each treatment will be used.

#### **Observations-**

1. After 15 days of release of *S.Oryzae* the mortality of insect will be calculated.
2. After 90 days of release of *S.Oryzae* the physical grain damage will be observed and weight loss will be measured.
3. After 90 days of release of *S.Oryzae* the effect of different treatments on germination of seeds will be evaluated.

**RAC Recommendations:** The Experiment was approved. RAC directed that the experiment on integrated pest management on sugarcane and rice should also be planed and conducted. The details of the experiment to be submitted to Directorate of Research.

## Experiment: 2

**Title:** Efficacy of novel insecticides and bio pesticides against sucking pests of okra.

**Investigators:** Dr. D. V. Singh, Dr. D.N. Mishra, Dr. G. Singh & Dr. H.L. Singh

**Year of Start:** 2020-21

### Objective of Experiment:

- To evaluate some new insecticides against sucking pests. (White fly, Jassids, Aphids)
- To evaluate the effect of different treatments against sucking pests.

### Treatments:

1. Dinotefuran 20 5G(Osheen/Token)	0.5g/L
2. Imidacloprid 17.8 SL	0.8 ml/L
3. Thiamethoxam 25 WDG	0.8 ml/L
4. Buprofezin 25 EC	2.0 ml/L
5. Neem Oil	2 ml/L
6. Verticillium lacini	4g /L
7. Untreated control	-

### Preparation of treatments:

The chemicals /biopesticides will be purchased from local market and spray solutions will be made as per requirements

**RAC Recommendations:** Experiment not approved. It was directed that scientist may discuss in departmental group and Dean of the college and plan something different and should be submitted to Directorate Research.



## Department of Genetics and Plant Breeding

### Staff Position:

S.No.	Name	Designation
1.	Dr. L. K. Gangwar	Professor & Head
2.	Dr. Pooran Chand	Professor
3.	Dr. S. K. Singh	Associate Professor
4.	Dr. Atar Singh	Assistant Professor

### Progress Report for Rabi-2019-20

#### Experiment-1

**Title:** National Initial Varietal Trial on wheat (NIVT-1A).

**Year of Start:** 2019-20

**Design:** Simple Lattice

**Replications:** 02

**Date of Sowing:** 05-11-2019

**Results:** A total of 36 entries were tested with two replications in Simple Lattice and out of them entry no. N-123 recorded highest grain yield (63.37 q/ha) followed by N-113 (62.80 q/ha) and N-127 (62.49 q/ha). The data of grain yield is presented in table-

**Table-:** National Initial Varietal Trial on wheat (NIVT-1A)

S.No.	Name of the entries	Grain yield (q/ha)
1	N-101	55.35
2	N-102	45.77
3	N-103	49.99
4	N-104	47.95
5	N-105	47.75
6	N-106	52.17
7	N-107	46.86
8	N-108	43.79
9	N-109	46.08
10	N-110	52.28
11	N-111	46.91
12	N-112	56.97
13	N-113	<b>62.80 (II)</b>
14	N-114	52.85
15	N-115	41.76
16	N-116	58.74
17	N-117	46.45
18	N-118	37.85
19	N-119	51.76
20	N-120	57.07
21	N-121	53.22
22	N-122	60.61
23	N-123	<b>63.37 (I)</b>
24	N-124	56.24
25	N-125	47.23
26	N-126	59.20
27	N-127	<b>62.49(III)</b>
28	N-128	57.12
29	N-129	56.13
30	N-130	55.82
31	N-131	57.90
32	N-132	55.82
33	N-133	54.15
34	N-134	57.17
35	N-135	48.42
36	N-136	56.60
	<b>GM</b>	<b>52.9</b>
	<b>SE (M)</b>	<b>1.904</b>
	<b>CD (10%)</b>	<b>4.5</b>
	<b>CV</b>	<b>5.1</b>

## Experiment-2

**Title:** NIVT-1B-IR-TS-TAS

**Year of Start:** 2019-20

**Design:** Simple Lattice

**Replications :** 02

**Date of Sowing:** 05-11-2019

### Results:

A total of 36 entries were tested with two replications in Simple Lattice and out of them entry no. N-231 recorded highest grain yield (62.69 q/ha) followed by N-221 (62.38 q/ha) and N-219(61.39 q/ha). The data of grain yield is presented in table-

**Table-:** National Initial Varietal Trial on wheat (NIVT-1B)

S.No.	Name of the entries	Grain yield (q/ha)
1	N-201	52.90
2	N-202	52.92
3	N-203	52.49
4	N-204	47.54
5	N-205	50.35
6	N-206	50.66
7	N-207	52.38
8	N-208	59.10
9	N-209	61.18
10	N-210	61.91
11	N-211	44.68
12	N-212	56.97
13	N-213	52.80
14	N-214	54.83
15	N-215	56.13
16	N-216	47.44
17	N-217	57.60
18	N-218	42.33
19	N-219	<b>61.39(III)</b>
20	N-220	48.61
21	N-221	<b>62.38(II)</b>
22	N-222	48.27
23	N-223	41.86
24	N-224	40.09
25	N-225	49.67
26	N-226	38.37
27	N-227	60.09
28	N-228	41.08
29	N-229	46.34
30	N-230	48.16
31	N-231	<b>62.69(I)</b>
32	N-232	50.46
33	N-233	59.57
34	N-234	45.72
35	N-235	49.67
36	N-236	48.00
	<b>GM</b>	<b>51.40</b>
	<b>SE (M)</b>	<b>1.930</b>
	<b>CD (10%)</b>	<b>4.70</b>
	<b>CV</b>	<b>5.30</b>

### Experiment-3

**Title:** NIVT-3A-IR-LS-TAS

**Year of Start:** 2019-20

**Design:** Simple Lattice

**Replications :** 02

**Date of Sowing:** 24-12-2019

#### Results:

A total of 36 entries were tested with two replications in Simple Lattice and out of them entry no. N-414 recorded highest grain yield (61.92 q/ha) followed by N-406 (60.30 q/ha) and N-434 (59.02 q/ha). The data of grain yield is presented in table-

**Table-:** National Initial Varietal Trial on wheat (NIVT-3A)

S.No.	Name of the entries	Grain yield (q/ha)
1	N-401	46.41
2	N-402	43.11
3	N-403	46.29
4	N-404	51.04
5	N-405	54.91
6	N-406	<b>60.30(II)</b>
7	N-407	46.75
8	N-408	34.83
9	N-409	47.39
10	N-410	45.31
11	N-411	39.81
12	N-412	45.71
13	N-413	54.16
14	N-414	<b>61.92(I)</b>
15	N-415	56.13
16	N-416	52.89
17	N-417	47.28
18	N-418	35.87
19	N-419	42.93
20	N-420	38.77
21	N-421	56.36
22	N-422	45.94
23	N-423	53.53
24	N-424	47.85
25	N-425	56.53
26	N-426	49.88
27	N-427	58.44
28	N-428	46.00
29	N-429	42.76
30	N-430	51.73
31	N-431	51.90
32	N-432	40.04
33	N-433	55.61
34	N-434	<b>59.02(III)</b>
35	N-435	47.33
36	N-436	58.33
	<b>GM</b>	<b>49.20</b>
	<b>SE (M)</b>	<b>1.727</b>
	<b>CD (10%)</b>	<b>4.10</b>
	<b>CV</b>	<b>5.00</b>

#### Experiment-4

**Title:** NIVT-5A-RI-TS-TAS

**Year of Start:** 2019-20      **Design:** Simple Lattice      **Replications:** 02

**Date of Sowing:** 25-10-2019

#### Results:

A total of 25 entries were tested with two replications in Simple Lattice and out of them entry no. N-716 recorded highest grain yield (64.15 q/ha) followed by N-719 (62.33 q/ha) and N-702 (59.26 q/ha). The data of grain yield is presented in table-

**Table-:** National Initial Varietal Trial on wheat (NIVT-5A)

S.No.	Name of the entries	Grain yield (q/ha)
1	N-701	39.44
2	N-702	<b>59.26(III)</b>
3	N-703	52.49
4	N-704	36.81
5	N-705	38.43
6	N-706	47.96
7	N-707	50.61
8	N-708	29.73
9	N-709	39.26
10	N-710	32.18
11	N-711	46.03
12	N-712	36.97
13	N-713	55.19
14	N-714	43.58
15	N-715	50.56
16	N-716	<b>64.15(I)</b>
17	N-717	54.52
18	N-718	57.95
19	N-719	<b>62.33(II)</b>
20	N-720	31.34
21	N-721	53.37
22	N-722	37.75
23	N-723	41.55
24	N-724	57.02
25	N-725	44.88
	<b>GM</b>	<b>49.70</b>
	<b>SE (M)</b>	<b>1.759</b>
	<b>CD (10%)</b>	<b>4.30</b>
	<b>CV</b>	<b>5.30</b>

#### Experiment-5

**Title:** AVT-IR-TS-TAS

**Year of Start:** 2019-20      **Design:** RBD      **Replications:** 04

**Variety:** Wheat      **Date of Sowing:** 06-11-2019

#### Results:

A total of 9 entries were tested with four replications in RBD and out of them entry no. NW-TS-102 recorded highest grain yield (61.9 q/ha) followed by NW-TS-104 (61.11 q/ha) and NW-TS-109 (60.78 q/ha). The data of grain yield is presented in table-

**Table-:** Advance Trial on wheat (AVT-IR-TS-TAS)

S.No.	Name of the entries	Grain yield (q/ha)
1	NW-TS-101	56.43
2	NW-TS-102	<b>61.39(I)</b>
3	NW-TS-103	53.64
4	NW-TS-104	<b>61.11(II)</b>
5	NW-TS-105	60.69
6	NW-TS-106	56.04
7	NW-TS-107	57.66
8	NW-TS-108	52.90
9	NW-TS-109	<b>60.78(III)</b>
	<b>GM</b>	<b>57.9</b>
	<b>SE (M)</b>	<b>0.611</b>
	<b>CD (10%)</b>	<b>1.5</b>
	<b>CV</b>	<b>2.1</b>

**Experiment-6****Title:** AVT-RI-TS-TAS**Year of Start:** 2019-20      **Design:** RBD      **Replications:** 04**Date of Sowing:** 25-10-2019**Results:**

A total of 9 entries were tested with four replications in RBD and out of them entry no. NW-RI-301 recorded highest grain yield (56.33q/ha) followed by NW-RI-304 (54.99 q/ha) and NW-RI-305 (51.83 q/ha). The data of grain yield is presented in table-

**Table-:** Advance Varietal Trial on wheat (AVT-RI-TS-TAS)

S.No.	Name of the entries	Grain yield (q/ha)
1	NW-RI-301	<b>56.33(I)</b>
2	NW-RI-302	41.15
3	NW-RI-303	43.57
4	NW-RI-304	<b>54.99(II)</b>
5	NW-RI-305	<b>51.83(III)</b>
6	NW-RI-306	45.61
7	NW-RI-307	47.80
8	NW-RI-308	49.26
9	NW-RI-309	51.59
	<b>GM</b>	<b>49.1</b>
	<b>SE (M)</b>	<b>0.670</b>
	<b>CD (10%)</b>	<b>1.6</b>
	<b>CV</b>	<b>2.7</b>

**Experiment-7****Title:** AVT-IR-LS-TAS**Year of Start:** 2019-20      **Design:** RBD      **Replications :** 04**Date of Sowing:** 23-12-2019**Results:**

A total of 17 entries were tested with four replications in RBD and out of them entry no. N-209 recorded highest grain yield (51.73 q/ha) followed by N-212 (48.55 q/ha) and N-210 (48.40 q/ha). The data of grain yield is presented in table-

**Table-:** Advance Trial on wheat (AVT-IR-LS-TAS)

S.No.	Name of the entries	Grain yield (q/ha)
1	N-201	45.44
2	N-202	44.55
3	N-203	42.76
4	N-204	45.98
5	N-205	35.85
6	N-206	43.43
7	N-207	41.17
8	N-208	46.17
9	N-209	<b>51.73(I)</b>
10	N-210	<b>48.40(III)</b>
11	N-211	45.40
12	N-212	<b>48.55(II)</b>
13	N-213	45.16
14	N-214	35.08
15	N-215	45.36
16	N-216	35.03
17	N-217	42.64
	<b>GM</b>	<b>43.6</b>
	<b>SE (M)</b>	<b>0.919</b>
	<b>CD (10%)</b>	<b>2.2</b>
	<b>CV</b>	<b>4.2</b>

**Experiment-8****Title:** IVT/AVT-FB(IR)-HL**Year of Start:** 2019-20**Design:** RBD**Replications :** 04**Crop:** Barley**Date of Sowing:** 13-11-2019**Results:**

A total of 10 entries were tested with four replications in RBD and out of them entry no. IVT/AVT-FB(IR)-HL-E5 recorded highest grain yield (60.38 q/ha) followed by IVT/AVT-FB(IR)-HL-E9 (56.81 q/ha) and IVT/AVT-FB(IR)-HL-E1 (55.91 q/ha). The data of grain yield is presented in table-

**Table-:** Initial/Advance Varietal Trial on Feed Barley-HL (IVT/AVT-FB(IR)-HL)

S.No.	Name of the entries	Grain yield (q/ha)
1	IVT/AVT-IRFB-HL-E1	<b>55.91(III)</b>
2	IVT/AVT-IRFB-HL-E2	55.51
3	IVT/AVT-IRFB-HL-E3	42.90
4	IVT/AVT-IRFB-HL-E4	50.90
5	IVT/AVT-IRFB-HL-E5	<b>60.38(I)</b>
6	IVT/AVT-IRFB-HL-E6	48.06
7	IVT/AVT-IRFB-HL-E7	52.25
8	IVT/AVT-IRFB-HL-E8	48.69
9	IVT/AVT-IRFB-HL-E9	<b>56.81(II)</b>
10	IVT/AVT-IRFB-HL-E10	53.04
	<b>GM</b>	<b>52.5</b>
	<b>SE (M)</b>	<b>1.2</b>
	<b>CD</b>	<b>3.0</b>
	<b>CV</b>	<b>4.7</b>

### Experiment-9

**Title:** AVT-IR-FB

**Year of Start:** 2019-20      **Design:** RBD      **Replications:** 03

**Crop:** Barley      **Date of Sowing:** 11-11-2019

#### Results:

A total of 8 entries were tested with three replications in RBD and out of them entry no. AVT-IR-FB-E3 recorded highest grain yield (64.02 q/ha) followed by AVT-IR-FB-E1 (60.13 q/ha) and AVT-IR-FB-E4 (57.36 q/ha). The data of grain yield is presented in table-

**Table-:** Advance Varietal Trial on Feed Barley (AVT-IR-FB)

S.No.	Name of the entries	Grain yield (q/ha)
1	AVT-IR-FB-E1	<b>60.13(II)</b>
2	AVT-IR-FB-E2	48.70
3	AVT-IR-FB-E3	<b>64.20(I)</b>
4	AVT-IR-FB-E4	<b>57.36(III)</b>
5	AVT-IR-FB-E5	52.89
6	AVT-IR-FB-E6	48.18
7	AVT-IR-FB-E7	50.63
8	AVT-IR-FB-E8	50.59
	<b>GM</b>	<b>54.1</b>
	<b>SE (M)</b>	<b>3.3</b>
	<b>CD</b>	<b>8.2</b>
	<b>CV</b>	<b>10.5</b>

### Experiment-10

**Title:** AVT-MB

**Year of Start:** 2019-20      **Design:** RBD      **Replications:** 03

**Crop:** Barley      **Date of Sowing:** 13-11-2019

#### Results:

A total of 9 entries were tested with four replications in RBD and out of them entry no. AVT-MB -1 recorded highest grain yield (61.95 q/ha) followed by entry no. AVT-MB 4 (61.61 q/ha) and entry no. AVT-MB 7 (60.02 q/ha). The data of grain yield is presented in table-

**Table-:** Advance Varietal Trial on Malt Barley (AVT-MB)

S.No.	Name of the entries	Grain yield (q/ha)
1	AVT-MB-1	<b>61.95(I)</b>
2	AVT-MB-2	59.41
3	AVT-MB-3	56.27
4	AVT-MB-4	<b>61.61(II)</b>
5	AVT-MB-5	56.70
6	AVT-MB-6	49.60
7	AVT-MB-7	<b>60.02(III)</b>
8	AVT-MB-8	56.95
9	AVT-MB-9	56.56
	<b>GM</b>	<b>58.1</b>
	<b>SE (M)</b>	<b>0.7</b>
	<b>CD</b>	<b>1.7</b>
	<b>CV</b>	<b>2.4</b>

## Experiment-11

**Title:** AVT-IR-FB

**Year of Start:** 2019-20      **Design:** RBD      **Replications:** 02

**Crop:** Barley      **Date of Sowing:** 13-11-2019

### Results:

A total of 25 entries were tested with two replications in RBD and out of them entry no. IVT-IRFB-E19 recorded highest grain yield (69.07 q/ha) followed by IVT-IRFB-E20 (65.57 q/ha) and IVT-IRFB-E17, IVT-IRFB-E18 & IVT-IRFB-E8 (64.00 q/ha). The data of grain yield is presented in table-

**Table-:** Initial Varietal Trial on Feed Barley (IVT-IR-FB)

S.No.	Name of the entries	Grain yield (q/ha)
1	IVT-IRFB-HL-E1	51.92
2	IVT-IRFB-HL-E2	47.21
3	IVT-IRFB-HL-E3	52.83
4	IVT-IRFB-HL-E4	52.41
5	IVT-IRFB-HL-E5	50.72
6	IVT-IRFB-HL-E6	62.67
7	IVT-IRFB-HL-E7	57.72
8	IVT-IRFB-HL-E8	<b>64.00(III)</b>
9	IVT-IRFB-HL-E9	45.22
10	IVT-IRFB-HL-E10	51.92
11	IVT-IRFB-HL-E11	62.43
12	IVT-IRFB-HL-E12	55.97
13	IVT-IRFB-HL-E13	46.85
14	IVT-IRFB-HL-E14	56.81
15	IVT-IRFB-HL-E15	57.54
16	IVT-IRFB-HL-E16	43.17
17	IVT-IRFB-HL-E17	<b>64.00(III)</b>
18	IVT-IRFB-HL-E18	<b>64.00(III)</b>
19	IVT-IRFB-HL-E19	<b>69.07(I)</b>
20	IVT-IRFB-HL-E20	<b>65.57(II)</b>
21	IVT-IRFB-HL-E21	51.38
22	IVT-IRFB-HL-E22	47.88
23	IVT-IRFB-HL-E23	50.23
24	IVT-IRFB-HL-E24	57.24
25	IVT-IRFB-HL-E25	52.53
	<b>GM</b>	<b>55.3</b>
	<b>SE (M)</b>	<b>2.2</b>
	<b>CD</b>	<b>5.2</b>
	<b>CV</b>	<b>5.5</b>

## Experiment-12

**Title:** IVT-MB

**Year of Start:** 2019-20      **Design:** RBD      **Replications:** 02

**Crop:** Barley      **Date of Sowing:** 18-11-2019

### Results:

A total of 22 entries were tested with four replications in RBD and out of them entry no. IVT-MB 21 recorded highest grain yield (80.47 q/ha) followed by entry no. IVT-MB 12 (77.46 q/ha) and entry no. IVT-MB 15 (74.37 q/ha). The data of grain yield is presented in table-



**Table-:** Initial Varietal Trial on Malt Barley (IVT-MB)

S.No.	Name of the entries	Grain yield (q/ha)
1	IVT-MB-1	67.16
2	IVT-MB-2	59.41
3	IVT-MB-3	52.62
4	IVT-MB-4	59.56
5	IVT-MB-5	70.52
6	IVT-MB-6	64.15
7	IVT-MB-7	68.05
8	IVT-MB-8	59.29
9	IVT-MB-9	62.41
10	IVT-MB-10	70.71
11	IVT-MB-11	68.35
12	IVT-MB-12	<b>77.46(II)</b>
13	IVT-MB-13	70.36
14	IVT-MB-14	72.71
15	IVT-MB-15	<b>74.37(III)</b>
16	IVT-MB-16	65.92
17	IVT-MB-17	54.12
18	IVT-MB-18	73.37
19	IVT-MB-19	50.92
20	IVT-MB-20	70.32
21	IVT-MB-21	<b>80.47(I)</b>
22	IVT-MB-22	74.03
	<b>GM</b>	<b>66.7</b>
	<b>SE (M)</b>	<b>1.9</b>
	<b>CD</b>	<b>5.5</b>
	<b>CV</b>	<b>5.8</b>

**Experiment-13****Title:** AVT-1+AHT-1-TS**Year of Start:** 2019-20**Design:** RBD**Replications :** 04**Crop:** Mustard**Date of Sowing:** 06-10-2019**Results:**

A total of 10 entries were tested with four replications in RBD and out of them entry no MCN-19-40 recorded highest grain yield (32.28 q/ha) followed by MCN-19-45 (30.49 q/ha) and MCN-19-39 (29.71 q/ha). The data of grain yield is presented in table-

**Table-:** Advance Varietal Trial on Mustard (AVT-1+AHT-1)

S.No.	Name of the entries	Grain yield (q/ha)
1	MCN-19-36	25.40
2	MCN-19-37	20.54
3	MCN-19-38	22.49
4	MCN-19-39	<b>29.71(III)</b>
5	MCN-19-40	<b>32.28(I)</b>
6	MCN-19-41	26.58
7	MCN-19-42	23.16
8	MCN-19-43	24.15
9	MCN-19-44	20.94
10	MCN-19-45	<b>30.49(II)</b>
	<b>GM</b>	<b>25.55</b>
	<b>CD (5%)</b>	<b>1.31</b>
	<b>CV(%)</b>	<b>3.5</b>

## Experiment-14

**Title:** IVT-TS-IR

**Year of Start:** 2019-20

**Design:** Alpha Lattice

**Replications :** 03

**Crop:** Mustard

**Date of Sowing:** 06-10-2019

### Results:

A total of 24 entries were tested with three replications in RBD and out of them entry no MCN-19-7 recorded highest grain yield (30.52 q/ha) followed by MCN-19-11 (29.47 q/ha) and MCN-19-4 (29.16 q/ha). The data of grain yield is presented in table-

**Table-:** Initial Varietal Trial on Mustard (IVT-TS-Irrigated)

S.No.	Name of the entries	Grain yield (q/ha)
1	MCN-19-1	20.63
2	MCN-19-2	28.59
3	MCN-19-3	23.16
4	MCN-19-4	<b>29.16(III)</b>
5	MCN-19-5	18.61
6	MCN-19-6	19.54
7	MCN-19-7	<b>30.52(I)</b>
8	MCN-19-8	25.52
9	MCN-19-9	20.40
10	MCN-19-10	24.45
11	MCN-19-11	<b>29.47(II)</b>
12	MCN-19-12	19.23
13	MCN-19-13	26.43
14	MCN-19-14	17.89
15	MCN-19-15	21.82
16	MCN-19-16	17.05
17	MCN-19-17	19.41
18	MCN-19-18	20.26
19	MCN-19-19	20.11
20	MCN-19-20	22.71
21	MCN-19-21	17.87
22	MCN-19-22	25.48
23	MCN-19-23	21.39
24	MCN-19-24	21.90
	<b>GM</b>	<b>18.27</b>
	<b>CD (5%)</b>	<b>3.07</b>
	<b>CV(%)</b>	<b>10.7</b>

## Experiment-15

**Title:** IVTO: Forage Oat

**Year of Start:** 2019-20

**Design:** RBD

**Replications :** 03

**Crop:** Oat & Berseem

**Date of Sowing:** 14-11-2019

### Results:

A total of 14 entries were tested with three replications in RBD and out of them entry no. IVT OSC-08 recorded highest green fodder yield (711.29 q/ha) followed by IVT OSC-07(709.61 q/ha) and IVT OSC-13 (684.52 q/ha). The data of green fodder yield is presented in table-

**Table-: Initial Varietal Trial on Forage Oat**

S.No.	Name of the entries	Green fodder yield (q/ha)
1	IVT OSC-01	603.82
2	IVT OSC-02	663.17
3	IVT OSC-03	525.65
4	IVT OSC-04	590.21
5	IVT OSC-05	589.64
6	IVT OSC-06	591.84
7	IVT OSC-07	<b>709.61(II)</b>
8	IVT OSC-08	<b>711.29(I)</b>
9	IVT OSC-09	488.00
10	IVT OSC-10	497.95
11	IVT OSC-11	631.82
12	IVT OSC-12	616.30
13	IVT OSC-13	<b>684.52(III)</b>
14	IVT OSC-14	611.05

**Experiment-16****Title:** AVT Oat-2 (Single Cut)**Year of Start:** 2019-20      **Design:** RBD      **Replications :** 03**Crop:** Oat & Berseem      **Date of Sowing:** 14-11-2019**Results:**

A total of 08 entries were tested with three replications in RBD and out of them entry no. AVT OSC-07 recorded highest green fodder yield (1001.16 q/ha) followed by IVT OSC-01(968.18 q/ha) and IVT OSC-8 (952.39 q/ha). The data of green fodder yield is presented in table-

**Table-: Advance Varietal Trial on Oat**

S.No.	Name of the entries	Green fodder yield (q/ha)
1	AVT OSC-01	<b>968.18(II)</b>
2	AVT OSC-02	911.46
3	AVT OSC-03	852.02
4	AVT OSC-04	753.47
5	AVT OSC-05	723.057
6	AVT OSC-06	664.34
7	AVT OSC-07	<b>1001.16(I)</b>
8	AVT OSC-08	<b>952.39(III)</b>

**Experiment-17****Title:** IVTB: Forage Berseem**Year of Start:** 2019-20      **Design:** RBD      **Replications:** 04**Crop:** Oat & Berseem      **Date of Sowing:** 15-11-2019**Results:**

A total of 06 entries were tested with three replications in RBD and out of them entry no IVT-B-01 recorded highest green fodder yield (849.74 q/ha) followed by IVT-B-02 (805.29 q/ha) and IVT-B-03 (-) (771.01 q/ha). The data of green fodder yield is presented in table-

**Table-: Initial Varietal Trial on Forage Berseem**

S.No.	Name of the entries	Green fodder yield (q/ha)
1	IVTB-01	<b>849.74(I)</b>
2	IVTB-02	<b>805.29(II)</b>
3	IVTB-03	<b>771.01(III)</b>
4	IVTB-04	706.25
5	IVTB-05	730.25
6	IVTB-06	689.25

**Experiment-18****Title:** AVTB-1: Forage Berseem**Year of Start:** 2019-20      **Design:** RBD      **Replications:** 03**Crop:** Oat & Berseem      **Date of Sowing:** 15-11-2019**Results:**

A total of 07 entries were tested with three replications in RBD and out of them entry no. AVTB-04 recorded highest green fodder yield (1130.51 q/ha) followed by AVTB-03 (1104.82 q/ha) and AVTB-01 (1098.71 q/ha). The Data of green fodder yield is presented in table-

**Table-: Advanced Varietal Trial-1 on Forage Berseem**

S.No.	Name of the entries	Green fodder yield (q/ha)
1	AVTB-01	<b>1098.71(III)</b>
2	AVTB-02	950.16
3	AVTB-03	<b>1104.82(II)</b>
4	AVTB-04	<b>1130.51(I)</b>
5	AVTB-05	1074.97
6	AVTB-06	892.27
7	AVTB-07	1071.64

**Experiment-19****Title:** AVTB-2: Forage Berseem**Year of Start:** 2019-20      **Design:** RBD      **Replications:** 04**Crop:** Oat & Berseem      **Date of Sowing:** 15-11-2019**Results:**

A total of 05 entries were tested with three replications in RBD and out of them entry no. AVTB-2-1 recorded highest green fodder yield (975.74 q/ha) followed by AVTB-2-2 (856.69 q/ha) and AVTB-2-5 (816.64 q/ha). The Data of green fodder yield is presented in table-

**Table-: Advanced Varietal Trial-1 on Forage Berseem**

S.No.	Name of the entries	Green fodder yield (q/ha)
1	AVTB-2-1	<b>975.74(I)</b>
2	AVTB-2-2	<b>856.69(II)</b>
3	AVTB-2-3	675.96
4	AVTB-2-4	731.16
5	AVTB-2-5	<b>816.64(III)</b>

# Progress Report for Kharif-2020

## Experiment-1

Assessment of genetic diversity in rice (*Oryza sativa* L.) germplasm for drought tolerance.

### Traits studied

1. Days to 50% flowering
2. Days to maturity
3. Plant height (cm)
4. Numbers of productive tillers per plant
5. Length of panicle (cm)
6. Number of grains per panicle
7. Biological yield per plant (g)
8. Grain yield per plant (g)
9. Harvest index (%)
10. 1000- grain weight (g)
11. Kernel length (mm)
12. Kernel width (mm)
13. L : B ratio
14. Stress Tolerance Index
15. Root length

### Results:

A total of 25 entries were evaluated studying yield and its components for genetic variability under direct sown condition *kharif* 2020. The data was observed on 15 traits mentioned above. But data is given for yield/plant, root length and stress tolerance index. The analyzed data is tabulation. The data is presented in the following table.

**Table-1**Yield and related traits data

SN	Name of the varieties	Root length	Stress Tolerance Index	Grain yield/ plant (g)
1	Pant Basmati-386	16.5	0.62	18.66
2	Haryana Basmati-1	17.6	0.76	15.5
3	Pusa Basmati-1509	15.5	0.56	16.5
4	vallabh Basmati-22	22.7	0.77	14.2
5	Basmati-564	14.9	0.51	15.3
6	Pusa Sugandh-3	20.1	0.98	21.4
7	Punjab Basmati-5	17.8	0.61	18.2
8	Punjab Basmati-4	16.1	0.48	17.5
9	Sharbati	17.3	0.55	17.8
10	Pusa Basmati-2	0.1	0.74	18.7
11	Pusa Basmati-1	21.2	0.93	23.0
12	Pusa Basmati-1718	19.9	0.69	23.2
13	Haryana Basmati-2	20.7	0.67	21.4
14	Taraodi Basmati	23.8	0.88	22.5
15	Punjab Basmati-2	17.6	0.67	23.6
16	Pant Basmati-2	21.8	0.62	22.3
17	Pusa Basmati-5	19.2	0.71	16.0
18	Kastoori	22.4	0.84	26.0
19	Ranbeer Basmati-	24.1	0.54	15.2
20	Malviya Basmati	21.5	0.70	20.2
21	Pusa Basmati-1121	23.4	0.65	18.6
22	Pusa Basmati-1121	20.7	0.75	17.5
23	Punjab Basmati-5	23.03	0.98	20.9
24	V. Nagina Basmati-1	22.4	1.12	24.4
25	CSR-30	19.3	0.66	23.6

## Experiment-2

### Identifying of superior parents of basmati rice based on gene action for using in hybridization.

#### Traits to be studied

1. Days to 50% flowering
2. Days to maturity
3. Plant height (cm)
4. Length of panicle (cm)
5. Numbers of spikelets per panicle
6. Number of grains per panicle
7. Biological yield per plant (g)
8. Grain yield per plant (g)
9. Harvest index (%)
10. 1000- grain weight (g)
11. Kernel length after cooking (mm)
12. Kernel width after cooking (mm)
13. L : B ratio
14. Hulling percentage
15. Gel consistency (mm)

#### Experimental Design:

1. No. of entries : 104 (80 F<sub>1</sub>s + 20 + 4)
2. Design: Randomized Block Design with three replication

A total of 80 crosses (F<sub>1</sub>s) were attempted by adopting line x tester mating design during *kharif* 2019 were evaluated during *kharif* 2020 as detailed below, data is under tabulation.

Lines	Testers			
	1	2	3	4
Punjab Basmati-2	P. Basmati-4	Taroari Basmati	Nagina-22	H. Basmati
Pusa Basmati-1609	P. Basmati	Taroari Basmati	Nagina-22	H. Basmati
Vallabh Basmati-23	P. Basmati	Taroari Basmati	Nagina-22	H. Basmati
Pusa Basmati-1	P. Basmati	Taroari Basmati	Nagina-22	H. Basmati
Pusa Basmati-1509	P. Basmati	Taroari Basmati	Nagina-22	H. Basmati
Basmati-564	P. Basmati	Taroari Basmati	Nagina-22	H. Basmati
Pusa Basmati-6	P. Basmati	Taroari Basmati	Nagina-22	H. Basmati
Vallabh Basmati-21	P. Basmati	Taroari Basmati	Nagina-22	H. Basmati
Basmati CSR-30	P. Basmati	Taroari Basmati	Nagina-22	H. Basmati
Vallabh Basmati-24	P. Basmati	Taroari Basmati	Nagina-22	H. Basmati
Type-3	P. Basmati	Taroari Basmati	Nagina-22	H. Basmati
Basmati-386	P. Basmati	Taroari Basmati	Nagina-22	H. Basmati
Pant Basmati-2	P. Basmati	Taroari Basmati	Nagina-22	H. Basmati
Pusa Basmati-1121	P. Basmati	Taroari Basmati	Nagina-22	H. Basmati
Pant Basmati-1	P. Basmati	Taroari Basmati	Nagina-22	H. Basmati
Punjab Basmati-5	P. Basmati	Taroari Basmati	Nagina-22	H. Basmati
Pusa Basmati-1637	P. Basmati	Taroari Basmati	Nagina-22	H. Basmati
Pusa Basmati-1718	P. Basmati	Taroari Basmati	Nagina-22	H. Basmati
Ranveer Basmati	P. Basmati	Taroari Basmati	Nagina-22	H. Basmati
Malviya Basmati	P. Basmati	Taroari Basmati	Nagina-22	H. Basmati

## Experiment-3

### Evaluation of AICRP Basmati trials

#### I. Advanced Varietal Trials

1. No. of entries: 32 (including checks)
2. Plot size:  
     Gross : 15.0 m.sq.  
     Net : 12.22 m.sq.
3. Design: Randomized Block Design with 3 replications
4. Date of transplanting: 14.07.20

**Results:** A total of 32 entries were tested with three replications in RBD. Out of these entries, entry number **AVT-1809** recorded highest grain yield (51.65 q/ha) followed by AVT-1811 (50.94 q/ha), AVT-1813 (49.04 q/ha) and AVT-1820 (58.12 q/ha). The data of grain yield is presented in table-3.

**Table-3:** Grain yield (q/ha.) of Advanced Varietal Basmati Trial

Sl. No.	Entries	Yield (q/ha.)	Sl. No.	Entries	Yield (q/ha.)
1	1801	39.63	17	1817	34.00
2	1802	46.84	18	1818	40.58
3	1803	42.16	19	1819	44.07
4	1804	37.92	20	1820	48.12- IV
5	1805	44.17	21	1821	34.69
6	1806	46.94	22	1822	35.78
7	1807	44.56	23	1823	36.74
8	1808	42.95	24	1824	40.10
9	1809	51.65 – I	25	1825	35.96
10	1810	42.74	26	1826	40.07
11	1811	50.94 – II	27	1827	37.09
12	1812	30.83	28	1828	39.15
13	1813	49.04 – III	29	1829	33.78
14	1814	40.95	30	1830	34.46
15	1815	46.66	31	1831	32.05
16	1816	43.21	32	1832(LC)	43.25

## Trials-4

### Initial Varietal Trial-Basmati Rice

#### Experimental Design:

1. No. of entries: 20 (including checks)
2. Plot size: Gross : 10.0 m.sq.      **Net:** 7.52 m.sq.
3. Design: Randomized Block Design with three replications
4. Date of transplanting: 15.07.2020

**Results:** A total of 20 entries were tested with three replications in RBD. Out of these entries, entry number **IVT-1904** recorded highest grain yield (53.49 q/ha) followed by IVT-1906 (51.99 q/ha), IVT-1907 (50.70 q/ha) and IVT-1903 (48.46 q/ha). The data of grain yield is presented in table-4.

**Table-4:** Grain yield (q/ha.) of Initial Varietal Basmati Trial

Sl. No.	Entries	Yield (q/ha.)	Sl. No.	Entries	Yield (q/ha.)
1	1901	33.45	11	1911	39.90
2	1902	40.83	12	1912	45.21
3	1903	48.46 - IV	13	1913	45.31
4	1904	53.49 – I	14	1914	40.43
5	1905	40.13	15	1915	40.10
6	1906	51.99 – II	16	1916	47.84
7	1907	50.70 - III	17	1917	45.45
8	1908	45.37	18	1918	33.45
9	1909	44.95	19	1919	35.02
10	1910	45.06	20	1920	40.99

## **(B) Pulses Improvement**

1. Greengram
2. Black gram
3. Lentil

### **Six F<sub>1</sub>s were evaluated during Kharif -2020**

Observations were recorded on:

1. Days to flowering
2. Days to maturity
3. Plant Height (cm)
4. No. of Pods per plant
5. Pod length (cm)
6. Incidence of insects
7. Harvest index
8. Seed yield per plant

20 Single plant progenies were selected for further study

### **Greengram**

Seven crosses were developed by using Four promising Genotypes during *Kharif 2020*.

- (1) *PDM139-14 x V. Umbellate*
- (2) *IPM2-14 x V. Umbellate*
- (3) *VBG04-008 x V. Umbellate*
- (4) *PDM139 x IPM2-14*
- (5) *PDM139 x VBG04-008*
- (6) *IPM2-14 x VBG04-008*
- (7) *PDM139 x V. Umbellate*

### **Blackgram**

Six crosses were developed by using Seven promising Genotypes during *Kharif 2020*.

- (1) Vallabh Urd-1 x Pant Urd 19
- (2) Shakhar 3 x Vallabh Urd -1
- (3) Type -27 x Vallabh Urd -1
- (4) Pant Urd -30 x Vallabh Urd -1
- (5) TNU-2 x Vallabh Urd -1
- (6) IPU-2 x Vallabh Urd -1

## **(C) Forage Sorghum Improvement Programme**

### **Area under sorghum**

**India:** Area: 3.84 Million hectares Production: 3.76 Million tones Productivity: 979 Kg/ha

**U.P.:** Area: 0.15 Million hectares Production: 0.18 Million tones Productivity: 1270 Kg/ha

**Source-** Agricultural Statistics at a glance 2019 (Govt. of India, Ministry of Agriculture).

### **Objectives:**

- Development of high yielding varieties in forage sorghum.
- Identification of sources of resistance for different diseases and quality attributes for further use in breeding programme.

### **Development of breeding material:**

A total of 28 crosses (F<sub>1</sub>'s) were developed by crossing eight lines *i.e.*, HC-308, Pant Chari-8, HC-136, Pant Chari-3, Pusa Chari-23, Pusa Chari-6, CSV 15 and UP Chari 1 by adopting diallel mating design (Sowing date 20 July 2020).



## Evaluation of breeding material:

A total of 28 (F<sub>1</sub>) crosses were evaluated for the performance of yield and its attributes. Out of twenty eight crosses, ten crosses were found superior for yield and its contributing traits are given below table-1.

**Table-1 Mean performance of F<sub>1</sub> crosses**

Sl. No.	Crosses	Days to 50% flowering	Plant height (cm)	Leaves per plant	Total soluble solids (%)	Green fodder yield (q/ha)
1.	HC-308 x HC-136	87.11	282.99	14.11	10.01	576.33
2.	HC-308 x UP Chari-1	82.09	262.49	13.78	9.77	575.22
3.	HC-136 x CSV-15	83.54	278.38	13.64	8.98	521.25
4.	HC-136 x Pant Chari-3	89.12	289.77	14.32	9.55	501.44
5.	Pant Chari-3 x CSV-15	88.99	283.45	13.22	9.79	580.88
6.	CSV-15 x UP Chari-1	86.77	270.66	12.55	8.71	548.02
7.	Pant Chari-8 x UP Chari-1	85.87	276.11	14.02	10.06	589.99
8.	Pusa Chari-6 x CSV-15	83.69	199.43	12.90	7.99	490.56
9.	HC-308 x Pant Chari-3	88.41	285.11	15.09	8.79	485.54
10.	Pant Chari-8 x HC-136	87.55	283.81	14.49	9.12	590.13

## Superior crosses are mentioned below:

Characters	Specific crosses
Days to 50% flowering (more than 85 to 90 days) Seven crosses	HC-308 x HC-136, HC-136 x Pant Chari-3, Pant Chari-3 x CSV-15, CSV-15 x UP Chari-1, Pant Chari-8 x UP Chari-1, HC-308 x Pant Chari-3 and Pant Chari-8 x HC-136.
Plant Height (more than 280 cm) Five crosses	HC-308 x HC-136, HC-136 x Pant Chari-3, Pant Chari-3 x CSV-15, HC-308 x Pant Chari-3 and Pant Chari-8 x HC-136.
Leaves per plant (more than 14) Five crosses	HC-308 x HC-136, HC-136 x Pant Chari-3, Pant Chari-8 x UP Chari-1, HC-308 x Pant Chari-3 and Pant Chari-8 x HC-136.
Total soluble solids (more than 9%) Six crosses	HC-308 x HC-136, HC-308 x UP Chari-1, HC-136 x Pant Chari-3, Pant Chari-3 x CSV-15, Pant Chari-8 x UP Chari-1 and Pant Chari-8 x HC-136.
Green fodder yield (more than 550 q/ha) Five crosses	HC-308 x HC-136, HC-308 x UP Chari-1, Pant Chari-3 x CSV-15, Pant Chari-8 x UP Chari-1 and Pant Chari-8 x HC-136.

### Evaluation of germplasm:

A total of 39 varieties/germplasm collected from IGFRI, Jhansi, GBPUA&T, Pantnagar and CCS-HAU, Hisar were evaluated and the results performance of germplasm lines are presented in following table:

Sl No.	Varieties/ Germplasm	Days to 50% flowering	Plant height (cm)	Leaves per plant	Stem girth	Total soluble solids (%)	Green fodder yield (q/ha)
1.	UP Chari-2	84.25	283.33	14.13	2.12	9.40	555.67
2.	HC-136	90.16	269.11	13.76	2.18	12.40	599.28
3.	Pant Chari-2	87.05	299.07	12.47	2.06	11.60	501.39
4.	CSV-17	90.45	210.77	13.83	2.10	9.40	553.55
5.	Pusa Chari -6	85.56	245.12	13.11	1.99	7.40	371.33
6.	Pusa Chari-9	87.12	250.23	12.99	2.00	8.60	424.47
7.	Pant Chari-7	86.11	261.56	13.00	1.62	8.60	429.82
8.	CSV-15	80.77	278.71	15.10	0.91	9.40	220.94
9.	Pant Chari-8	90.28	276.98	11.20	1.87	10.60	604.53
10.	Pusa Chari-23	75.33	299.17	11.66	1.16	8.60	551.77
11.	Rajasthan Chari-1	90.45	301.25	12.82	1.58	11.40	561.28
12.	Pusa Chari-615	90.02	303.11	13.07	1.59	5.60	681.66
13.	HJ-513	93.44	283.74	15.57	1.97	10.40	610.49
14.	Varsha	60.83	157.91	10.56	1.52	8.40	270.39
15.	Pant Chari-3	90.11	192.28	15.41	1.98	8.40	601.38
16.	Pant Chari-5	85.89	245.79	14.60	0.90	9.60	401.87
17.	Pant Chari-4	86.81	290.80	18.09	2.13	8.60	558.51
18.	Rajasthan Chari-2	90.58	271.01	14.01	2.10	10.60	450.59
19.	CSV-21	90.11	277.69	14.54	0.88	12.60	558.99
20.	MP Chari	90.88	289.85	13.37	1.79	12.40	605.92
21.	UP Chari-3	85.77	221.65	14.41	1.52	8.60	435.23
22.	G-48	88.61	298.57	12.52	1.23	11.40	401.22
23.	SSG-59-3	85.88	279.27	13.05	2.16	9.60	503.29
24.	HC-260	74.33	310.43	13.04	1.60	8.40	515.57
25.	SSV-84	84.22	280.33	14.08	1.23	9.40	541.44
26.	Jawahar Chari-6	90.59	307.57	13.58	1.82	9.60	690.00
27.	UP Chari-4	85.43	265.66	13.30	1.91	8.60	386.43
28.	UP Chari-1	86.44	298.41	13.51	2.10	9.40	379.61
29.	HC-171	90.09	276.66	13.56	2.21	11.60	571.77
30.	Pratap Chari-1080	85.81	256.02	14.05	1.72	12.60	423.72
31.	HC-308	90.56	283.49	14.31	1.10	9.60	575.55
32.	IC-056030	82.81	247.21	12.66	1.84	9.40	446.33
33.	IC-0568396	84.99	248.20	15.11	1.39	10.60	449.32
34.	IC-0585175	84.88	230.71	12.09	1.15	11.60	490.88
35.	IC-0597651	85.04	256.68	14.22	1.82	10.40	509.58
36.	IC-0597638	87.28	277.11	14.14	2.50	12.60	564.35
37.	IC-0347568	86.19	259.37	13.40	2.30	11.40	561.93
38.	IC-0347570	88.68	245.43	13.60	2.54	12.40	553.46
39.	IC-0347571	87.44	292.75	14.12	1.80	8.60	551.73

## Evaluation of promising lines/varieties characters wise:

Days to 50% flowering (more than 90 days) Thirteen lines	HC-136, CSV-17, Pant Chari-8, Rajasthan Chari-1, Pusa Chari-615, HJ-513, Pant Chari-3, Rajasthan Chari-2, CSV-21, MP Chari, Jawahar Chari-6, HC-171 and HC-308.
Plant Height (more than 290 cm) Ten lines	Pant Chari-2, Pusa Chari-23, Rajasthan Chari-1, Pusa Chari-615, Pant Chari-4, G-48, HC-260, Jawahar Chari-6, UP Chari-1 and IC-0347571.
Leaves per plant (more than 14) Sixteen lines	UP Chari-2, CSV-15, HJ-513, Pant Chari-3, Pant Chari-5, Pant Chari-4, Rajasthan Chari-2, CSV-21, UP Chari-3, SSV-84, Pratap Chari-1080, HC-308, IC-0568396, IC-0597651, IC-0597638 and IC-0347571.
Stem girth (more than 1.80 mm) Twenty lines	UP Chari-2, HC-136, Pant Chari-2, CSV-17, Pusa Chari-6, Pusa Chari-9, Pant Chari-8, HJ-513, Pant Chari-3, Pant Chari-4, Rajasthan Chari-2, SSG-59-3, Jawahar Chari-6, UP Chari-4, UP Chari-1, HC-171, IC-0597651, IC-0597638, IC-0347568 and IC-0347570.
Total soluble solids (more than 10%) Seventeen lines	HC-136, Pant Chari-2, Pant Chari-8, Rajasthan Chari-1, HJ-513, Rajasthan Chari-2, CSV-21, MP Chari, G-48, HC-171, Pratap Chari-1080, IC-0568396, IC-0585175, IC-0597651, IC-0597638, IC-0347568 and IC-0347570.
Green fodder yield (more than 550 q/ha) Nineteen lines	UP Chari-2, HC-136, CSV-17, Pant Chari-8, Pusa Chari-23, Rajasthan Chari-1, Pusa Chari-615, HJ-513, Pant Chari-3, Pant Chari-4, CSV-21, MP Chari, Jawahar Chari-6, HC-171, HC-308, IC-0597638, IC-0347568, IC-0347570 and IC-0347571.

**(D) Cowpea:** One Coordinated Breeding Trials of Cowpea as per details given below in the table were conducted during *Kharif 2020*:

### 1. Initial Varietal Trial Cowpea: Forage Cowpea

Name of trial	: IVTC : Forage Cowpea
Design	: RBD
Replication	: 03
Entries	: 08
Plot size (Gross & Net)	: 7.2 m <sup>2</sup> (06 Rows at 30 cm & 4.0 m long)
Date of sowing	: 25.07.2020

A total of 08 entries were tested with three replications in RBD and out of them entry no. IVTC-4 recorded highest green fodder yield (422.27 q/ha) followed by IVTC-5 (418.20 q/ha) and IVTC-6 (387.39 q/ha). The data of green fodder yield is presented in table-

**Table-: Initial Varietal Trial Cowpea**

S.No.	Name of the entries	Green fodder yield (q/ha)
1	IVTC-1	365.83
2	IVTC-2	384.24
3	IVTC-3	254.97
4	IVTC-4	422.27 (I)
5	IVTC-5	418.20 (II)
6	IVTC-6	387.39 (III)
7	IVTC-7**	128.71
8	IVTC-8	226.15

\*\* Poor germination in the entry

## Action Plan for *Kharif 2021*

### (I) Rice

- Creation of variability through hybridization
- Evaluation of segregating material and germplasm
- Evaluation AICRIP Trials
- Breeder/Nucleus seed production of released rice varieties.
- Crosses in rice will be made.

### (II) Forage Crops

#### Sorghum /Cowpea

- Collection, evaluation and maintenance of forage sorghum germplasm.
- Hybridization programme will be taken up for the development high yielding forage sorghum varieties.
- The F<sub>1</sub> hybrids generated during *Kharif 2020* will be raised in *Kharif 2021*.
- Evaluation of ACRIP trials of cowpea.

### (III) Pulses

- Nucleus and Breeder Seed Production of Vallabh Urd-1.
- Germplasm collection of urd and mungbean.
- Crosses in *blackgram* and *greengram* will be made.
- Crosses will be evaluated for further study in during *Kharif 2021*.

**RAC Recommendations:** Technical programme of the department was the approved with the remark that advanced breeding lines of crops developed should be included in all India coordinated programmes. Department should focus on rice research and monitor Nagina research centre as promising lines developed by the centre have scope. Efforts may be made to develop lentil varieties for cultivation after rice crop harvest.

## Department of Plant Pathology

### Staff Position:

S.No.	Name	Designation
1.	Dr. Gopal singh	Professor & Head
2.	Dr. Ramji Singh	Professor
3.	Dr. Kamal Khilari	Professor
4.	Dr. Prashant Mishra	Professor
5.	Dr. Ramesh Singh	Associate Professor

### Progress Report for Rabi-2019-20

#### Experiment: 1

**Title:** Voluntary Centre: All India Coordinated Research Project on Nematodes in Cropping Systems.

**Investigators:** Dr. Kamal Khilari

**Year of Start:** 2019-20

#### Objective

- Diversity and distribution of economically important plant parasitic nematode
- Management of major nematode pest of cereals

**A.1.** Screening, confirmation and evaluation of rice genotype for resistance against root knot nematode (*Meloidogyne graminicola*)

**B.4.** Determination of host races of *Meloidogyne graminicola*

**B.6.** biomanagement of rice root knot nematode (*Meloidogyne graminicola*)

**D.4.** Screening, confirmation and field evaluation of promising resistance germplasm of pulse crops against important nematode

**H.7.** Evaluation of new chemical molecules against *Meloidogyne spp.* infecting cucumber in poly houses

**HD.4.** Demonstration on integrated nematode management on cucumber in polyhouse.

#### Progress:

- During *rabi* 2019 survey in village-Rekhara, Block-Bhopa, district- Muzaffarnagar. infestation of cereal cyst nematode was recorded in 6 fields out of 20 fields observed.
- During same season (*rab*-2019) in village-Surana, Block-Muradnagar, district Ghaziabad in 1 field out of 16 fields observed, infestation of cereal cyst nematode was recorded.
- During survey in 2020 in university orchard 100 percent (156/156) plant of Guava of 6-7 years old were found heavily infected with root knot nematode (*M. enterilobii*).
- During *kharif*- 2020 in rice nursang in 11 blocks of Meerut district out of 146 fields 60 fields were found infested with rice root knot nematodes

**Table: Prevalence of rice root knot nematode in different blocks of Meerut districts**

S. No.	Block name	No. of village/Block	Totalno. Of field examined	Nematode infected field	% Prevalence	% Incidence
1.	Daurala	10	24	17	70.83	58.33
2.	Mawana	6	19	8	42.10	23.15
3.	Rohta	5	18	1	5.55	03.33
4.	Jani	7	23	10	43.47	34.78
5.	Sardhana	4	11	6	54.54	29.09
6.	Kharkhoda	7	19	1	5.26	02.10
7.	Rajpura	4	9	5	55.55	40.00
8.	Pariskhitgarh	3	6	2	33.33	16.66
9.	Meerut	5	9	6	66.66	24.44
10.	Machra	2	4	2	50.00	15.00
11.	Kithore	2	4	2	50.00	15.00
	<b>Total</b>	<b>55</b>	<b>146</b>	<b>60</b>	<b>43.39</b>	

**Technical Program for 2021-2023 of AICRP Project**

S.No.	Exp. No.	Title of experiment	Crop
1.	A.1	Study of nematode diversity	Wheat, Banana, Guava, Tomato, brinjal, okra& cucurbits.
2.	B.1	Screening of rice germplasm against RKN.	Rice
3.	B.8	Evaluation of microbial consortium for RKN management in transplanted rice.	Rice
4.	B.7	Management of RKN through chemicals in transplanted rice.	Rice
5.	D.1	Screening, confirmation of resistant germplasm of pulse against <i>M.spp.</i>	Green Gram
6.	F.1	Screening of genotype/varieties/accessions of guava against <i>M. enterolobii.</i>	Guava
7.	F.8	Documentation of nematode infested nurseries in the state.	Guava & other plant
8.	H.1&2	INM of <i>M.spp.</i> in protected cultivation.	Cucumber

**Experiment: 2**

**Title:** Bio-efficacy of evaluation of new fungicide NF 171, 10% against late blight of potato.

**Investigators:** Dr. Kamal Khilari

**Year of Start:** 2019-20

**Variety:** Kufri Bhar

**Date of Sowing:**

**Ist Year 13-11-2018**

**IInd Year 18-11-2019**

**Objective**

- To evaluate the bio efficacy and phytotoxicity of NF 171,10% SC against late blight of potato

**Treatments:**

	Treatment description	Dosage formulation (ml/gm)/ha
T1	NF-171-10%SC	500ml/ha
T2	NF-171-10%SC	750ml/ha
T3	NF-171-10%SC	1000ml/ha
T4	NF-171-10%SC	1250ml/ha
T5	Dimethomorph 50% WP	1000g/ha
T6	Propineb 70% WP	300g/100Lof water

**Rabi 2018-19**

Treatments	Treatment details	Disease severity	Yield in kg
T1	NF-171-10%SC@500ml/ha	54.32	27.60
T2	NF-171-10%SC@750ml/ha	53.98	28.30
T3	NF-171-10%SC@1000ml/ha	33.33	29.48
T4	NF-171-10%SC@1250ml/ha	23.45	30.87
T5	NF-171-10%SC@2000ml/ha	8.02	29.17
T6	NF-171-10%SC@2500ml/ha	3.70	32.82
T7	Dimethomorph 50% WP@1000g/ha	35.71	27.87
T8	Propineb70% WP@ 300g/100L of water	33.94	29.67
T9	Control	89.50	26.15

Second season: to evaluate the bio efficacy and phytotoxicity of NF 171, 10% sc against lab blight of potato

**Rabi 2019-20**

Treatments	Treatment details	% Disease Control	Yield Q/ha
T1	NF-171-10%SC@500ml/ha	23.06	94.50
T2	NF-171-10%SC@750ml/ha	41.45	105.50
T3	NF-171-10%SC@1000ml/ha	68.64	124.30
T4	NF-171-10%SC@1250ml/ha	77.85	132.20
T5	Dimethomorph 50% WP@1000g/ha	62.78	117.40
T6	Propineb70% WP@ 300g/100L of Water	41.15	106.80
T7	Control	-	81.20

## **Progress Report for Kharif -2021**

### **Experiment: 1**

**Title:** Demonstration to evaluate the efficacy of Nimitz 2% GR against plant parasitic nematode in Tomato, cucumber and Guava crop in open field and polyhouse condition

**Investigators:** Dr. Kamal Khilari

**Year of Start:** 2019-20

**Detail of trails conducted at different location on farmer field:**

S.No	Farmer name	Date of Sowing	Crop Name	Open field/ Poly house	Location	Variety Name
1.	Manoj Kumar	5/3/2019	Tomato	Open field	Lawar (Meerut)	Himsona
2.	Boby Tyagi	13/3/2019	Tomato	Open field	Kharkhoda (Meerut)	Himsona
3.	Brajveer Singh	9/4/2019	Tomato	Polyhouse	Sukrtal (Muzaffarnagar)	Indo-American
4.	Rajeev Kumar	4/4/2019	Cucumber	Open field	Puttha Husainpur (Hapur)	Zennext Deshi
5.	Deepak Choudhary	25/6/2019	Cucumber	Polyhouse	Ramraj (Mawana, Meerut)	RSO-3602833
6.	Shushil Kumar Saini	4/3/2019	Cucumber	Open field	Lawar (Meerut)	Puja Sammer
7.	Vichitra Sen	12/7/2019	Guava	field	Ladwa(Baghra) Muzaffarnagar	
8.	Sudesh Pal Singh	24/7/2019	Guava	field	Ladwa (Baghra) Muzaffarnagar	Sweta
9.	Bhagt Singh	24/7/2019	Guava	field	Ladwa (Baghra) Muzaffarnagar	Sweta

## Experiment: 2

**Title:** Centre of excellence on Basmati Rice.

**Investigators:** Dr. Kamal Khilari, Dr. Hem Singh, Dr.U.P. Shahi, Dr. Manoj Kumar, Dr. Mukesh Kumar, Dr. Adesh Singh, Dr.Vineeta Verma, Dr. Ashok Kumar and Dr.Lokesh Gangwar

**Variety:** Basmati Rice. PB-1121, PB-1509, PB-1718

**Date of Sowing:** 28/7/2021

### OBJECTIVES:

- Development of knowledge hub on basmati rice.
- Capacity building of basmati rice stakeholders.
- Bio-intensive management of biotic and a-biotic stress & development of good management practices in basmati rice.
- Identification of hotspot regarding pest disease, pesticide residues and heavy metals.
- To study the impact of climate change on basmati rice production.
- Quality analysis of basmati rice (nutritional, heavy metal, pesticides residues and development of basmati rice aroma kit using molecular tools etc.)

### Financial & physical status

S.N	Financial year	Fund sanctioned	Fund released	Status of expenditure	Remark
1	2018-19	200 lakh	100 lakh	Surrendered due to	Late receipt
2	2019-20	100 lakh	50 lakh	45 lakh transferred for lab renovation and 5 lakh surrendered	Renovation work to agency is going on.
3	2020-21	100 lakh	25 lakh as first installment	24.87 spent on the purchase of equipments	0.13 lakh surrendered

## Experiment: 3

**Title:** Effect of different nutrient management options on soil properties and performance of commonly grown basmati rice cultivars in Western Uttar Pradesh

**Investigators:** Dr. Kamal Khilari

**Year:** 2019-20

**Design :** Split Plot Design (SPD)

**Replication:** 3

### Treatments:

**Main plot** : varieties- 3

**Subplot** : Nutrient Management options (5)

**Variety:** Pusa Basmati-1509, Pusa Basmati-1718, PusaBasmati-1121)

S.N.	Treatments	Symbol
<b>A.</b>	<b>Varieties</b>	
	Pusa Basmati-1121	V1
	Pusa Basmati-1509	V2
	Pusa Basmati-1718	V3
<b>B.</b>	<b>Treatments</b>	
	Control	T1
	100% Inorganic Fertilizer	T2
	INM (50% inorganic and 50% organic)	T3
	100% Organic fertilizer (FYM+VC+PM)	T4
Low budget Natural Farming (LBNF)	T5	



## Action Plan for Khaif 2021

### Experiment-1

**Title:** Evaluation of storability of spawn for Medicinal mushroom (Shiitake).

**Investigators:** Dr. Gopal singh, Dr. Prashant Mishra and Dr. Ramji singh

**Year of Start:** *Kharif- 2021*

**Design:** CRBD,

**Replications :** 04

#### Objective

To evaluate spawn of different age on room temperature for Shiitake mushroom Production

#### Treatments

T1: 40 days old spawn

T2: 35 days old spawn

T3: 30 days old spawn

T4: 25 days old spawn

T5: 20 days old spawn (control)

#### Observations Recorded

Crop Period (Days)

Pin head initiation (Days)

Number of sporophore /kg. substrate

Sporophore Yield kg/ qt. Substrate)

### Experiment-2

**Title:** Evaluation of different organic additives for edible mushroom Production.

**Investigators:** Dr. Gopal singh, Dr. Prashant Mishra and Dr. Ramesh singh

**Year of Start:** *Kharif- 2021*

**Design:** CRBD,

**Replications :** 04

#### Objective

To evaluate different cereal flours as additives in substrates for oyster mushroom Production

#### Treatments

T1: Substrate with wheat flour (2%)

T2: Substrate with wheat flour (4%)

T3: Substrate with wheat flour (6%)

T4: Substrate with wheat flour (8%)

T5: Substrate with wheat flour (10%)

T6: Substrate without additives (control)

#### Observations Recorded

Crop Period (Days)

Pin head initiation (Days)

Number of sporophores /kg. substrate

Sporophore Yield (kg/ qt. Substrate)

### **Experiment-3**

**Title:** Chickpea Mission Mode Net work Project

**Principal Investigator:** Dr. Kamal Khilari

**Objective:**

- Screening of Chickpea Germplasm against nematodes

**Progress:**

- Developing site for chick pea accession screening.
- Purchase of items under the budget allotted for first half of first year.
- Completed the paper work requirement for running the project, such as submission of MOA, SMTA etc.
- Process of requirement of project staff (one JRF & two lab/field attendant going on). Most probably may be complete within July 2021.
- Process of nematode culture development work is going on for screening purpose.

### **Experiment-4**

**Title:** Development, Validation and dissemination of IPM techniques for major insect pest of mango.

**Investigator:** Dr. Kamal Khilari and Dr. Rajendr kumar

**Objective:**

- Demonstration on IPM technology in Mango.

**Progress:**

- Demonstration at one location (village–Validpur) in the orchard of Moh. Shahid.

## Department of Soil Science & Agricultural Chemistry

### Staff Position:

S.No.	Name	Designation
1.	Dr. Satendra Kumar	Professor & Head
2.	Dr B. P. Dhyani	Professor
3.	Dr. S. P. Singh	Associate Professor
4.	Dr. U. P. Shahi	Associate Professor
5.	Dr. Yogesh Kumar	Associate Professor

### Progress Report for Rabi-2019-20

#### Experiment: 1

**Title:** Qualitative study of soil and water of Ganga canal command area on west side (right side) from Purkaji to Muradnagar.

**Investigators:** Dr. Satendra Kumar, Dr. B.P. Dhyani, Dr. Vivek and Dr. U.P. Shahi

**Year of Start:** 2018-19

#### Objectives:

- To study the electro-chemical properties of soil at different locations on west side of Ganga canal command area,
- To study the electro-chemical properties of ground water at different locations on west side of Ganga canal command area,
- To find out the rating of different nutrients at different distance for all locations of study area,
- To find out the suitability of water for drinking and irrigation purpose for the study area and
- To find out the correlation between productivity of major crops and water table depth under different cropping patterns.

**Methodology:** Soils and water were collected from Ganga canal command area on west side (right side) from Purkaji to Muradnagar. Samples were taken from land mark (bridge of Ganga canal) with the distance of 1, 2, 3, 4 and 5 km from the right side of canal. Samples were analysed for different parameter.

#### Results:

- The soils of study area are neutral to slightly alkaline at surface and slightly to moderately alkaline at subsurface in soil reaction and safe for crop production. Normal in salinity at surface and subsurface and suitable for production of many crops.
- The soil samples are poor in available nitrogen-medium to low in organic carbon at surface and subsurface.
- Most of the soils of study area are characterized low-high-medium categories in fertility index for N, P and K at surface, while at subsurface, characterized as low-medium-medium respectively.
- The surface soils are sufficient in available micronutrients while at subsurface, characterized marginal.
- The groundwater of the study area is non problematic on the basis of EC, SAR and RSC respectively. According to Collin's and Kelly's ratio the groundwater of the study area is safe for drinking as well as irrigation purpose.

#### Experiment:2

**Title:** Yeild forecasting for mustard, potato and sugarcane in western Uttar Pradesh under FASAL

**Investigators:** Dr. Yogesh Kumar, Dr. U. P. Shahi and Dr. R. B. Yadav

**Year of Start:** 2018-19

## Objectives:

### A summarized progress report of project with reference to objectives:

- Daily weather data of last 20 years collected from different districts such as Meerut, Saharanpur, Baghpat, Bijnor, Moradabad, Rampur, Bareilly, Pilibhit, Muzaffarnagar and Bulandshar districts.
- Last 20 years crop yield data of all 15 districts collected from Agriculture Department, Lucknow, Uttar Pradesh.
- Soil profile data collected from different places such as Meerut, Saharanpur, Baghpat, Bijnor, Moradabad, Rampur, Bareilly, Pilibhit, Muzaffarnagar and Bulandshar districts.
- Potato yield forecast of different districts Aligarh, Budaun, Bijnor, Bulandshar, Ghaziabad, Meerut, Muzaffarnagar and Saharanpur districts during 2020-21.
- Mustard forecast of Meerut, Muzaffarnagar, Moradabad and Bijnor districts during 2020-21.
- Sugarcane forecast of all 15 district under AMFU Modipuram jurisdiction.

### Result: Yield Forecast statistical method

#### Mustard yield forecast at F3 stages for 2020-21 using statistical method

Mustard yield prediction using statistical method the observed yield data was collected for 20 years (1999 to 2018) period. In statistical yield forecasting, actual weekly weather data has been used, up to the date of issue of forecast and further for the remaining crop period normal daily weather data were used. Statistical method yield forecasting has been done using SPSS package. The required weather data for this method is maximum and minimum air temperature ( $^{\circ}\text{C}$ ), rainfall (mm) and maximum and minimum relative humidity (%). Regression equations were generated through statistical method using SPSS package. One regression equation is developed for each district. The forecasted yield was worked out by putting the value of correlation in the regression equation for each district obtained between the weather and the observed yield and are presented in Table-1. In this way mustard yield forecasting was completed for all the 4 districts under of AMFU, SVPUA&T Modipuram, Meerut, for year 2020-2021 using statistical method. Highest yield has been predicted for Moradabad district which is 1342 kg/ha while lowest yield has been predicted for Muzaffarnagar district (1123 kg/ha) by statistical method.

**Table-1 :** Mustard yield forecasting at various stages during 2020-21 using statistical method.

S.N	District	Regression Equation	Weather Parameters in the equation	Forecast	% of error		$R^2$	F	SE
				yield-2021(kg/ha)	2019	2020			
1	Moradabad	$Y=1181.5+(17.4*\text{time})+(35.4*Z21)+(.31*Z231)$	time, Tmin, Tmin*R/F	1342	11.71	02.97	0.80	23.86	89.67
2	Bijnor	$Y=2076.5+(21.6*Z11)+(.29*Z131)+(20.6*Z21)$	time, RHI*RHII, Tmin, RHI,	1219	13.59	02.79	0.84	34.00	90.40
3	Meerut	$Y=732.1+(.01*Z450)+(3.9*Z20)+(14.0*Z41)+(11.9*\text{time})$	Tmax* Tmin, R/F	1268	09.29	11.21	0.78	25.22	84.80
4	Muzaffarnagar	$Y=1201.45+(.19*Z251)+(.03*Z341)$	Tmax*Tmin, RH max	1123	19.75	11.37	0.68	18.73	98.85

#### Potato yield forecast at F3 stages for 2020-21 using statistical method

Potato yield prediction using statistical method observed yield data that was collected for 20 years (1999 to 2018) period. In statistical yield forecasting, actual weekly weather data has been used up to the date of issue of forecast and further for the remaining crop period normal daily weather data were used. Statistical method yield forecasting has been done using SPSS package. The required weather data for this method is maximum and minimum air temperature ( $^{\circ}\text{C}$ ), rainfall (mm) and maximum and minimum relative humidity (%). Regression equations were generated through statistical method using SPSS package. One regression equation is developed for each district. The forecasted yield was worked out by putting the value of

correlation in the regression equation for each district obtained between the weather and the observed yield and are presented in Table-2. In this way potato yield forecasting was completed for all the 8 districts under AMFU, SVPUA&T Modipuram, Meerut, for year 2020-2021 using statistical method. Highest yield has been predicted for Aligarh district which is 2967.97kg/ha while lowest yield has been predicted for Budaun district which is (2193.37 kg/ha) by statistical method.

**Table-2 Potato yield forecasting at various stages during 2020-21 using statistical method.**

SL District No	Regression Equation	Weather Parameters in the equation	Forecast yield- 2021(kg/ha)	% of error		R <sup>2</sup>	F	SE
				2019	2020			
1 Aligarh	Y=-2583.82+(112.16*Z11)+(.092*Z240)+(1.33*Z341)+(-1.30*Z351)+(7.91*Z10)	Tmax,Tmin*RHI,R/F*RHII,Tmax	2967.97	6.64	8.27	.618	21.85	154.42
2 Budaun	Y=2152.0+(22.82*time)	Time	2193.37	12.75	-1.87	.542	22.51	133.46
3 Bijnor	Y=2048.62+(-25.946*Time)+(23.512*Z21)+(.187*Z120)	Tmin , Tmin, Tmax* Tmin	2687.14	2.10	7.32	.721	14.62	110.22
4 Bulandshar	y=2511.18+(-28.622*Time)+(1.655*Z41)	Time, RH I	2611.90	8.11	7.58	.644	16.28	120.92
5 Ghazibad	Y=2432.96+(-22.002*Time)+(1.403*Z40)+(-.035*Z451)+(.034*Z250)	Time, RHI, RHI* RHII, Tmin*RHII	2616.11	9.11	8.25	.793	15.34	97.76
6 Meerut	Y=2986.456+(-22.165*time)+(.848*Z40)+(-3.906Z51)	Time, RH I, RHII	2951.03	8.30	11.53	.727	15.09	108.96
7 Muzaffarnagar	Y=-3242.48+(.38*Z121)+(23.17*Z21)	Tmax*RHI,Tmin	2246.54	-4.81	7.99	.647	36.40	180.63
8 Saharanpur	y=2859.588+(-19.138*Time)+(0.067*Z231)	Time, Tmin* R/F	2246.50	7.14	5.59	.670	18.28	116.39

**Sugarcane yield forecast at F2 stages for 2020-21 using statistical method**

Sugarcane yield prediction using statistical method, that observed yield data was collected for 20 years (1999 to 2018) period. In statistical yield forecasting, actual weekly weather data has been used up to the date of issue of forecast and further for the remaining crop period normal daily weather data were used. Statistical method yield forecasting has been done using SPSS package. The required weather data for this method is maximum and minimum air temperature (°C), rainfall (mm) and maximum and minimum relative humidity (%). Regression equations were generated through statistical method using SPSS package. One regression equation is developed for each district. The forecasted yield was worked out by putting the value of correlation in the regression equation for each district obtained between the weather and the observed yield and are presented in Table-3. In this way sugarcane yield forecasting was completed for all the 15 districts under of AMFU, SVPUA&T, Modipuram, Meerut, for year 2020-21 using statistical method. Highest yield has been predicted for Baghpat district which is 84.81 T/ha while lowest yield has been predicted for Moradabad district (57.77 T/ha) by statistical method.

**Table-3 Sugarcane yield forecasting at various stages during 2020-21 using statistical method.**

S. N	District	Equation	Weather Parameters in the equation	Forecast Yield (2021) (T/ha)	% of error		R <sup>2</sup>	F	SE
					2018	2019			
1	Aligarh	Y=56.927+.002*Z341-.002Z351	Rain*RHI,Rain*RHII	66.00	12.80	18.82	.89	39.58	1.97
2	Badaun	Y=15.735+.014*Z121	Tmax*Tmin	61.88	10.51	8.21	.88	38.04	2.43
3	Baghpat	Y=37.41+.436*Z11+.00071*Z131+.00005*Z340+.00112*	Tmax,Tmax*R/F,R/F *RHI,Tmax*RHI,Tmax	84.81	4.64	-0.77	.99	228.20	0.58

	Z141-.00014*Z150	* RHII							
4	Bareilly	Y=-22.678+.018*Z121 +.691*Time	Tmax*Tmin, Time	66.92	8.51	7.95	.89	39.12	2.73
5	Bijnor	Y=73732.40+3.183*Z121	Tmax*Tmin	62.73	20.3	17.29	.79	41.27	4.23
6	Bulandshaher	Y=36328.11+0.102*Z341+0.0 80Z351	R/F*RHI, R/F*RHII	71.45	19.08	22.58	.90	45.34	2.88
7	G B Nagar	Y= 68282.99+0.292*Z341	R/F* RHI	75.15	18.94	17.54	.87	70.84	3.15
8	Ghaziabad	Y=63294.52+.192*Z341	R/F* RHI	73.21	14.75	16.21	.84	56.30	4.58
9	Meerut	Y=95892.46+0.147*Z341- 0.01*Z140	R/F* RHI ,Tmax* RHI	79.16	28.41	23.69	.93	63.23	2.77
10	Moradabad	Y=11686.3+0.084*Z151+.117 *Z231	Tmax* RH II, Tmin*R/F	57.77	15.91	6.26	.93	68.48	2.03
11	Muzaffarnagar	Y=-3621.07+88.66 *Z11+.065*Z341	Tmax, R/F* RHI	79.08	11.23	7.92	.94	79.65	2.01
12	Pilibheet	Y=-43.190+.026*Z121	Tmax*Tmin	65.19	13.22	9.68	.83	55.64	3.12
13	Rampur	Y=-62.535+.02*Z121 +.001Z240	Tmax*Tmin, Tmax* RHI	61.74	20.27	20.21	.84	26.68	2.82
14	Saharanpur	Y=36604.13+3.102*Z31+.297 *Z141	R/F, Tmax*RHI	71.53	10.68	6.74	.92	59.37	1.50
15	Sahajahanpur	Y=-32.309+.022*Z121 +.910*Time	Tmax*Tmin, Time	71.32	11.97	7.25	.89	39.51	3.09

### Experiment: 3

**Title:** Assessment of Polyhalite for productivity, quality of potato and residual soil fertility in western plain zone of Uttar Pradesh

**Investigators:** Dr. U.P. Sahi

**Year of Start:** 2018-19      **Design:** R.B.D.      **Replication :** 03      **Treatments:** 13

**Variety:** Chipsona-1 and Kufri Bahar      **Date of Sowing:** Chipsona – 9/11/2019, Kufri Bahar 5/11/2019

#### Result:

Treatment	Treatments
T1	Recommended N,P, K and S (Normal fertilizers)
T2	Recommended N and P (no-K, no-S)(Normal fertilizers)
T3	Recommended N, P and S (no-K)(Normal fertilizers)
T4	Recommended N,P and K (no-S)(Normal fertilizers)
T5	Recommended N, P and 50% of recommended K through POLY-4
T6	Recommended N, P and 100% of recommended K through POLY-4
T7	Recommended N, P and 150% of recommended K through POLY-4
T8	Recommended N, P+ 50% of recommended K through MOP+50% of recommended S equal to T5 through Bentonite
T9	Recommended N, P+ 100% of recommended K through MOP+100% of recommended S equal to T6 through Bentonite
T10	Recommended N, P+ 150% of recommended K through MOP+150% of recommended S equal to T7 through Bentonite
T11	Recommended N,P and 25% K through MOP + 75% through POLY4
T12	Recommended N,P and 50% K through MOP + 50% through POLY4
T13	Recommended N,P and 75% K through MOP + 25% through POLY4

**Note:** Polyhalite is a natural combination of four (K, S, Mg and Ca) nutrients of 14% K<sub>2</sub>O, 6% MgO, 17% CaO and 19% S

<b>Initial soil properties of experimental plot</b>	Bulandshahar	Meerut
Textural class	Sandy Loam	Sandy loam
Bulk density (mg/m <sup>3</sup> )	1.45	1.4
Soil pH (1:2.5 soil: water) suspension	7.5	8.12
Organic carbon (%)	0.45	0.39
EC (dS m <sup>-1</sup> at 25C <sup>o</sup> ) (1:2.5 Soil: Water)	0.33	0.33
Available nitrogen (kg ha <sup>-1</sup> )	125.56	138.5
Available phosphorus (kg ha <sup>-1</sup> )	14.5	19
Available potassium (kg ha <sup>-1</sup> )	141.6	224.5
Available Sulphur (kg ha <sup>-1</sup> )	13.95	18.5

**Table 4 : Effect of different treatments on soil fertility after potato harvest:**

<b>Treatments</b>	<b>Kufri Bahar (ZARS Bulandshahar)</b>					<b>Kufri Chipsona-1 (CRC Meerut)</b>				
	Available (kg/ha)	K	Available S (kg/ha)	Exch (cmol(p+)/kg)	Ca+Mg	Available (kg/ha)	K	Available S (kg/ha)	Exch (cmol(p+)/kg)	Ca+Mg
T <sub>1</sub>	164.64		19.27	11.40		244.65	22.91		13.49	
T <sub>2</sub>	135.52		17.51	10.52		165.51	20.00		12.19	
T <sub>3</sub>	145.60		19.40	11.14		175.97	21.44		13.07	
T <sub>4</sub>	165.43		13.77	11.09		245.28	14.55		12.29	
<b>T<sub>5</sub></b>	<b>167.56</b>		<b>20.52</b>	<b>13.40</b>		<b>239.15</b>	<b>24.79</b>		<b>15.99</b>	
<b>T<sub>6</sub></b>	<b>176.89</b>		<b>22.73</b>	<b>15.84</b>		<b>260.72</b>	<b>28.64</b>		<b>17.05</b>	
<b>T<sub>7</sub></b>	<b>204.71</b>		<b>24.92</b>	<b>17.00</b>		<b>286.55</b>	<b>29.74</b>		<b>17.68</b>	
T <sub>8</sub>	156.39		20.15	11.93		221.37	26.51		12.51	
T <sub>9</sub>	173.23		22.90	12.03		256.04	27.86		13.25	
T <sub>10</sub>	208.47		25.04	12.41		286.67	29.61		13.45	
<b>T<sub>11</sub></b>	<b>182.19</b>		<b>20.84</b>	<b>14.29</b>		<b>278.13</b>	<b>26.06</b>		<b>16.69</b>	
<b>T<sub>12</sub></b>	<b>176.73</b>		<b>20.22</b>	<b>13.63</b>		<b>246.68</b>	<b>23.85</b>		<b>15.62</b>	
<b>T<sub>13</sub></b>	<b>175.03</b>		<b>18.16</b>	<b>13.49</b>		<b>243.73</b>	<b>20.23</b>		<b>14.84</b>	
<b>SEM+</b>	<b>6.43</b>		<b>0.44</b>	<b>0.39</b>		<b>13.89</b>	<b>0.41</b>		<b>0.42</b>	
<b>CD 5%</b>	<b>18.78</b>		<b>1.44</b>	<b>1.14</b>		<b>40.54</b>	<b>1.20</b>		<b>1.24</b>	

#### **Experiment: 4**

**Title:** Gramin Krishi Mausam Sewa (GKMS)

**Investigators:** Dr. U.P. Shahi

#### **Objective:**

1. To prepare Agro-meteorological Advisories for farmers on the basis of medium range weather forecast received from India Meteorological Department (IMD) and current crop situation in consultation with agricultural scientists of different disciplines.

2. To disseminate the Agro-meteorological Advisories to selected progressive farmers through personal contact and to other farming community through electronic and print media like TV, Radio, and local daily newspaper.
3. To provide feedback to IMD along with forecast verifications using actual weather data of the local agro-meteorological observatories.

Prepared and disseminated weather based agro advisory through print and electronic media and SMS through mkisan portal in the interest of farming community. In 2020-21, about 31 SMS sent to 60635361 farmers of 20 districts under jurisdiction through mKisan portal.

S.N	Month	No of Farmers
1	April-20	2593708
2	April-20	3424210
3	April-20	2594023
4	April-20	2594180
5	May-20	2684287
6	May-20	2776120
7	May-20	3045572
8	June-20	3462897
9	June-20	1438564
10	July-20	2470654
11	July-20	1156420
12	July-20	629157
13	July-20	3584306
14	August-20	3678036
15	August-20	1767824
16	August-20	964100
17	August-20	917127
18	August-20	2325137
19	August-20	2561004
20	September-20	1669800
21	September-20	1508306
22	October-20	1813093
23	November-20	1344439
24	November-20	2078518
25	December-20	1313596
26	December-20	747368
27	December-20	551589
28	January-21	1781954
29	February-21	1600144
30	March-21	19190164
31	March-21	369064

**Table 5 : Summary of actual weather parameters AMFU–Modipuram.**

Month	Rainfall (mm)	Rainy Days	Temperature (OC)		Relative humidity (%)		Wind speed (km/h)	Sunshine (Hours)
			Max.	Min	I	II		
Mar-20	53.3	2	27.4	14	92.8	49.9	16.5	7.6
Apr-20	7.5	0	34.8	19.4	58.7	27.6	2.8	7.6
May-20	72.1	2	37.7	21.7	64.2	35.8	4.3	9.3
Jun-20	17.8	1	35.8	25.7	74.2	54.9	5.1	9
Jul-20	228.8	7	34	25.8	82.9	69.5	4.4	6.1
Aug-20	148.2	5	33.2	25.4	85.5	74	3.9	4.8
Sep-20	9.4	0	35.1	26.4	78.7	58.3	2.5	8
Oct-20	0	0	33.8	19	83.7	49.5	1.8	8.3
Nov-20	2.7	0	27.2	10.3	83.2	47.5	4.8	7.2
Dec-20	6.1	0	22.2	6.3	87.5	49.9	3.2	5.5
Jan-21	24	1	18.7	6.4	92.4	61.8	5.1	3.9
Feb-21	6.9	0	26.7	10.1	84	47.2	3.5	7.2
Mean/Total	576.8	19	30.6	17.5	80.7	52.2	4.8	7.2



## **Action Plan for Kharif-2021**

### **Experiment: 1**

**Title:** Soil carbon pools and cationic micronutrient fraction under prominent cropping systems of western U.P.

**Investigators:** Dr. B.P. Dhyani Satendra Kumar, U.P. Shahi, S.P. Singh and Dr.Vivek

**Year of Start** : 2021

#### **Objectives:**

- To study the physico-chemical properties of soils collected from different cropping systems in western U.P.
- To find out the soil carbon pools in the soils under different cropping systems.
- To assess the available NPK content, DTPA extractable micronutrient (Fe, Mn, Zn and Cu) and catatonic micronutrient fractions in soil under different cropping systems.
- To identify the relationship among soil organic carbon pools and with soil properties under different cropping systems.
- To arrive at relationship among soil catatonic micronutrients (Fe, Mn, Zn and Cu) and their fractions with soil properties under different cropping systems

#### **Cropping Systems:**

- Barren
- Rice - Wheat
- Rice - Potato spring
- Vegetable - Vegetable
- Sugarcane - Ratoon - Wheat
- Rice - Mustard

### **Experiment- 2**

**Title:** Assessment of Physico-chemical properties of KVK, Shahjahanpur Soil.

**Investigators:** Dr. Satendra Kumar, Dr. B.P. Dhyani, Dr. Yogesh Kumar, Dr. U.P. Shahi & Dr. Mukesh Kumar

**Year of Start** : 2020-21

#### **Objective:**

1. Evaluation of Physico-chemical properties of KVK, Shahjahanpur Soil.
2. Characterization and classification on the basis of Physico-chemical properties of the KVK, Shahjahanpur Soil.
3. Establishment of relationship between soil properties.
4. Provide basic guidance and management techniques to enhance KVK, Shahjahanpur soil fertiity.

### Experiment: 3

**Title:** Nutrient availability in soil, their uptake, growth and yield of mustard under INM approach in light textured soil.

**Investigators:** Dr. Satendra Kumar, Dr. B.P. Dhyani, Dr. Yogesh Kumar & Dr. Mukesh Kumar

**Year of Start :** 2021-22

**Design:** R.B.D

**Replication :** 4

**Variety:** Pusa Vijai

#### Objectives:

1. To study the effect of INM approach on growth and yield of mustard.
2. To Study the effect of INM approaches on nutrient content and their uptake by Mustard.
3. To find the effect of INM approach on available nutrient status in soil.
4. To study the effect of INM approach on soil physico-chemical properties.

#### Treatments:

Symbols	Treatments
T <sub>1</sub>	Control
T <sub>2</sub>	RDF (-S)
T <sub>3</sub>	RDF (+S)
T <sub>4</sub>	125% RDF (+S)
T <sub>5</sub>	100% RDF (-S) + 4 ton FYM
T <sub>6</sub>	100% RDF (-S) + 1.25 ton vermicompost
T <sub>7</sub>	100% RDF (-S) + 2 ton FYM + 0.6 ton vermicompost
T <sub>8</sub>	75% RDF (-S) + 4 ton FYM
T <sub>9</sub>	75% RDF + 1.25 ton vermicompost
T <sub>10</sub>	75% RDF + 2 ton FYM + 0.6 ton vermicompost

### Experiment: 4

**Title:** Dynamics of Soil Potassium under Prominent Cropping Systems of Western Uttar Pradesh.

**Investigators:** Dr. Satendra Kumar, Dr. B.P. Dhyani, Dr. U.P. Shahi and Dr. R.K. Naresh

**Year of Start :** 2021-22

#### Objectives:

1. To assess different forms of potassium in selected soils and their relationship with soil properties.
2. To study the kinetics of potassium release in soils.
3. To determine the Quantity/Intensity relationship of potassium in soils.
4. To determine the potassium fixing capacity of soils.

#### Cropping Systems:

1. Barren
2. Rice - Wheat
3. Rice - Potato springr
4. Vegetable - Vegetable
5. Sugarcane – Ratoon - Wheat
6. Rice - Mustard

### **Experiment: 5**

**Title:** Study of Macro and Micro nutrient availability in soils of Shamli KVK

**Investigators:** Dr. Yogesh Kumar, Dr. S.P. Singh, Dr. Satendra Kumar & Dr. R. K. Naresh

**Year of Start :** 2021-22

#### **Objectives:**

1. To Study the macro and micro nutrients status at different depths of soil of KVK Shamli.
2. To Study the enzyme activity (dehydrogenase) at different depths of soil.
3. To examine the relationship among the available nutrient and physico- chemical properties at different depths of soil.

### **Experiment: 6**

**Title:** Collection and Characterization in Soils of KVK Moradabad

**Investigators:** Dr. Yogesh Kumar, Dr. S.P. Singh, Dr. Mukesh Kumar, Dr. Satendra Kumar & Dr. R. K. Naresh

**Year of Start :** 2021-22

#### **Objectives:**

1. To Study the Physico-chemical properties of soil of KVK Moradabad.
2. To Study the relationship between selected soil properties.
3. Classification, Characterization of soil health based on their physico-chemical properties

### **Experiment: 7**

**Title:** Assessment of physical, chemical and biological properties of soil and crop productivity under different nutrient management approaches in Rice- Wheat cropping system.

**Investigators:** Dr. S.P. Singh, Dr. Satendra Kumar, Dr. Yogesh Kumar & Dr. Adesh Singh

**Year of Start :** 2021-22

**Design:** R.B.D.

**Replication :** 03

#### **Objective:**

1. To evaluate the effect of organic, inorganic and INM on growth, yield and yield attributes under rice-wheat cropping system.
2. To find out the effect of organic, inorganic and INM on nutrient content and their uptake under rice-wheat cropping system.
3. To study the effect of organic, inorganic and INM on physical, chemical and biological properties of soil.
4. To identify the best organic module for getting higher yield and good soil health under rice-wheat cropping system.
5. To study the economic feasibility of various treatments under rice-wheat cropping system.

## Treatment Details:

Symbol	Treatments
T <sub>1</sub>	Control
T <sub>2</sub>	100% NPK
T <sub>3</sub>	50% NPK+ 25% Crop residue + 25% Vermicompost
T <sub>4</sub>	50% NPK + 50% (FYM+Vermicompost)
T <sub>5</sub>	100% (FYM+ Vermicompost + Crop residue with Pusa decomposer + Jeevamrit)
T <sub>6</sub>	100% Seed treated with Beejamrit + 100% ( FYM+ Vermicompost+ Jeevamrit)
T <sub>7</sub>	100% Organic Sources of (FYM+ Vermicompost+ Jeevamrit)
T <sub>8</sub>	100% Organic Sources of (FYM+ Vermicompost+ Poultry manure + PSB/Azotobacter)

### Experiment: 8

**Title:** Effect of different nutrient management options on soil properties and performance of commonly grown basmati rice cultivars in Western Uttar Pradesh

**Investigators:** Dr. U.P. Shahi, Dr. B.P. Dhyani & Dr. Adesh Singh

**Year of Start :** 2021-22

**Design:** S.P.D.

**Replication :** 03

### Objective-

1. To study the effect of different nutrient management options on growth and yield attributes of basmati rice.
2. To investigate the effect of different nutrient management options a nutrient content and uptake of basmati rice.
3. To analyze the effect of different nutrient management optimus on various soil properties in basmati rice.
4. To evaluate the economic feasibility under different nutrient management options in basmati rice.

### Treatment Details :-

#### S.N. Treatment

**A)- Varieties :- (V1) Pusa Basmati 1121 (V2) Pusa, Basmati 1509 (V3) Pusa Basmati 1718.**

**B)- Nutrient Management options:-**

**T1 Control**

**T2 100% Inorganic Fertilizer**

**T4 100% Organic Fertilizer (FYM + VC + PM)**

**T5 Low Budget Natural Farming (LBNF)**

## Department of Agricultural Economics

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S.No.	Name	Designation
1.	Dr. H. L. Singh	Professor & Head

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### Action Plan for Kharif 2021

**Title:** Economic analysis of crops production enterprises in Western Plain Zone of Uttar Pradesh

**Investigators:** Dr. H.L. Singh

**Year of Start:** 2021-22

**Problem statement:**

Agriculture and agro-based enterprise are the backbone of Indian economy, and contributing about 18.4 percent (2019-20) to national Gross Domestic Product (GDP) and providing employment to 51 percent of the total work force. The main occupation in rural areas is crop cultivation. In India about 70 percent of the farmers belonging to the small category and serving under resource crunch conditions and unaware about the optimum use of the costly input regarding their profit maximization. Technological advancement in agriculture, highly volatile input prices, climatic uncertainty, weak linkage between farmers- extension system, improper marketing facilities etc. that directly affects cost of cultivation and production. Under the existing circumstances, optimum input utilization is the only way to curb the excess cost of production. Due to non availability of storage and processing facilities at farmer's level and heavy financial burden, most of the farmers are unable to retain their farm products and they are forced to sale at the time of harvest to meet their family requirements. Therefore, at the time of harvest there is glut production, in the market supply of agricultural commodities exceeds to their demand and thus the market prices fall. Mandi samities were established to provide remunerative prices of the farm produce but existing system unable to help the desired extent due to existence of many malpractices. Covering most of the crops under minimum support price program, the government requires data from each state on cost of cultivation of all the crops. In view of this to record authentic and reliable information from the farmers is an utmost requirement for policy purpose. Therefore, the study is an attempt in this direction to full fill the requirement not only at state level but also at national level in respect of MSP of the crop enterprises with the following objectives.

**Objectives:**

1. To work out per unit cost of cultivation and cost of production of major crops grown in the study area.
2. To estimate the resource use efficiency of the major crops.
3. To suggest suitable measures to the farmers, researchers, planner and policy makers for enhancing the efficiency of crop production enterprises.

**Methodology:**

Multi stage stratified random sampling technique will be employed in the present study. Based on the highest area under the crop, district at the first stage will be purposively selected. One block from each selected district will be selected randomly. After that a list of all villages will be prepared from the block headquarters. From each block, two villages will be selected randomly. From the selected village a list of all the farmers (on the basis of size of holding) will be prepared and then classified into marginal, small, medium and large size group of farms. A representative sample of five percent under each category of the farmers in each group will be taken to collect the desired data.

**Data collection: Primary & Secondary data will be required to meet the objectives of the study.**

**Primary Data Collection**

The authentic, pertinent and reliable primary data will be collected on various aspects like expenditure on land preparation, manure and fertilizer seed and seed treatment, irrigation expenses, plant protection, harvesting and threshing etc. in quantity and monetary terms to meet the objectives of the study from the selected farmers with personal interview method on pre-tested structured schedule.

**Secondary Data Collection : The Secondary data will be collected from -**

The data collection work will be carried out by the students under the practical classes/ assignments of the UG and PG programme. The related information will also be collected with the help of KVK and Research station of the university.

**Analytical tools:**

The collected information will be classified, tabulated and then analysed with the help of suitable statistical tools.

**RAC Recommendations:** The Experiment was approved. However, RAC suggested that impact analysis of varieties/technologies developed should be carried out in collaboration with Krishi Vigyan Kendra.

- Various published reports, government records and Journals etc.

## Department of Agriculture Extension

S.No.	Name	Designation
1.	Dr. D. K. Singh	Professor & Head
2.	Dr. R. N. Yadav	Professor
3.	Dr. L. B. Singh	Professor
4.	Dr. Dan Singh	Associate Professor
5.	Dr. V. K. Singh	Associate Professor

### Action Plan for Kharif 2021

#### **Experiment-1**

**Title:** To study the technological gap analysis on agronomical package of practices of basmati rice in Western Uttar Pradesh.

**Investigators:** Dr. Dan Singh, Dr. R.N.Yadav, Dr.D.K.Singh, Dr. L.B.Singh and Dr. V.K.Singh

**Year of Start:** *Kharif 2021-22*

**Objectives:**

1. To study the personal socio-economic characteristics of the basmati rice growers.
2. To assess the knowledge level of the basmati rice growers with respect to package of practices.
3. To study the adoption level of basmati rice growers with respect to recommended package of practices.
4. To find out the technological gap between knowledge and adoption level with reference to package of practices.
5. To find out the constraints and strategy for promotion of basmati rice cultivation.

**Methodology:** From Western Uttar Pradesh Bulandshahar and Saharanpur district will be selected purposively on the basis of maximum area and production for execution of this project. From each district one block will be selected randomly and from each block, four villages will be selected purposively where basmati rice growers will be easily available. The total 08 villages will studied. From each village 10 basmati rice growers will be chosen for the investigation. Thus the total sample size will be 80 basmati rice growers for this investigation.

**RAC Recommendations:** Experiment was approved with the comments of RAC that package of practices should be given in detail which is being adopted by the farmers and also include the machinery in the package of practices. Your suggestions will be included at the time of survey schedule preparation.

#### **Experiment-2**

**Title:** Identification of Agricultural problems through Participatory Rural Appraisal.

**Investigators:** Dr. D.K. Singh, Dr. R.N. Yadav, Dr. L.B. Singh, Dr. Dan Singh and Dr. V.K. Singh

**Year of Start:** *Kharif 2021-22*

**Objectives:**

1. To find out the different Agro Eco-Analysis of the village.
2. To know the constraints as encountered by the farmers.

## **Methodology :**

The district Meerut comprises 12 Community development blocks. Out of 12 blocks, only Daurala block will be selected for the purpose. Due to time and resource constraints only two Village nearby the university of Daurala block will be selected purposively. After the selection of the village, Key Informants (K.Is.) will be selected as they are most important agents for Collection of data. The farmers / person who are most conversant with the village situations and problems will be considered as the Key informants under the study. For the selection of Key Informants 15-20 farmers from the each village will be asked to identify the most knowledgeable, respected and helpful farmers / persons will be identified as Key Informants.

**RAC Recommendations:** Experiment was approved with the comments of RAC that number of villages for the study should be increased for better precision.

## **Experiment-3**

**Title:** A Study on awareness of agricultural waste management practices among the farmers of Sardhana block of Meerut district.

**Investigators:** Dr. L.B. Singh, Dr. D.K. Singh, Dr. R.N. Yadav, Dr. Dan Singh and Dr. V.K. Singh

**Year of Start:** *Kharif 2021-22*

## **Objectives :**

1. To study the personal socio-economic status of the farmer.
2. To find out the awareness about various waste management Practices.
3. To assess the sources of information regarding waste management practices.
4. Constraints faced in adopting waste management practices.

## **Methodology:**

The Meerut district of Uttar Pradesh comprises 12 community development blocks. Out of 12 blocks only two blocks that are Sardhana and Daurala will be selected purposively. Four villages from each village will be selected for the study. From each village, 9 farmers will be selected to make a sample size of 72 under the research work.

**RAC Recommendations:** Experiment was approved with the comments of RAC that number of blocks and villages for the study should be increased for better precision.



## College of Horticulture

SN.	Name of Staff	Designation
1	Dr. Bijender Singh	Dean & Professor
2	Dr. Satya Prakash	Professor & Head
3	Dr. Mukesh Kumar	Professor
4	Dr. Sunil Malik	Professor
5	Dr. Manoj Kumar Singh	Associate Professor
6	Dr. Vipin Kumar	Associate Director / Associate Prof.
7	Dr. Arvind Kumar	Associate Director / Associate Prof.

### Progress Report for Rabi-2019-20

#### Experiment-1

**Title:** Collection, maintenance and evaluation of germplasm of turmeric.

**Investigators:** Dr. Bijendra Singh

**Year of Start:** 2019-20

**Objective:** Screening and evaluation of germplasm

**Result already achieved:** 40 collections have been classified as under after evaluation

**Treatments-**40 (28 Old + 12 New)

**1. Design-** Unreplicated 2 raised beds.

**2. Spacing-** 50x20 cm between rows and plants.

**3. Fertilizer-** 120 kg N + 60 kg P<sub>2</sub>O<sub>5</sub> + 80kg K<sub>2</sub>O/ha. ½ N, full P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O will be applied as basal remaining ½ N shall be applied in 2 splits on 45 and 95 days.

#### Experiment-2

**Title:** SVT on turmeric

**Investigators:** Dr. Bijendra Singh

**Year of Start:** 2019-20

**Design:** RBD

**Replications :** 03

**Objective:** To develop high yielding variety of turmeric.

**Treatment :**

S.N.	Strain/ Variety	Yield (Q/ha)		
		2019-20	2020-21	Average
1	Selection – 1	275.00	284.17	279.50
2	Selection – 2	248.33	229.17	238.75
3	Selection – 3	232.50	275.00	253.75
4	Selection – 4	244.17	220.83	232.50
5	Azad Haldi – 1	154.17	180.83	167.50
6	VallabhPriya	157.50	195.83	176.66
7	Vallabh Sharad	237.50	220.00	228.50
	CD	64.34	49.88	
	CV	13.36	9.07	

On the basis of above results, Selection – 1 were found highest yield 279.50 q/ha followed by Selection – 3, Selection – 2 and were found promising

### Experiment-3

**Title:** Collection, maintenance and evaluation of germplasm of colocasia.

**Investigators:** Dr. Bijendra Singh

**Year of Start:** 2019-20      **Design:** unreplicated double rows      **Replications:** 03

**Objective:** Screening and maintenance of germplasm

**Result:** 20 germplasm collections were evaluated and classified as below with respect to various characters

#### Statistical design and layout

- a) **Treatment-25** (20 Old + 5 New)
- b) **Design** - unreplicated double rows
- c) **Spacing** –50 x 25 cm between row and plant
- d) **Fertilizer** - 100 kg N + 60 kg P<sub>2</sub>O<sub>5</sub> + 80kg K<sub>2</sub>O/ha

**Observation were recorded** - Data on edible maturity wt. of corm and other desirable character recorded.

### Experiment-3

**Title:** Varietal trail on Colocasia.

**Investigators:** Dr. Bijendra Singh

**Year of Start:** 2019-20      **Design:** RBD      **Replications :** 03

**Objective:** To develop a high yielding variety of Colocasia.

**Treatments :**

S.N.	Strain/ Variety	Yield (Q/ha)			
		2018	2019	2020	Average
1	MCS – 1	212.56	221.29	300.04	244.61
2	MCS – 2	277.00	306.02	329.67	304.23
3	MCS – 3	215.00	245.26	252.14	237.46
4	MCS – 4	259.11	255.46	288.92	267.83
5	MCS – 5	210.00	266.33	297.48	257.93
6	Vallabh Hans	213.78	272.34	304.15	263.42
7	Azad Arvi-1	211.73	268.43	300.37	260.17
8	Vallabh Nikki	223.11	259.99	300.00	261.10
	CD	22.92	22.92	30.00	
	CV	7.99	4.26	6.87	

On the basis of above results variety MCS-2 and MCS – 4, Vallabh Hans were found promising on the basis of wt. of corm and desirable attributes.

### Experiment-4

**Title:** Varietal trail on Colocasia.

**Investigators:** Dr. Bijendra Singh

**Year of Start:** 2019-20      **Design:** RBD      **Replications :** 03

**Objective:** To develop a high yielding variety of Colocasia.

**Treatments:**

S.N.	Strain/ Variety	Yield (Q/ha)			
		2018	2019	2020	Average
1	MCS – 1	212.56	221.29	300.04	244.61
2	MCS – 2	277.00	306.02	329.67	304.23
3	MCS – 3	215.00	245.26	252.14	237.46
4	MCS – 4	259.11	255.46	288.92	267.83
5	MCS – 5	210.00	266.33	297.48	257.93
6	Vallabh Hans	213.78	272.34	304.15	263.42
7	Azad Arvi-1	211.73	268.43	300.37	260.17
8	Vallabh Nikki	223.11	259.99	300.00	261.10
	CD	22.92	22.92	30.00	
	CV	7.99	4.26	6.87	

On the basis of above results variety MCS-2 and MCS – 4, Vallabh Hans were found promising on the basis of wt. of corm and desirable attributes.

**Experiment-5**

**Title:** Collection, maintenance and evaluation of germplasm of Cucurbitaceas and Okra crop.

**Investigators:** Dr. Bijendra Singh

**Year of Start:** 2020

**Design:** RBD

**Replications :** 03

**Objective:** Screening and maintenance of germplasm

**Treatment**

	Exhausting	Collection	New	Total
Bottle gourd		15	3	18
Okra		70	05	75
Pumpkin		–	10	10
Pointed gourd		–	10	
Salputia& Ribbed gourd		–	08, 10	18
Bottle gourd (Round)		–	10	10
Sponge gourd		–	10	10

**Statistical design and layout**

All the above collections will be grown in unreplicated single row.

**Observation recorded** – Yield and other desirable character will be recorded.

**Experiment-6**

**Title:** Developing of high yielding and disease resistant variety of Okra.

**Investigators:** Dr. Bijendra Singh

**Year of Start:** 2009

**Objective:** Evaluation of high yielding and disease resistant to okra varieties YVMV.

**Result:** F<sub>1</sub> seed procured.

Line	Tester
KS -312, KS-305 (Red), K. Bonia, KS-341	Azad Bhindi-2, BO-2 and Prabhani Kranti
KS-442, 7109, P-7, 7219, KS-437, KS 321, VRO-3, 7216, KS-423, Azad Bhindi-1	

**Design :** Single row with 10 plants.

**Distance-** 50x50 cm apart.

**Observation-** Data will be recorded on yield and yield contributing traits and YVMV disease.

### Experiment-7

**Title:** Maintenance and multiplication of developed vegetable varieties.

**Investigators:** Dr. Bijendra Singh

**Year of Start:** 2019-20

**Objective:** Evaluation of high yielding and resistant to YVMV variety.

**Treatments:**

Vallabh Priya, Vallabh Sharad (Turmeric),

Vallabh Nikki, Vallabh Hans (Colocasia),

Vallabh Saral (Bottle gourd) and

Vallabh Petha-1 (Ash gourd).

### Experiment-8

**Title:** Collection, maintenance and evaluation of germplasm of seed spices.

**Investigators:** Dr. Bijendra Singh

**Year of Start:** 2020

**Objective:**

To evaluate seed species, collection for their economic traits for necessary improvement

**Treatments:**

Exhausting	Collection		Total
	Old	New	
Coriander	15	3	18
Fenugreek	10	2	12
Kalonji	8	-	8
Soya	10	-	10
Fennel	10	3	13

**Statistical design and Layout** - All the above collection will be grown unreplicated in two rows each of 3 m. long.

**Fertilizer**-50 Kg N + 30 kg P<sub>2</sub>O<sub>5</sub> + 30 Kg K<sub>2</sub>O/ha

**Design**—Unreplicated

**Plot size**-50 x 30 cm.

**Observation to be recorded:** Yield and other desirable characters will be recorded.

### **Experiment-9**

**Title:** Maintenance and multiplication of developed spices varieties.

**Investigators:** Dr. Bijendra Singh

**Year of Start:** 2019-20

**Objective:** Evaluation of high yielding and resistant to YVMV variety.

**Treatments:**

Vallabh Bhavi (Nigella),

Sarvhari (Coriander),

Vallabh Chinki (Fenugreek) and

Vallabh Puneet (Fennel)

### **Action Plan for Kharif-2021**

**Experiment-1 :** Collection, maintenance and evaluation of germplasm of turmeric.

**Experiment-2 :** SVT on turmeric

**Experiment-3 :** Collection, maintenance and evaluation of germplasm of colocasia.

**Experiment-4 :** Varietal trail on Colocasia.

**Experiment-5 :** Collection, maintenance and evaluation of germplasm of Cucurbitaceous and Okra

**Experiment-6 :** Developing of high yielding and disease resistant variety of Okra.

**Experiment-7 :** Maintenance and multiplication of developed vegetable varieties.

**Experiment-8 :** Characterization and evaluation of different germplasm of Onion (*Allium cepa* L.) for WPZ of UP.

**Experiment-9 :** Effect of Beejamrit and Jeevamrit on Growth and Yield of Onion (*Allium cepa* L.) cv. NHRDF Red-3.

**Experiment-10 :** Effect of Nutrient Management Practices on Growth and Yield of Coriander (*Coriandrum sativum* L.) var Sarvhari.

**Experiment-11 :** Characterization and evaluation of different germplasm of Garlic (*Allium sativum* L.) for NWPZ of UP.

**Experiment-12 :** Effect of Nutrient Management Practices on Growth and Yield of Garlic (*Allium sativum*) cv. G-282.

**Experiment-13 :** Effect of integrated use of manure and fertilizer on the growth and yield of potato (*Solanum tuberosum* L.) cv. Kufri Mohan.

**Experiment-14 :** Collection, evaluation and multiplication of bougainvillea germplasm.

**Investigators:** Mukesh Kumar, Sunil Malik, Satya Prakash, Manoj Kumar Singh and Arvind Kumar

**Design:** RBD

**Replication:** 02

**Objectives:**

- To study the better growth and flowering in bougainvillea under agro-climatic conditions for western Uttar Pradesh
- To find out the best cultivars and their multiplication under western Uttar Pradesh conditions

**Characters to be recorded**

- Plant growth habit (Visually assessment)
- Young shoot colour (Visually assessment)
- Length of internode (Manually) :
- Stem thorns (Visually assessment)
- Thorn length (Manually)
- Thorn colour (Visually assessment)
- Leaf width (Manually)
- Leaf blade (Visually assessment)
- Inflorescence (Visually as single/cluster)

**Experiment-15** *In vitro* mutagenesis and management of chimera for development of new flower color/shape and chlorophyll variegated mutants in tuberose (*Polianthes tuberosa* L.)

**Investigators:** Mukesh Kumar, Sunil Malik, Satya Prakash, Manoj Kumar Singh, Arvind Kumar, Lokesh Gangwar and Vipin Kumar

**Objectives:**

- To develop regeneration and micro-propagation protocol.
- Optimization of physical and chemical mutagens for induction of mutants in tuberose
- Screening of mutated explants by plant tissue culture.
- Molecular characterization for identification of mutated lines using molecular markers

**Experimental details:**

**Bulb treatment with gamma rays**

1. 0 krad      2. 0.5 krad      3. 1.0 krad      4. 1.5 krad      5. 2.0 krad

**Bulbs treatment by Ethyle methane sulphonate (EMS)**

1. 0.25%      2. 0.50%      3. 0.75%      4. 1.00%      5. 1.5%

**Bulbs treatment by Diethyl sulphate (DES)**

1. 0.1%      2. 0.2%      3. 0.3%      4. 0.4%

**Total number of treatments:** 14      **Replications:** 03      **Experimental Design:** CRD

**Observation to be recorded**

**Growth characters:**

1. Days taken to sprouting
2. Plant height (Tall/dwarf)
3. Number of leaves
4. Leaves colour (colourful/variegated or other characters different from original)

**Flowering characters**

1. Days for initiation of spike
2. Number of florets/spike
3. Flower colour
4. Flower stalk colour
5. Flower spikes
6. Spike head formation
7. Length of rachis (cm)

## ***In vitro* experiments:**

### **Preparation of culture medium**

*In-vitro* studies to be conducted on Murashige and Skoog, (1962) nutrient medium with different growth regulators. For convenience sake and in order to avoid weighing individual ingredients each time, concentrated stock solutions of macro elements, micro elements will be prepared and stored in refrigerator. Stock will be freshly prepared every fortnightly and stored in amber coloured reagent bottles. Each salt of the major stock solution will dissolve separately in distilled water to avoid precipitation. The medium will be supplemented separately with different plant growth regulators, sucrose and gelling agents. Freshly prepared solutions will be used for plant growth regulators. Auxins will be dissolved in small amount of 0.1 N NaOH or ethyl alcohol and cytokinins in 0.1 N HCl before preparing the final volume in distilled water.

All the stock solutions will be mixed in a small amount of distilled water to prepare a required medium. The final volume to be made in a graduated cylinder by adding distilled water. After adding the required amount of growth regulators, it will be supplemented with 3 % sucrose and the pH will be adjusted to 5.8 with 1 N HCl or 1 N NaOH. Agar-Agar (0.65 %) to be dissolved by heating the medium. The hot medium will be poured into the culture vessels (tubes/ honey jars). For experiments on surface sterilization, establishment of cultures and rooting test tubes will be used for experiment. For experiment on shoot multiplication, test tubes/ honey jars will be used. After plugging the culture vessels with non-absorbent cotton plugs and caps, these will be sterilized in an autoclave at 121°C and 1.05 Kg/cm<sup>2</sup> pressure (15 psi) for 20 minutes (Dodds and Roberts, 1982). The medium to be kept at room temperature and used for culturing after 2 days waiting period to check for any contamination in the medium.

### **Preparation of explants**

Nodal sections will be used for the establishment of cultures. Stem cuttings to be taken from healthy donor plants and the leaves covering the stem were removed gently. Nodes will be excised from these stem cuttings. All the explants to be treated in the 0.1 % teepol solution for 10 minutes and washed with tap water. After that, the same will be treated with Bavistin (0.1 %) for 20 minutes and to be washed under running tap water for 15-20 minutes. All the explants will be cut to a size of 5-6 mm. Under laminar flow cabinet, nodes to be treated with surface sterilization (Mercuric Chloride 0.1%) for 4-5 minutes. After surface sterilization, explants will be washed thrice with distilled water before inoculation.

### **Culture environment**

All the cultures to be kept in the culture trollies of culture room maintained at a temperature of 25±2°C under artificial light (16 hours light and 8 hours dark period daily) that will have intensity of 1.5 Klux at plant level. The *in vitro* cultures during establishment, multiplication and rooting to be incubated in culture room.

### **Standardization of culture medium for establishment and shoot multiplication of tuberose.**

#### **Methodology:**

- The sterilized explants to be inoculated in the culture tubes containing MS medium supplemented with different concentration of BAP + SNP + AgNO<sub>3</sub> in combination will be used for the initial establishment of cultures. For shoot multiplication, healthy shoots of approximately 3.5-4 cm to be selected for multiplication. Such shoots will individually cultured on basal MS medium supplemented with different concentration of BAP + SNP + AgNO<sub>3</sub> in combinations to be used for multiplication.
- The details of the experiment are as follows:

- **Explants** : Nodal
- **Cultivar** : Local Double

#### **Establishment and multiplication medium:**

Studies will be conducted with the combinations of following chemicals viz: BAP + Nitric oxide (NO) donor sodium nitroprusside (SNP) + AgNO<sub>3</sub>

#### **Treatment combinations:**

1. MS-1: MS Basal Medium
2. MS-2: MS Basal Medium + 0.5 mg l<sup>-1</sup> BAP + 5 μM SNP + 0.5 mg l<sup>-1</sup> AgNO<sub>3</sub>
3. MS-3: MS Basal Medium + 1 mg l<sup>-1</sup> BAP + 10 μM SNP + 1 mg l<sup>-1</sup> AgNO<sub>3</sub>
4. MS-4: MS Basal Medium + 1.5 mg l<sup>-1</sup> BAP + 15 μM SNP + 1.5 mg l<sup>-1</sup> AgNO<sub>3</sub>
5. MS-5: MS Basal Medium + 2.0 mg l<sup>-1</sup> BAP + 20 μM SNP + 2 mg l<sup>-1</sup> AgNO<sub>3</sub>
6. MS-6: MS Basal Medium + 2.5 mg l<sup>-1</sup> BAP + 25 μM SNP + 2.5 mg l<sup>-1</sup> AgNO<sub>3</sub>
7. MS-7: MS Basal Medium + 3.0 mg l<sup>-1</sup> BAP + 30 μM SNP + 3 mg l<sup>-1</sup> AgNO<sub>3</sub>
8. MS-8: MS Basal Medium + 4 mg l<sup>-1</sup> BAP + 40 μM SNP + 4 mg l<sup>-1</sup> AgNO<sub>3</sub>

**Total treatment combinations** : 08

**Replications** : 03

**Design** : Completely Randomized Design (C.R.D)

#### **Observations to be recorded:**

The following observations to be recorded after 4 weeks of culturing.

1. **Percent of shoot regeneration:** Percent of shoot regeneration will be measured during culture media establishment.
2. **Number of shoots:** Number of shoots formed from original shoot after 4 weeks of culturing on multiplication medium will be counted.
3. **Shoot length/shoot (cm):** Length of the shoots to be recorded with the help of measuring scale after 4 weeks of culturing on multiplication medium.
4. **Days for shoot formation:** Number of days to be counted after initiation of shoot on multiplication medium.

#### **Studies on rooting of *in vitro* regenerated shoots:**

The multiplied shoots to be separated and individual shoots will be transferred to MS medium supplemented with different levels of auxins (IBA/NAA) alone or in combinations for rooting of *in- vitro* multiplied shoots.

**Cultivar** : Local Double

#### **Rooting Media:**

##### **(i) Different rooting media of IBA**

1. MS-1: ½ MS Basal Medium
2. MS-2: ½ MS Basal Medium + 0.5 mg l<sup>-1</sup> IBA
3. MS-3: ½ MS Basal Medium + 1.0 mg l<sup>-1</sup> IBA
4. MS-4: ½ MS Basal Medium + 1.5 mg l<sup>-1</sup> IBA
5. MS-5: ½ MS Basal Medium + 2.0 mg l<sup>-1</sup> IBA



## (ii) Different rooting media of NAA

1. MS-1: ½ MS Basal Medium
2. MS-2: ½ MS Basal Medium + 0.5 mg l<sup>-1</sup> NAA
3. MS-3: ½ MS Basal Medium + 1.0 mg l<sup>-1</sup> NAA
4. MS-4: ½ MS Basal Medium + 1.5 mg l<sup>-1</sup> NAA
5. MS-5: ½ MS Basal Medium + 2.0 mg l<sup>-1</sup> NAA

## Different rooting media of IBA+NAA

1. MS-1: ½ MS Basal Medium
2. MS-2: ½ MS Basal Medium + 0.5 mg l<sup>-1</sup> IBA + 0.5 mg l<sup>-1</sup> NAA
3. MS-3: ½ MS Basal Medium + 1.0 mg l<sup>-1</sup> IBA + 0.5 mg l<sup>-1</sup> NAA
4. MS-4: ½ MS Basal Medium + 1.5 mg l<sup>-1</sup> IBA + 0.5 mg l<sup>-1</sup> NAA
5. MS-5: ½ MS Basal Medium + 2 mg l<sup>-1</sup> IBA + 1.0 mg l<sup>-1</sup> NAA

**Total treatment combinations** : 15

**Replications** : 3

**Design** : Completely Randomized Design (CRD)

**Observations recorded** : The following observations to be recorded after 4 weeks of culturing.

**Number of roots/culture:** Total number of roots developed at shoot base to be counted after 4 weeks of culturing on rooting medium.

**Days for root induction:** After transferring shoots to rooting medium, the number of days taken by shoots for visible root formation will be counted.

**Regeneration percent rooting:** It will be recorded as the number of shoots showing visible development of roots out of total number of shoots cultured after 4 weeks of culturing.

## Hyperhydricity:

Hyperhydricity (previously also known as vitrification) is a physiological malformation that results in excessive hydration, low lignifications, impaired stomatal function and reduced mechanical strength of tissue culture-generated plants

## Methodology:

Explants (Nodal segments) to be cultured on half Murashige and Skoog, (1962) medium supplemented with sucrose (1.5 %). The pH of the medium will be adjusted in between 5.4 to 5.5 with 1N HCl or 1N NaOH. Thereafter, solidifying agent (agar 0.7 %) to be added and homogenized by heating the medium. The different concentration of AgNO<sub>3</sub> and CaCl<sub>2</sub> to be tested to evaluate the performance of plants under *in vitro* condition to overcome hyperhydricity.

**The details of the experiment are as follows:**

**Explants** : **Nodal**

**Cultivar** : **Local Double**

➤ **Media to be tested for hyperhydricity.**

1. MS-1: MS Basal Medium
2. MS-2: MS Basal Medium + 5 mg<sup>l</sup><sup>-1</sup> AgNO<sub>3</sub>
3. MS-3: MS Basal Medium + 10 mg<sup>l</sup><sup>-1</sup> AgNO<sub>3</sub>
4. MS-4: MS Basal Medium + 15 mg<sup>l</sup><sup>-1</sup> AgNO<sub>3</sub>
5. MS-5: MS Basal Medium + 20 mg<sup>l</sup><sup>-1</sup> AgNO<sub>3</sub>
6. MS-6: MS Basal Medium + 5mg<sup>l</sup><sup>-1</sup> CoCl<sub>2</sub>
7. MS-7: MS Basal Medium + 10 mg<sup>l</sup><sup>-1</sup> CoCl<sub>2</sub>
8. MS-8: MS Basal Medium + 10 mg<sup>l</sup><sup>-1</sup> CoCl<sub>2</sub>
9. MS-9: MS Basal Medium + 15 mg<sup>l</sup><sup>-1</sup> CoCl<sub>2</sub>
10. MS-10: MS Basal Medium + 20 mg<sup>l</sup><sup>-1</sup> CoCl<sub>2</sub>

**Treatments** : 10

**Replications** : 3

**Design** : Completely Randomized Design (CRD)

**Observations to be recorded:**

- The following observations to be recorded after 4 weeks of culturing.
- Percent hyperhydricity in shoot growth

**Genetic stability analysis:**

Genetic stability analysis will be carried out by ISSR and SSR markers

## College of Biotechnology

### Staff Position:

SN.	Name	Designation
1.	Dr. Ravindra Kumar	Dean Biotechnology
2.	Dr. Ravindra Kumar	Professor & Head
3.	Dr. Pankaj Chauhan	Associate Professor (Cell Biology)
4.	Dr. Rekha Dixit	Professor & Head (Commercial Biotechnology)
5.	Dr. Naresh Pratap Singh	Assistant Professor
6.	Dr. Pankaj Kumar	Professor & Head (Immunology and Defense Mechanism)
7.	Dr. Jitendra Singh	Associate Professor
8.	Dr. Amit Kumar	Associate Professor
9.	Dr. Purushottam	Associate Professor
10.	Dr. Anil Sirohi	Professor & Head (Molecular Biology and Genetic Engineering)
11.	Dr. Shalini Gupta	Associate Professor
12.	Dr. Sandeep Kumar	Assistant Professor
13.	Dr. Sweta Mishra	Associate Professor
14.	Dr. Neelesh Kapoor	Assistant Professor
15.	Dr. Akash Tomar	Associate Professor

**Experiment 1:** Estimation of pesticide residues in rice grains in Western Uttar Pradesh

**Duration of the Experiment:** 1 Year

**Name and Designation of Faculty Involved in Experiment :** Dr Rekha Dixit, Professor  
(Biochemistry and Physiology)

### Aim and Objectives:

- Collection of rice sample from different locations of Western UP
- Detection and quantification of various pesticides in collected rice samples.
- To analyse the data for distribution pattern of pesticide residues in rice grains

### Technical Program:

In the present study, 79 pesticides were analysed for presence of their residues in paddy, brown and white rice of 23 samples. These rice samples included Basmati rice varieties and non-Basmati rice and were collected from different locations in Western UP. Of 79 pesticides, residues of only 19 pesticides were detected at various levels in 23 samples.

### Results:

- Levels of Acephate (organophosphate insecticide that is used to control Brown plant hopper) in brown and white rice are below MRL value of 0.01 ppm as per Europe standards.
- Residue of Buprofezin was detected only in one sample at concentrations of 0.018 ppm and values are higher than the MRL value of 0.01 ppm as set by EU.
- Carbofuran effective in controlling rice pests such as green leafhoppers, brown planthoppers and stemborers was detected in one sample at 0.007 ppm.
- Etofenprox insecticide was below MRL value in white rice.
- Imidacloprid was found to be the most widely used insecticides (present in all the samples). Paddy rice had higher values of Imidacloprid than brown rice followed by white rice, however, all the values were found significantly lower than its MRL value of 1.5 ppm.
- Fipronil was detected in one sample only at concentrations of 0.009 ppm and these values are below its MRL value of 0.010 ppm as per Europe standards.

- Carbendazim is a broad-spectrum fungicide. Carbendazim was detected in 7 samples. Its concentrations were found above its MRL of 0.01 ppm in brown and white rice of sample No. 3 and 5 only. In other samples, it was either absent or its concentrations were below the MRL value
- *Chlorantraniliprole* insecticide was detected in paddy rice of nine samples with an average of  $\pm 0.0009$  ppm (its MRL value is 0.40 ppm)
- Propiconazole was detected in paddy rice of nine samples (Sample Nos. 1, 2, 4, 5, 6, 8, 9, 14, 18 & 23), in brown and white rice of 8 samples. The levels of Propiconazole were found above its EU MRL value of 1.5 ppm in paddy rice of four samples (sample Nos. 4, 5, 6 & 14), whereas in brown and white rice of all the samples it was below its MRL
- Tebuconazole is a broad-spectrum fungicide extensively used worldwide for the control of disease anthracnose of rice in one paddy sample, its concentration is above its EU MRL value of 1.5 ppm.

#### **Outcome of Experiments:**

- Insecticides such as acephate, buprofezin, carbofuron, fipronil, methamidophos etc. seems to be used less frequently by farmers in Western UP regions as compared to the farmers of Punjab and Haryana regions
- Propiconazole was found to be the most widely used fungicide in Western UP region (detected in 10 samples) followed by Carbendazim (7 samples) and Tricyclazole (5 samples).

#### **Recommendation:**

- This information could be useful for policy makers, rice exporters and the public at large in order to take urgent action to control the use of some excessively applied and potentially persistent pesticides.

### **Experiment 2: Accumulation of Heavy metals in Rice grains in Western UP**

**Duration of the Experiment:** 01 Year

**Name and Designation of Faculty Involved in Experiment:** Dr Rekha Dixit, Professor  
(Biochemistry and Physiology)

#### **Aim and Objectives:**

1. To collect rice/basmati rice samples from various contaminated as well as non-contaminated areas within Western Uttar Pradesh.
2. To analyse collected samples for presence of heavy metals in rice grains using ICP MS.
3. To find out accumulation patterns of various heavy metals in rice grains

#### **Technical Program:**

Heavy metals such as Arsenic, lead, cadmium, and chromium are of particular concern in relation to harmful effects on human health. These metals can not only compete with minerals such as calcium, magnesium or iron for absorption but can also bind to vital cellular components, such as structural proteins, enzymes and nucleic acids, where they can interfere with their functions. In the present work analysis of these four heavy metals was carried out in 23 rice samples collected from different locations in Western UP to evaluate levels of these metals in rice samples. These rice samples included different varieties of some notified Basmati rice and some non-Basmati rice. The concentration of each metal is determined in paddy, brown and milled rice of each sample.

#### **Results:**

- Levels of Arsenic in paddy, brown and white rice of each of 23 demonstrated that paddy rice of each sample has higher concentrations of Arsenic (in a range of 0.041-0.275 ppm with an average of 0.120 ppm) followed by brown rice (in a range of 0.021-0.169 ppm with an average of 0.092 ppm) and milled rice (in a range of 0.013-0.133 ppm with an average of 0.068 ppm)

- In present study levels of cadmium in paddy, brown and white rice of each of 23 show that paddy rice of each sample has slightly higher concentrations of cadmium (in a range of 0.006-0.080 ppm with an average of 0.030 ppm) followed by brown rice (in a range of 0.006-0.078 ppm with an average of 0.0295 ppm) and milled rice (in a range of 0.006-0.061 ppm with an average of 0.0243 ppm)
- Paddy rice of each sample has higher concentration of Pb (0.03 – 0.414 ppm with an average of 0.123ppm) followed by brown rice (0.003 – 0.250 ppm with an average of 0.075 ppm) and white rice (0.000 – 0.144 ppm with an average of 0.050 ppm).
- Results show that paddy rice of each sample has higher concentrations of chromium (in a range of 18.613-63.369 ppm with an average of 39.340 ppm) followed by brown rice (in a range of 0.388-8.585 ppm with an average of 1.313 ppm) and milled rice (in a range of 0.123 -1.712 ppm with an average of 0.38 ppm)

**Outcome of Experiments:** This study was able to analyze the different rice samples, locally produced in the Western part of Uttar Pradesh. The findings of the studies showed that all the 23 samples of rice including Basmati rice were found contaminated with Arsenic, Lead, Cadmium and Chromium, however, levels of all the contaminant heavy metals were below their MRL values.

**Experiment 3:** “Studies on Characterization of Microorganisms for Solubilization of Phosphate, Potassium and Zinc”.

**Duration of Research Experiment:** ~ 6 month (M-Tech Student research work)

**Name and Designation of Faculty:** Dr. A. Tomar, Assoc Prof, Deptt. of Recomb. Tech., COB.

**Aim & Objectives:**

- Screening rhizospheric soil samples for presence and isolation of microbes from mixed cultures obtained on various culture medium.
- Colony Morphology and Microscopic study of different pure cultures of microbial isolates.
- Screening microbial isolates for Phosphorus, Potassium and Zinc solubilization.
- Comparative nutrient solubilizing potential of different microbial isolates.
- Biochemical testing of different microbial isolates.

## 5. Technical Programme:

Soil is the basis of life and we living beings are directly and indirectly depend on it. Agriculture is based fully on the soil, because without it agriculture cannot sustain, it is the building block of agriculture. Soil have several organic, inorganic materials in it. Nutrients are one of the important part of soil because plants are directly influenced by the availability of nutrients. Deficiency of these nutrients causes severe damage to growth and yield of plants and crops. These are the basic need of plants and major nutrients include Phosphorous, Nitrogen and Potassium. Rhizospheric soil samples were collected from native crop fields and nearby regions. Potential microbes were isolated and tested for solubilization of P, K and Zn on Pikovskayas medium, Aleksandrov’s agar medium and on Zinc solubilizing agar medium that were supplemented with P, K and Zn source. Mineral solubilization involves releasing of these bound nutrients by soil microorganism and making them available for plant uptake via three possible mechanisms that are acidification of the medium, production of chelating metabolites, and redox activity. The nutrient solubilizing bacteria generates a halo zone around their colony on the basis of which their solubilization potential was identified.

## 6. Results:

A total of 18 isolates, two isolated from soil and 16 from previous studies, were tested for multiple solubilization potential, some were found to solubilize all the three nutrients. Microscopic studies showed presence of bacteria with rods, oval, and cocci cell morphology. 17 isolates were gram negative and one gram

positive. Colony morphology showed 05 isolates were greenish-yellow fluorescence producing bacteria denoted as MS-1, PYS-2, PYS-3, PYS-11, PYS-14 and S6 producing yellowish green fluorescence, 02 isolates S4 and MS-3 were brown pigment producing gram negative rods. Isolate SS-9-2 was gram positive with cocci or in some instance streptococci cell arrangement. During plate assay for solubilization, isolates S4, S6, MS-1, PYS-14 and SS-9-2 showed highest level of solubilization of P present in the form of tricalcium phosphate. Isolates S1, S6, MS-1, MS-3, SS-7-6, SS-7-7 and SS-9-2 showed potential to solubilize K present in the form of potassium aluminosilicate. Whereas, Zn present as zinc oxide in media was solubilized by S1, S6, MS-3, PYS-2, PYS-11, PYS-14, SS 7-6 and SS-9-2. The study showed that isolates S1, S6, MS-1, PYS-2, PYS-3, PYS-11, PYS-14 and SS-9-2 can solubilize either of the nutrient (P, K and Zn), although with differing efficiency. On the basis of above study 09 potential isolates (S1, S4, S6, MS-1, MS-3, PYS-2, SS-7-6, SS-7-7 and SS-9-2) were selected to perform biochemical tests for their diversity analysis. 13 biochemical tests were performed to identify isolates. Isolates showed different characteristics in terms of morphology, solubilization assay and biochemical tests, but some on the other hand showed similarities in either of the aspect making them relating to same genera.

## **7. Outcomes of the experiments:**

The results indicated that some isolates from different crop rhizospheres were able to solubilize single, two or all three nutrients being tested, however the isolates differ in their ability and potential to solubilize multiple nutrients, it was also imperative that many isolates were showing higher solubilization of one specific nutrient only, some of the isolates were poor solubilizers of two or in some instance all three nutrients. These analysis may serve as reference for further studies on nutrient solubilization assay and its mechanisms.

**Experiment 4:** Identification and Molecular Characterization of Viruses and Phytoplasma infecting Horticultural Crops of western Uttar Pradesh

**Duration of Experiment: 2019-2021**

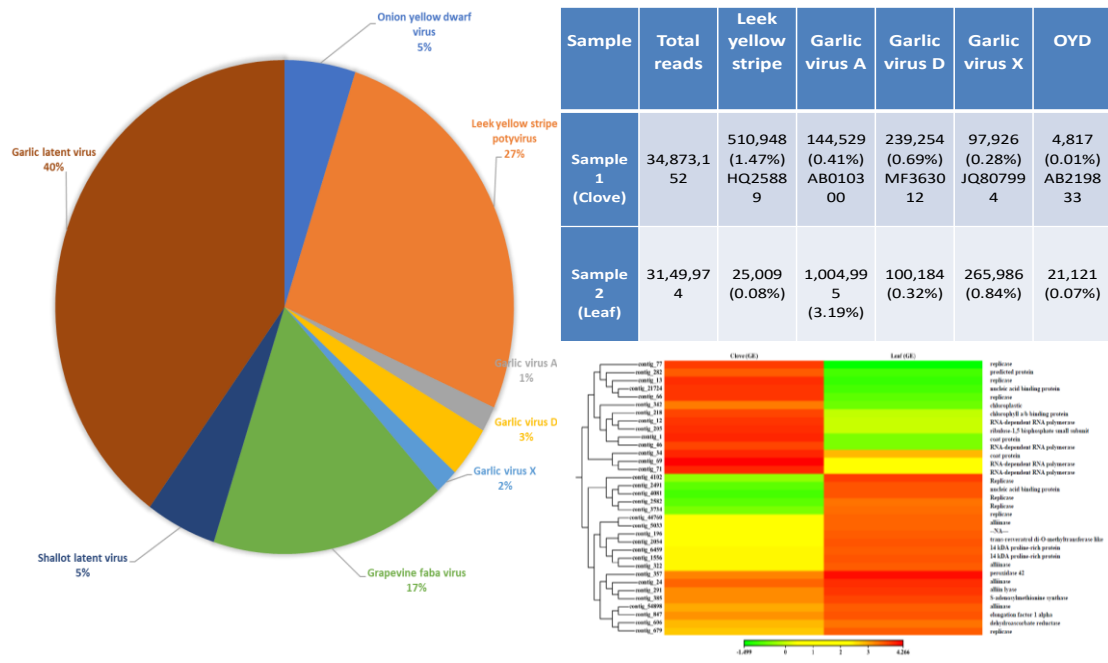
**Name of Scientist Involved: Dr. Jitender Singh and Dr. Manoj Kumar**

### **Technical Programme:**

1. High throughput sequencing based study on RNA viromes of the Garlic *Allium sativum*- G282
2. NGS based identification of viruses associated with Garlic *Allium sativum*.
3. Full genome characterization and assessment of genetic diversity
4. Molecular based detection of viruses associated with garlic and Amaryllis Plants from India
5. Bioinformatics based characterization of identified viruses.

### **Results:**

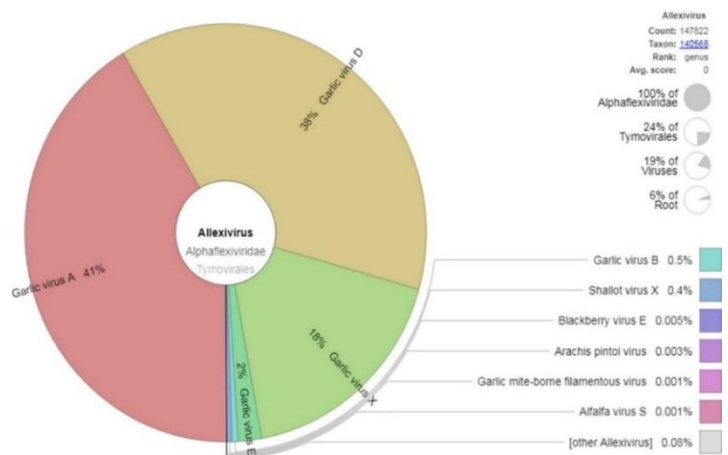
**High throughput sequencing based study on RNA viromes of the Garlic *Allium sativum*- G282**



**Fig. 1.** Symptomatic garlic plant at the experimental plot of Horticulture Research Centre, Sardar Vallabhai Patel University of Agriculture and Technology, Meerut, India.



**Fig. 2.** Krona plot of virus genome sequence reads generated from garlic samples on illumina sequencing platforms.



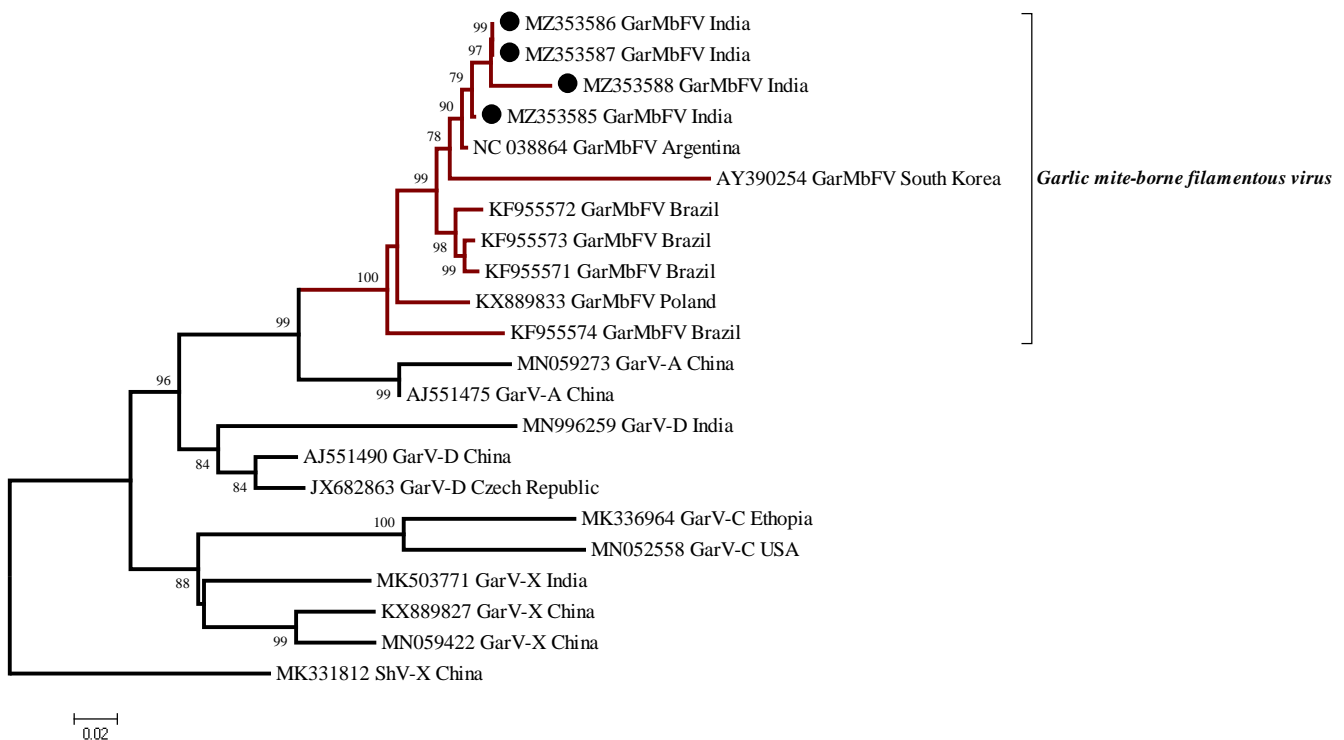
**Table 1.** The table characterizes the open reading frames of GarV-A, Meerut Isolates (MT731489 and MT7314890). Length (nt/aa), pairwise identity by the BLAST algorithm, protein motif identification by the Conserved Domain Tool (NCBI).

Isolate	Accession Number	Sequence length	ORF	ORF position	Protein MW (kDa)
GarV-A	MT731489	8,793 bp	ORF-1	194 - 5071	182.78
			ORF-2	5194 - 5949	27.60
			ORF-3	5946 - 6257	11.29
			ORF-4	6368 - 7462	40.08
			ORF-5	7520 - 8275	27.58
			ORF-6	8276 - 8670	15.20
GarV-A	MT731490	8,625 bp	ORF-1	103 - 4980	182.78
			ORF-2	5112 - 5858	27.60
			ORF-3	5855 - 6166	11.29
			ORF-4	6277 - 7371	40.08
			ORF-5	7423 - 8184	27.58
			ORF-6	8184 - 8579	15.20

Table 2. Break point analysis of GarV-A Meerut sequence and their putative parental sequences.

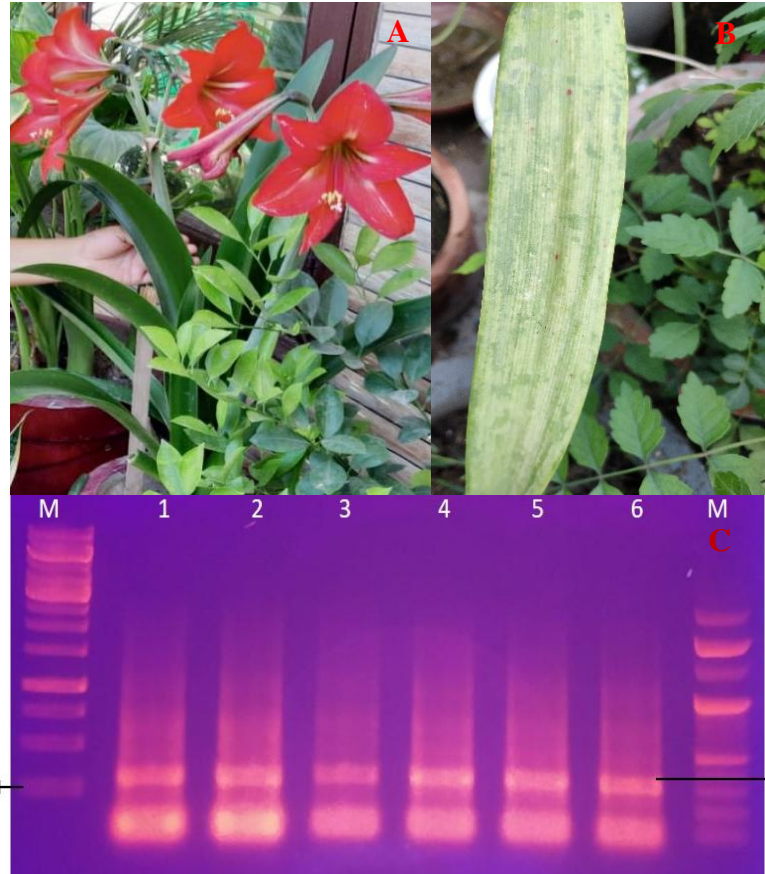
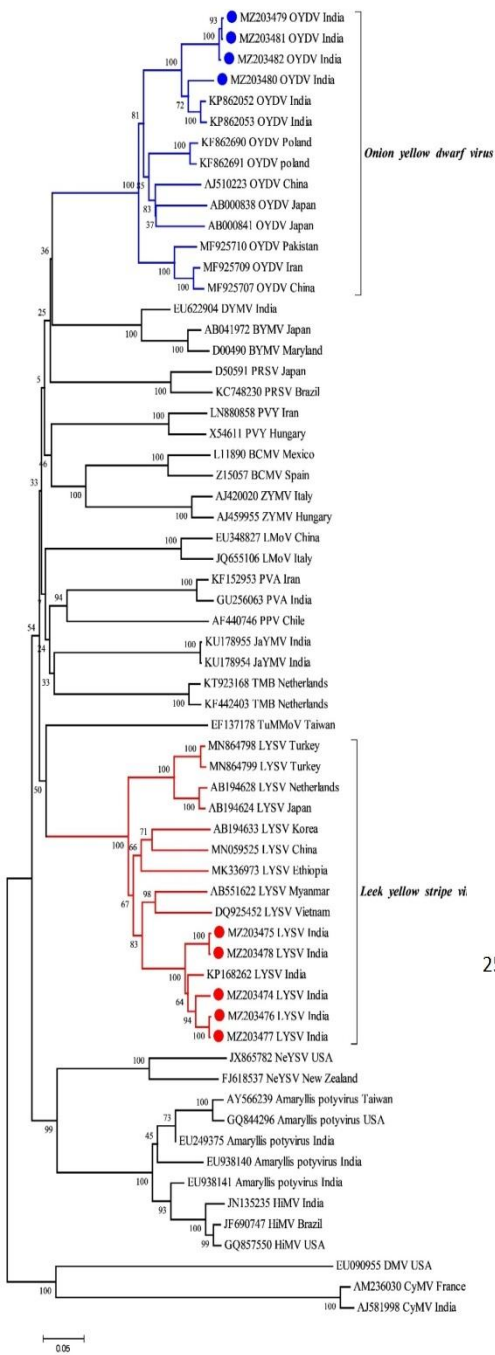
Recombinant isolate	Parental isolate		Recombination Breakpoint		Recombination detection	
	Major	Minor	Start	End	Method	P-value
GarV-A isolate (MT731489)	ShV-X (JX310755)	GarV-E (MN059326)	6150	6483	R, B, M, C, S, 3S	5.220 x 10 <sup>-03</sup>

## 2. First report of *Garlic mite-borne filamentous virus* (GarMbFV) infecting garlic (*Allium sativum* L.) in India





# First Report of Natural Infection by Two Potyviruses on Amaryllis (*Hippeastrum hybridum*) Plants from India



**Outcome of Experiment:**

- A. High throughput sequencing based study on RNA viromes of the Garlic *Allium sativum*- G282 concluded that the garlic plants were found to be infected by Alexivirus of group of plant viruses. Besides this other plant viruses belonging to *Carla virus* and *Potyvirus* were also observed.
- B. Characterized the garlic virus a (*Garv a*) infecting *allium sativum* l. through next generation sequencing technology and developed the diagnostics with pcr technology.
- C. Successfully first reported the *Garlic mite-borne filamentous virus* (GarMbFV) infecting garlic (*Allium sativum* L.) in India
- D. Successfully first reported natural infection by two Potyviruses on Amaryllis (*Hippeastrum hybridum*) Plants from India with PCR based detection

**Recommendation:** Garlic virus A (GarV A) and *Garlic mite-borne filamentous virus* (GarMbFV) infects garlic with mosaic symptoms. Both the viruses reported belongs to Alexivirus of group of plant viruses.

The Amaryllis (*Hippeastrum hybridum*) plants from India were reported to be infected by two potyviruses namely *Onion yellow dwarf virus* (OYDV) and *Leek Yellow Stripe Virus* (LYSV). The detection method based on PCR were developed. This technology will be used for the production of disease-free plant material of garlic and amaryllis.

**Experiment 5: Institutional capacity building leading to accreditation of College of Biotechnology, SVPUAT, Meerut,**

**Project Cost: Rs 100.00 (lakhs)      Specific thematic area : Innovation Grant**

**Name of Principal Investigator : Dr. Anil Sirohi**

**Objectives:**

- To obtain accreditation of *National Agricultural Education Accreditation Board of ICAR*.
- Up gradation of existing laboratories to state-of-art facilities for imparting quality teaching, research, training and capacity building to students.
- Establishment of experiential learning unit for entrepreneurship of students.
- Establishment of lab animal facility for UG and PG students teaching and research.
- Capacity building of faculty and students through specialized training.
- Initiation of collaborations with National and International Institutions of repute including industries to achieve research excellence and address regional and national goals.
- Organization of training programmes in next generation technologies.

**Outcome:**

S.N.	Project Objectives	Activities		Outcome
		Target	Achievement	
1.	Up gradation of existing laboratories to state-of-art facilities for imparting quality teaching, research, training and capacity building to students	-	1	Developed Advance Biotechnology Laboratory (CoB) & renovated being utilized by faculty and student of CoB
2.	Establishment of experiential learning unit for entrepreneurship of students	1	1	
3.	Establishment of lab animal facility for UG and PG students teaching and research	1	1	Developed and applied to CPCSEA for approval
4.	Capacity building of faculty and students through specialized training	1 each	1 each	14 faculty members benefited from training that improved quality of research and project submission

### Success stories/testimonials:

- Renovated & upgraded the existing committee room with all modern multimedia system and sound proof facility with battery backup.
- Developed advance biotechnology lab with modern equipment facility for student training and entrepreneurship development.
- To support experimentation in Animal Biotechnology and conduct animal trial, a small animal laboratory has been developed.

### Roadmap ahead for technical progress:

- Procurement of instruments by 31<sup>st</sup> Dec., 2021.
- Human resource development through trainings (01) and workshops (01) by 31<sup>st</sup> Oct., 2021.
- Faculty participation in seminar/symposium/conferences by 31<sup>st</sup> December, 2021.
- Students exposure visits by 30<sup>th</sup> September, 2021.
- To achieve the accreditation from National Agricultural Education Accreditation Board of ICAR

**Experiment 6:** Establishment of referral analytical laboratory for microbial toxins and environmental pollutants / toxicants

**Principal Investigator :** Dr. Amit Kumar, Associate Professor, Immunology & Defense Mechanism

Project sanctioned for the duration	:	2020-2021
Total sanctioned budget	:	375 lacs
Utilized/transferred during 2020-21	:	60 lacs
Revalidation demanded for 2021-22	:	315 lacs

### Objectives:

- Basic and strategic quality facilities for the development of sustainable and diversified animal husbandry.
- Quality testing of animal feed and fodder, meat, egg, milk and their products with species based identification.
- Drugs/ pesticide residue and heavy metal accumulation in animal feed and fodder, feed and fodder, meat, egg, milk and their products.
- Human resource development through training, education and extension
- To provide research and analysis facilities wherever found deem fit.

**Experiment 7:** Centre for FMD Sero monitoring in All India Coordinated Research Project (AICRP) on Foot and Mouth Disease

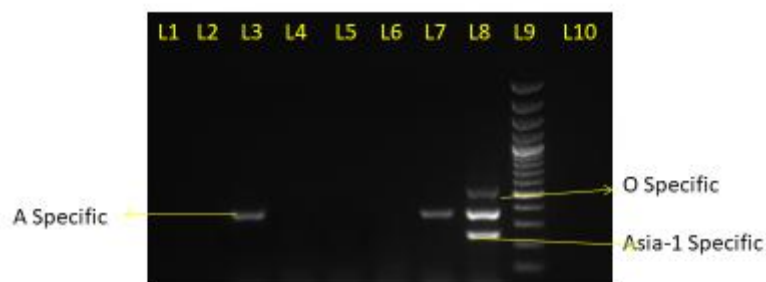
**Principal Investigator :** Dr. Amit Kumar, Associate Professor, Immunology & Defense Mechanism

**Date of Project sanctioned** : 13.10.2020

**Total sanctioned budget** : Nil

### Objective:

- Sero-monitoring and sero-surveillance of FMD



**Multiplex PCR of clinical samples**

L2-sample1, L3-sample2, L4-sample3, L5-sample4,  
L6-sample5, L7-sample6, L8-positive control (O, A,  
Asia1), L9-100bp ladder, L10-NTC

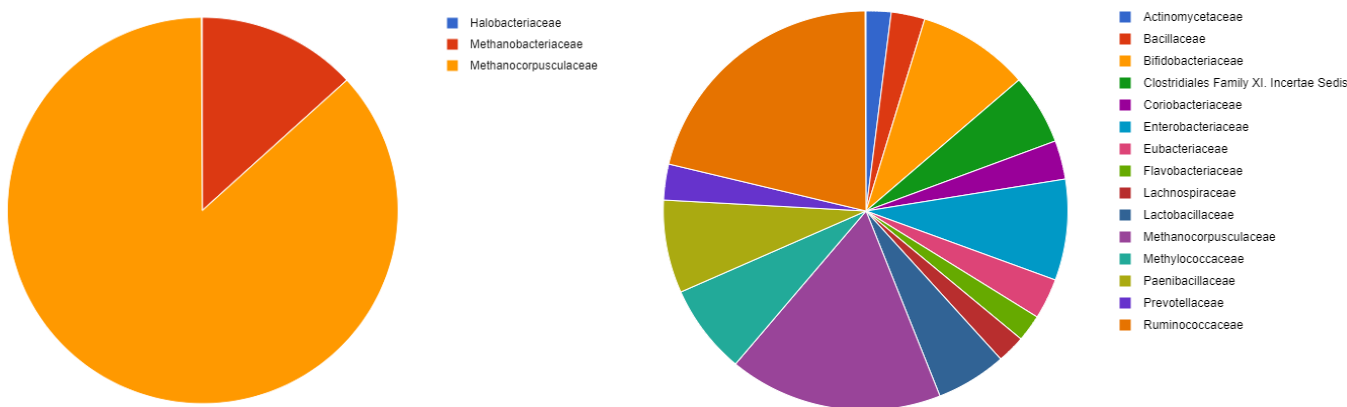
Based on the clinical examinations, gross lesions recorded during visit to the villages a total 38 villages were reported to be affected by the FMD. The laboratory based confirmation, the clinical manifestation of FMD may have been consequential upon infection with serotype “O” strain of the virus. All the clinical samples were sent to IC-FMD at Bhubaneswar for further confirmation and the serotype “O” strain was confirmed. The isolated virus has been submitted to repository at Bhubaneshwar.

**Experiment 8 : 16S rRNA based Metagenomic Analysis of Uterine Microbiota in Cattle**

**Principal Investigator :** Dr. Amit Kumar, Associate Professor, Immunology & Defense Mechanism

**Objectives**

- To establish cattle uterine microbiota at and immediate after parturition.
- To identify the major bacterial pathogens involved in the cattle metritis.
- To suggest the prevention and control strategies to avoid post parturient metritis in cattle.



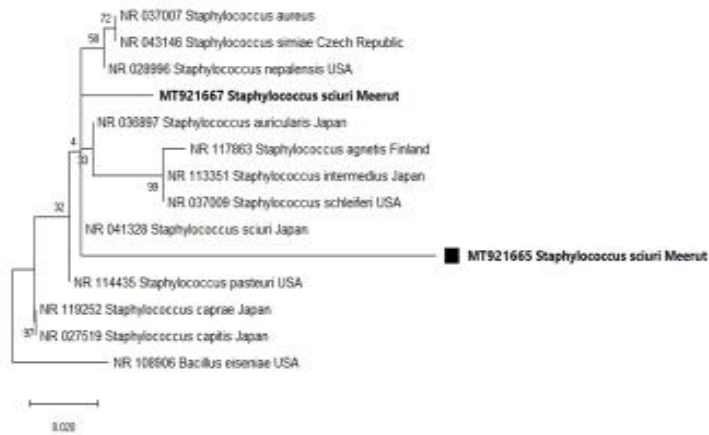
**Experiment 9: 16S rRNA based Metagenomics Analysis of Mastitis Milk in Bovine**

**Principal Investigator :** Dr. Amit Kumar, Associate Professor, Immunology & Defense Mechanism

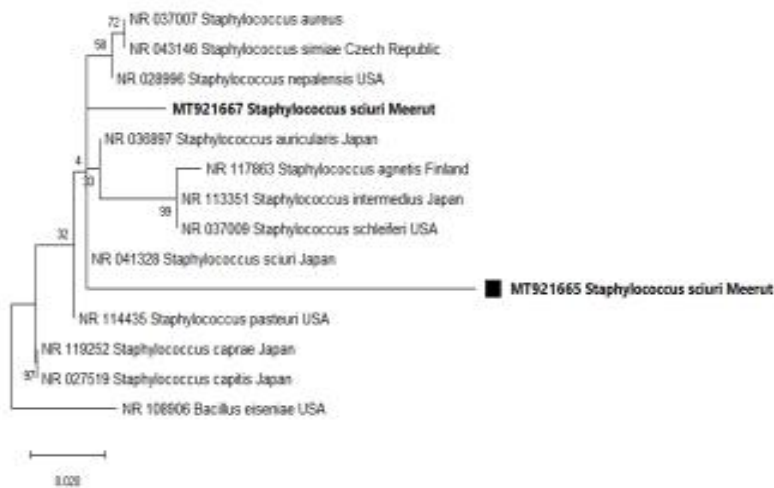
**Objectives:**

- Screening of milk samples for clinical and sub-clinical mastitis
- Identification and characterization of the isolates
- Determining the antibiotic susceptibility of the isolates
- Metagenomics study and analysis of the mastitis milk samples

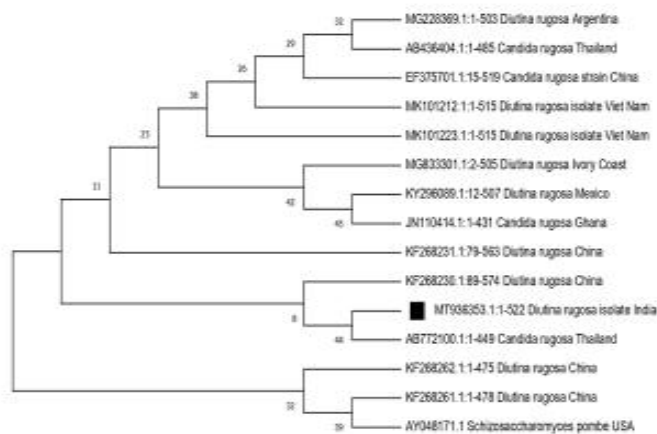
## *Staphylococcus sciuri*



## *Staphylococcus sciuri*



## *Diutina rugosa*



## Salient findings

- First report of *Kocuriapalustris* from cattle mastitis milk in India and WGS submitted with BioProject: PRJNA694095, BioSample: SAMN17506965
- First report of *Mammaliicoccus sciuri* from cattle milk in India and WGS submitted with BioProject: PRJNA693155, BioSample: SAMN17379018
- First report of *Anaplasma capra* in cattle from India
- First report of *Anaplasma ovis* in cattle from India
- First report of *Diutinariguosa* in cattle mastitis from India
- FMD Virus Serotype “A” in Cattle after 2016 in India.

## Action Plan

Detection of Autoinducer - II (AI-2) regulatory genes in Multi-drug Resistance (MDR) zoonotic bacterial pathogens and their inhibitory phytochemicals

**Experiment 10:** Investigation of Phytochemicals and antimicrobial activity of Tulsi (*Ocimum sanctum* L.)

**Duration :** 1 Year

**Name & Designation of Scientist involved in Experiment :** Dr. Pankaj Chauhan, Associate Professor

### Aim

The present study aimed to screen the phytochemical constituents present in *Ocimum sanctum* leaf extract which imparts the antimicrobial potential. Phytochemical analysis in different kinds of solvents which can enhance the knowledge for researchers in future. The use of plant extracts and their phytochemicals study can be of great significance in therapeutic treatments. Anti-microbial study encourages the use of herbs as alternative or supplementary medicine to reduce the burden of high cost, sideeffects and progressively increasing drug resistance of pathogens.

### Objectives

1. Phytochemical's extraction and their screening from *Ocimum sanctum* leaf using different solvents.
2. To check antibacterial & antifungal activity of *Ocimum sanctum* leaf extract.
3. Comparative analysis of different extracts of *Ocimum Sanctum* by determining zone of inhibition.

### Results

Phytochemical analysis of Methanol, Ethanol, Acetone and Aqueous extracts of Tulsi revealed presence of alkaloids, flavonoids, steroids, saponins, glycosides, phenols, tannins and terpenoids. The leaf extract of *Ocimum sanctum* found to be effective against the bacterial species such as *Bacillus cereu*, *Pseudomonas aeruginosa*, *Staphylococcus epidermidis*, *Bacillus subtilis*, and *Escherichia coli*. It was also found to be effective against the fungal species such as: *Aspergillus fumigatus*, *Candida albicans* and *Penicillium chrysogenum*.

The study was carried out to investigate antimicrobial activity for minimum inhibitory concentration (MIC) of Tulsi (*Ocimum sanctum*) leaf extract required to control the growth of microorganisms. It was found that for each microbial strain which was tested against each tulsi leaf extract at different concentration showed different results. The MIC values of each extract was found to be different for all tested microorganisms. For all the tested bacterial species such as *Bacillus cereus*, MIC was found to be (11mm) of methanol extract at

50% concentration. For *Pseudomonas aeruginosa* MIC was found to be (13mm) of methanol and acetone extract at 75% concentration while ethanol and aqueous extract at 50% concentration. For *Staphylococcus epidermidis* MIC was found to be (10 mm) of ethanol extract at 75% concentration. For *Bacillus subtilis* MIC was found to be (13mm) of aqueous extract at 50% concentration. For *Escherichia coli* MIC was found to be (12mm) of methanol extract at 50% concentration and aqueous extract at 75% concentration.

For all the tested fungal species such as *Aspergillus fumigatus* MIC was found to be (11mm) of acetone extract at 75% concentration. For *Candida albicans* MIC was found to be (11mm) of ethanol and aqueous extract at 75% concentration. For *Penicillium chrysogenum* MIC was found to be (11mm) of ethanol and aqueous extract at 75% concentration.

### **Qualitative & Quantitative Outcome of the Experiment**

On the basis of the result obtained from the present investigation, the following conclusions can be drawn.

- The highest percent of yield was found to be at 100% for all extract and lowest percent of yield was found to be at 50% for all extract by this statement it was concluded that increasing the water concentration in solvent for extract preparation the percent yield decreases.
- All the phytochemicals were found to be present in *Ocimum sanctum* leaf extract at 100% concentration of solvents because of the highest percent yield.
- In methanol extract, it was observed that most of the phytochemicals (Tannins, Phenols, Terpenoids, Steroids) were found to be present at 100% concentration.
- In ethanol extract, it was observed that the phytochemicals (Alkaloids, Tannins, Glycosides, Steroids and Saponins) were found to be present at 100% concentration.
- In acetone extract, it was observed that (Tannins, Phenols, Terpenoids, Glycosides, Steroids and saponins) were present at 100% concentration.
- In aqueous extract (Alkaloids, Flavonoids, Phenols, Glycosides, Steroids and Saponins) were present at 100% concentration.
- The methanol extract showed most effective results against *Bacillus cereus*, *Pseudomonas aeruginosa* and *Escherichia coli* at 50% concentration.
- The ethanol extract showed most effective results against *Pseudomonas aeruginosa*, *Staphylococcus epidermidis*, *Candida albicans* and *Penicillium chrysogenum* at 75% concentration.
- The acetone extract showed most effective results against *Pseudomonas aeruginosa* and *Aspergillus fumigatus* at 75% concentration.
- The aqueous extract showed most effective results against *Pseudomonas aeruginosa*, *Bacillus subtilis*, *Escherichia coli*, *Candida albicans* and *Penicillium chrysogenum* at 75% concentration.

### **Experiment 11: Stability studies and steady state kinetics of $\alpha$ -amylase from *Vigna radiata***

**Duration of Experiment :** 1 year

**Name of faculty involved in the Experiment :** Dr. Sandeep Kumar

**Aim & Objectives :** The objectives of present study were as follow:

- To isolate the  $\alpha$ -amylase enzyme from *Vigna radiata* seeds.
- To conduct the storage stability studies with respect to temperature.

- To characterize the  $\alpha$ -amylase biochemically and to determine the values of various kinetic parameters such as, Michaelis-Menten constant ( $K_m$ ),  $V_{max}$ , optimum pH, optimum temperature etc.
- To find various inhibitors of  $\alpha$ -amylase and to determine their  $I_{50}$  values.

### **Technical Programme:**

#### **Preparation of reagents:**

1. Extraction Buffer : (0.2M sodium phosphate buffer, pH-7.0) 0.345g  $\text{NaH}_2\text{PO}_4$  was dissolved in 20ml of DDW, 0.445g  $\text{NaHPO}_4$  was dissolved in 20ml of DDW and 1.46g NaCl was dissolved in 10ml of DDW, and the final volume was made to 50ml with DDW.
2. Assay Buffer : (0.05M sodium phosphate buffer, pH-7.0) Diluted form of extraction buffer.
3. Substrate solution (1% (w/v) Starch) : 1g starch in 100ml of DDW
4. DNSA solution (0.5% w/v) : 1g DNSA + 30g Rochelle salt + 2N NaOH + 100ml DDW.
5. Maltose solution (0.002M) : 0.1g of maltose in 100ml of DDW.
6. Rochelle salt (40% w/v) : 40g of sodium potassium tartrate in 100ml DDW with pH 6.5.

#### **Extraction of enzyme:**

- 20g seed of mung bean were soaked in 50ml of DDW for 5-6 hour at room temperature and seeds were spread over the blotting paper in a petri dish overnight.
- Next day, Seeds were washed and homogenized with motor and pestle in phosphate buffer.
- Make slurry and filter with a four layered muslin cloth filtrate.
- Filtrate centrifuged at 10,000 rpm for 15 min at 4°C.
- Isolate supernatant and discard pellets.

#### **Storage stability:**

##### **Temperature stability studies:**

Mung bean alpha-amylase was stored separately at two different temperatures and assayed for enzyme activity at every 5 days intervals. The enzyme was stored at 4°C and 37°C (room temperature) for 50 days.

#### **Steady state kinetics:**

##### **Determination of optimum pH:**

The assay buffers of different pH values (4, 5, 6, 7, 8, 9, 10, and 11) were prepared and the activity assay was performed. Eight test tubes were taken and 1.0 ml of starch solution was added in every test tube. The pH of solution was maintained (4, 5, 6, 7, 8, 9, 10 and 11) with the help of diluted HCl and NaOH. 0.1 ml enzyme was added in every test tube. Then 900  $\mu\text{L}$  assay buffer was added. Further the test tubes were incubated at room temperature (37°C) for 15min. The reaction was stopped by adding 2ml of DNSA solution in every test tube. Tubes were kept in boiling water bath for 5min. Then 1.0 ml of Rochelle salt was added in each test tube. The tubes were cooled under running tap water and the volume was make-up to 10.0 ml with the help of DDW. Absorbance was measured at 540 nm. The percent relative activity was plotted against pH.

##### **Determination of optimum temperature:**

The effect of temperature on alpha-amylase activity was studied, by varying the temperature 20°C to 90°C in a multi-temperature water bath (TC-120, Grant instrument, England) during the activity assay. The various values of temperature chosen were 20, 30, 40, 50, 60, 70, 80, and 90°C. The activity assay was performed at each of the indicated temperatures separately. Eight test tubes were taken and 1.0ml of starch solution was added in every test tube. Further, 0.1 ml enzyme was added in every test tube. 900  $\mu\text{L}$  assay buffer was then added. All the tubes were kept for incubation at different temperature (20, 30, 40, 50, 60, 70, 80 and 90°C) for 15min. After then the reaction was stopped by adding 2.0 ml of DNSA solution in every test tubes. All tubes were kept in boiling water bath for 5min. Then after 1.0 ml of Rochelle salt solution was added in every test tube. The tubes were cooled under running tap water and the final volume was made-up to 10.0ml



of every test tube with the help of DDW. Absorbance was measured at 540nm. The percent relative activity was plotted against temperature.

#### **Effect of substrate concentration on alpha-amylase activity:**

To study the effect of substrate concentration on *vigna radiata*  $\alpha$ -amylase, the experiment was carried out. The values of  $K_m$  and  $V_{max}$  were determined by measuring the amount of substrate converted into product by the enzyme in a unit time interval. The various parameters *viz*; enzyme concentration, temperature and incubation time were fixed at 5x dilution, 37°C and 15min time, respectively while the substrate concentration varied in the range of 100mg–1000mg. Ten test tubes were taken and 1.0 ml of starch solution (substrate) was added with different concentration (100 mg, 200 mg, 300mg, 400 mg, 500 mg, 600 mg, 700 mg, 800 mg, 900 mg and 1000 mg). Further, 0.1 ml enzyme was added in every test tube. 900  $\mu$ L assay buffer was then added. All tubes were kept for incubation at 37°C (room temperature) for 15 min. The reaction was stopped by adding 2.0ml of DNSA solution in every tube. All the tubes were kept in boiling water bath for 5 min. Then 1.0 ml Rochelle salt solution was added in every tube. Now the tubes were cooled under running tap water and the final volume was made to 10.0 ml with DDW. Absorbance was taken at 540 nm and Line weaver-Burk graph was plotted.

#### **Inhibition studies:**

##### **$\alpha$ -amylase inhibition with $HgCl_2$ :**

The stock solution of  $HgCl_2$  was prepared in 0.05M sodium phosphate buffer, pH-7.0 and were suitably diluted for experiments. The activity assay was performed at standard conditions in the presence of varying concentration of inhibitors. Appropriately diluted alpha-amylase was mixed with varying concentration of the inhibitor during the activity assay. Ten test tubes were taken and 1.0ml of starch solution was added in every test tube. Further, 0.1 ml enzyme was added in every test tube. 900  $\mu$ L assay buffer containing the indicated concentration of inhibitor was then added. The tubes were kept for incubation at room temperature for 15 min. The reaction was stopped by adding 2.0 ml of DNSA solution in every tube. Then all the tubes were kept in boiling water bath for 5 min. Then 1.0 ml of Rochelle salt solution was added in every tube. Again the tubes were cooled under running tap water and the final volume was made to 10.0 ml in every tube with DDW. Absorbance was taken at 540 nm. Percent residual activity was plotted against inhibitor concentration and  $I_{50}$  value was calculated.

##### **Alpha-amylase inhibition with $CuSO_4$ :**

The stock solution of  $CuSO_4$  was prepared in 0.05M sodium phosphate buffer, pH-7.0 and were suitably diluted for experiments. The activity assay was carried out at standard conditions in the presence of varying concentration of inhibitors. Ten test tubes were taken and 1.0ml starch solution was added in every test tube. Further, 0.1 ml enzyme was added in every test tube. 900  $\mu$ L assay buffer containing the indicated concentration of inhibitor was then added. The tubes were kept for incubation at room temperature for 15 min. The reaction was stopped by adding 2.0 ml of DNSA solution in every tube. All the tubes were kept in boiling water bath for 5 min. Then 1.0 ml Rochelle salt solution was added in every tube. The tubes were cooled under running tap water and the final volume was make-up to 10.0 ml with DDW. Absorbance was taken at 540 nm. Percent residual activity was plotted against inhibitor concentration and  $I_{50}$  value was calculated.

## **RESULTS:**

#### **Storage stability studies:**

$\alpha$ -amylase was stored for the indicated time period (days) at 4°C (cold conditions) and 37°C (room temperature) in order to find appropriate temperature conditions to store the  $\alpha$ -amylase for prolonged duration while retaining the maximum enzyme activity. The plot of percent residual activity versus the number of days gave a  $t_{1/2}$  of 40 days for  $\alpha$ -amylase stored at 4°C. When stored at 37°C, the activity of mung bean  $\alpha$ -amylase decreases drastically with time and the value was found to be 15 days.

#### **Steady state kinetics:**

### **(i) Determination of Optimum Temperature:**

The optimum temperature can be determined by measuring the amount of substrate transformed to product by an enzyme in a given time at different temperatures. The various temperatures used were 20, 30, 40, 50, 60, 70, 80 and 90°C at constant assay conditions. At 40°C, the  $\alpha$ -amylase shows maximum activity (100%).

### **(ii) Determination of Optimum pH:**

To determine the effect of pH on mung bean  $\alpha$ -amylase, the experiment was conducted where the activity assay was performed at different pH value (4, 5, 6, 7, 8, 9, 10 and 11) at constant assay conditions. The rate of hydrolysis by mung bean  $\alpha$ -amylase at 37°C showed the optimum pH at 7.0.

### **(iii) Effect of substrate concentration on $\alpha$ -amylase activity:**

The Mung bean  $\alpha$ -amylase was assayed in the presence of varying concentration of starch (100-1000 mg/ml) and the  $\alpha$ -amylase follows Michaelis-Menton kinetics. The Lineweaver Burk Plot was used to calculate the  $K_m$  of  $\alpha$ -amylase and value was 483.09 mg.ml<sup>-1</sup>. The value of  $V_{max}$  was also calculated and was found to be 50.50  $\mu$ mole/min.

### **Inhibition studies of mung bean $\alpha$ -amylase:**

#### **(i) Inhibition with HgCl<sub>2</sub>:**

The  $I_{50}$  value for the Hg<sup>2+</sup> ion found to be 46.41 mg/ml. Due to quite low value of  $I_{50}$  as compare to other inhibitors mercuric chloride has been found to be a strong inhibitor of  $\alpha$ -amylase.

#### **(ii) Inhibition with CuSO<sub>4</sub>:**

The  $I_{50}$  value for the Cu<sup>2+</sup> ions found to be 46.94 mg/ml. It is a fact that copper containing materials, capable of entering the body via the food chain, are harmful to the ecosystem.

### **Outcomes of experiment:**

- The storage stability temperature of the mung bean  $\alpha$ -amylase was determined from a plot of the percent residual activity versus the number of days. The value of  $t_{1/2}$  was found to be 40 days for amylase stored at 4°C and 15 days for amylase that was stored at 37°C. Therefore  $\alpha$ -amylase is more stable and can be stored for longer durations when stored at 4°C.
- The optimum temperature of mung bean  $\alpha$ -amylase was 40°C. Therefore, for activity assay, the temperature 40°C is the most suitable temperature. The rate of hydrolysis of starch by mung bean  $\alpha$ -amylase at different pH revealed at the optimum pH at 7.0. Therefore for activity assay, pH 7.0 was most suitable pH.
- The experiments were carried out to study the effect of the substrate concentration, by measuring the amount of product formed at different substrate concentration. The  $K_m$  and  $V_{max}$  of  $\alpha$ -amylase was found to be 483.091 mg ml<sup>-1</sup> and 50.50  $\mu$ mole/min. The value of  $K_m$  indicates that mung bean  $\alpha$ -amylase has high affinity for starch as a substrate.
- Further,  $\alpha$ -amylase was investigated for the inhibitory effect of compounds such as HgCl<sub>2</sub> and CuSO<sub>4</sub>. The  $I_{50}$  values for Hg<sup>2+</sup> and Cu<sup>4+</sup> inhibition were found to be 46.41 mg/ml and 46.94 mg/ml respectively. The result clearly shows the strong inhibitory nature of Hg<sup>2+</sup> and Cu<sup>4+</sup> due to its high  $I_{50}$  value.

# College of Post Harvest Technology and Food Processing

S.No.	Name	Designation
1.	Prof. Samsher	Professor and Dean
2.	Dr. Suresh Chandra	Associate Professor
3.	Dr. Neelesh Chauhan	Associate Professor

## Progress Report for Rabi-2019-20

**Experiment 1:** Development of Multigrain Biscuits

**Investigators:** Prof. Samsher, Dr. Suresh Chandra and Dr. Neelash Chauhan

**Year of Start:** 2019-20 **Design:** Randomized Block Design (RBD) **Replications :** 03

**Objectives :**

- To standardize and develop the methodology of multigrain biscuits
- Physico-chemical and sensory evaluation of multigrain biscuits

**Technical Program**

Multigrain biscuits were prepared using following flours in different ratio as mentioned below:

Wheat flour: multigrain flour [(100:0, 95: 5, 90: 10; 85:15; 80:20; 75:25)]

Flour (s)	Ratio					
Wheat Flour (%)	100	95	90	85	80	75
Oat (%)	0	1	2	3	4	5
Barley (%)	0	1	2	3	4	5
Corn (%)	0	1	2	3	4	5
Bajra (%)	0	1	2	3	4	5
Mung Bean (%)	0	1	2	3	4	5

**Observations:** Physico-chemical qualities: Moisture content, Fat, Protein and Fibre content. Sensory attributes: Colour, Flavor, Taste, Crispiness and Overall acceptability

**Results :** Physico-chemical and sensory evaluation data of fresh multigrain biscuits are given in Table 1 & Table 2, respectively.

**Table 1.1: Physico-Chemical Quality of Multigrain Biscuits (Fresh)**

Treatments	Moisture Content (%)	Fat (%)	Protein (%)	Fibre Content (%)
100:0	6.886	13.39	10.600	1.939
95: 05	6.404	12.60	12.530	2.730
90:10	6.899	11.81	12.198	2.640
85:15	6.628	11.03	13.149	2.623
80:20	6.516	10.23	13.270	2.788
75:25	6.702	10.44	12.958	2.436

**Table 1.2: Sensory Evaluation of Multigrain Biscuits**

Treatments	Colour	Taste	Flavour	Texture	Crispiness	Overall acceptability
100:0	8.57	8.25	8.45	8.29	8.54	8.42
95: 05	8.48	8.35	8.62	8.55	8.63	8.53
90:10	8.35	8.29	8.54	8.52	8.42	8.42
85:15	8.49	8.42	8.64	8.65	8.49	8.54
80:20	8.59	8.42	8.42	8.69	8.72	8.57
75:25	8.63	8.35	8.52	8.62	8.19	8.46

- Results indicated that multigrain biscuits having ratio of 80: 20 [Wheat flour (80%): Oat (4%): Barley (4%): Corn (4%): Bajra (4%): Mung Bean (4%)] was found to be best combination over the other treatments on the basis of nutritional value.

- On the basis of sensory quality evaluation, the overall acceptability of multigrain biscuits having ratio of 80: 20 rated highest score as 8.57 amongst the other treatments.

**Outcomes :** (a) Qualitative – Good quality biscuits

**Recommendation :** Thus, it can be concluded that ratio of 80:20 is the best combination of ingredients for preparation of multigrain biscuits on the basis of nutritional and sensory evaluation

**Experiment 2:** Development of cookies fortified with apple and carrot pomace

**Investigators:** Dr. Neelash Chauhan, Prof. Samsheer and Dr. Suresh Chandra

**Year of Start:** 2019-20

**Objectives:**

- To develop fortified cookies.
- Physico-chemical and sensory attributes of developed fortified cookies.

**Technical Program**

Flour (s)	Ratio				
Wheat Flour (%)	100	95	90	85	80
Apple pomace (%)	0	2.5	5.0	7.5	10
Carrot pomace (%)	0	2.5	5.0	7.5	10

**Results :** Physico-chemical and sensory attributes of developed fortified cookies are given in Table 2.1 and Table 2.2.

**Table 2.1: Physico-chemical properties of fortified cookies**

Treatments	Moisture Content (%)	Fat (%)	Protein (%)	Crude Fiber (%)	β-Carotene (%)
100:0:0	4.2	22.40	5.85	0.45	-
95:2.5:2.5	4.5	22.65	5.62	1.50	0.35
90:5.0:5.0	4.6	22.72	5.45	2.40	0.62
85:7.5:7.5	4.8	22.87	5.20	2.95	0.95
80:10:10	5.1	23.10	4.95	3.65	1.20

**Table 2.2: Sensory attributes of developed fortified cookies**

Treatments	Color	Flavor	Taste	Crispiness	Overall Acceptability
100:0:0	8.0	7.8	8.0	8.5	8.07
95:2.5:2.5	8.6	8.4	8.6	8.3	8.47
90:5.0:5.0	8.8	8.5	8.8	8.1	8.55
85:7.5:7.5	8.5	8.2	8.5	8.0	8.30
80:10:10	8.2	8.0	8.2	7.8	8.05

- Moisture and fat content increased with increasing the apple and carrot pomace.
- Protein content slightly decreased with increasing apple and carrot pomace.
- Fiber and β-carotene increased significantly with increasing apple and carrot pomace.

**Outcome -** Qualitative – Good Quality cookies.

**Recommendation :** Highest sensory score was found in sample containing 90:5:5 ratio of wheat flour: apple pomace: carrot pomace which was found to be more acceptable as compared to other samples having good physico-chemical composition.

**Experiment 3: Establishment of Agro-Processing Centre****Investigators:** Dr. Suresh Chandra, Prof. Samsher, Dr. Neelash Chauhan and Dr. Ramesh Singh**Year of Start:** 2019-20**Objectives**

- To establish Agro-Processing Centre at SVPUA&T, Meerut.
- To organize skill development programmes at Agro-Processing Centre for rural youths, women and farmers of western U.P. in order to enhance their income.

**List of Equipments Procured Under Establishment of Agro Processing Centre at SVPUAT Meerut**

(1) Abbe Refractometer	(25) Fruit and vegetable slicer	(49) Pickle mixer
(2) Air screen cleaner	(26) Fruit crusher	(50) Potato slicing machine
(3) Autoclave	(27) Fruit pressure tester	(51) Pouch sealing machine
(4) Automatic fat analyzer	(28) Fruit pulper	(52) Refractometer
(5) Automatic Protein Analyzer	(29) Grain cleaner/grader	(53) Refrigerated Shaking incubator
(6) Bag filling machine	(30) Heat sealing machine	(54) Refrigerators
(7) Baking oven	(31) Hot air oven	(55) Shrink wrapping machine
(8) Blanching machine	(32) Induction	(56) Sieve shaker
(9) BOD incubator	(33) Laptop	(57) Smoke point apparatus
(10) Centrifuge	(34) LCD projector	(58) Softening point apparatus
(11) Cleaveland flashpoint and fire point apparatus	(35) Maize sheller	(59) Spectrophotometer
(12) Colour meter	(36) Mango cutting machine	(60) Spice grinder
(13) Dal Milling	(37) Mechanical expeller	(61) Steamer
(14) Dalia making machine	(38) Microwave	(62) Stitching machine
(15) Deep freezer (-18°C)	(39) Mini Rice mill	(63) Texture analyzer
(16) Dicer	(40) Muffle furnace	(64) Thermo Anemometer
(17) Digital humidity and thermometer	(41) NIR	(65) Vacuum packaging machine
(18) Digital melting point apparatus	(42) Noodle making machine	(66) Verneir calipers
(19) Digital pH meter	(43) Oil bath	(67) Viscometer
(20) Digital temperature/humidity meter	(44) Oil filter	(68) Water bath
(21) Electronic balances	(45) Oil Fryer	(69) Weighing balance
(22) Fibre extractor	(46) Penetrometer	(70) Whiteness meter
(23) Flour mill (Atta Chakki)	(47) Pensky marten flash point apparatus	
(24) Fruit and vegetable juicer	(48) Photocopier machine	

**Skill development training program proposed at Agro-Processing Centre for rural youths, women and farmers of western U.P.**

- Month & year : August, 2021
- Duration: 3 days
- No. of training proposed: 02
- No. of candidates: 20-25 (each training)

## Action Plan for Kharif-2021

**Experiment 1:** Development of Biscuits containing Flaxseed and Moringa leaf powder as ingredients

**Investigators:** Dr. Neelash Chauhan, Dr. Suresh Chandra and Prof. Samsher

**Year of Start:** 2021-22

**Design:** RBD

**Replications :** 03

**Objectives:**

- To standardize and develop the methodology of biscuits
- Quality evaluation of developed biscuits containing Flaxseed and Moringa leaf

**Year of Start:**2021-22

**Treatments:** Wheat flour: Flaxseed powder: Moringa leaf powder  
(100:0, 90: 5:5, 80:10:10; 70:15:15]

**Observations:** Moisture content, fat, protein, fibre content, and sensory evaluation  
(colour, flavor, taste, and overall acceptability)

**Experiment 2:** Studies on Zero Energy Cool Chamber (ZECC) for the storage of Fruits and Vegetables

**Investigators:** Dr. Suresh Chandra, Dr. Neelash Chauhan and Prof. Samsher

**Year of Start:**2021-22

**Replications:** 03

**Objectives:**

- To study the effect of storage on physiological loss in weight (PLW)
- To assess the effect of storage on colour intensity of fruits and vegetables

**Storage methods** : 03 (Zero energy cool chamber, Refrigerator, ambient temperature)

**Commodity** : 02 (Fruits and vegetables)

**Observations:**

Moisture content (%), Weight (g), Volume (cc), % shrinkage, % Physiological Loss in Weight (PLW),  
Colour intensity and Temperature

## College of Veterinary and Animal Science

<b>S.No.</b>	<b>Name</b>	<b>Designation</b>
1.	Dr. Rajbir Singh	Dean, CoVAS
2.	Dr. Kuldeep Kumar Tyagi	Associate Professor
3.	Dr. Atul Kumar	Assistant Professor
4.	Dr. Devesh Kumar Yadav	Assistant Professor
5.	Dr. Debashis Roy	Associate Professor
6.	Dr. Ajit Kumar	Assistant Professor
7.	Dr. Vijay Singh	Professor
8.	Dr. Manish Kumar Shukla	Associate Professor
9.	Dr. Akhil Patel	Assistant Professor
10.	Dr. Atul Kumar Verma	Assistant Professor
11.	Dr. Veer Pal Singh	Associate Professor
12.	Dr. Akhilesh Kumar Verma	Assistant Professor
13.	Dr. Pramila Umaraw	Assistant Professor
14.	Dr. Dharendra Kumar	Professor
15.	Dr. Amit Kumar	Professor
16.	Dr. Manoj Kumar Singh	Assistant Professor
17.	Dr. Ahmad Fahim	Assistant Professor
18.	Dr. Rachna Verma	Professor & Head
19.	Dr. Rajesh Mandil	Associate Professor
20.	Dr. Shweta Anand	Assistant Professor
21.	Dr. Vivek Malik	Associate Professor & OIC
22.	Dr. Vineet Kumar	Assistant Professor
23.	Dr. Surbhi Kuldeep Tyagi	Assistant Professor
24.	Dr. Alok Kumar Dixit	Associate Professor & OIC
25.	Dr. Prem Sagar Maurya	Assistant Professor
26.	Dr. Shivani Sahu	Assistant Professor
27.	Dr. Mohd. Ameer khan	Associate Professor & OIC
28.	Dr. Jitendra Pratap	Assistant Professor
29.	Dr. Prabhakar Kumar	Associate Professor & OIC
30.	Dr. Prashant M. Gedam	Associate Professor
31.	Dr. Mohd. Yousuf Dar	Assistant Professor
32.	Dr. Aditya Kumar	Assistant Professor
33.	Dr. Rakesh Kumar Singh	Associate Professor & OIC
34.	Dr. R. A. Siddique	Associate Professor
35.	Dr. Gulab Chandra	Assistant Professor
36.	Dr. Koushlesh Ranjan	Assistant Professor
37.	Dr. Mahesh Kumar Bharti	Assistant Professor
38.	Dr. Arbind Singh	Assistant Professor
39.	Dr. Ashutosh Tripathi	Assistant Professor
40.	Dr. Ram Kumar Singh	Assistant Professor
41.	Dr. Taraun Kumar Sarkar	Professor & Head
42.	Dr. Amit Kumar Verma	Associate Professor
43.	Dr. Vipul Thakur	Assistant Professor
44.	Dr. Desh Deepak	Assistant Professor
45.	Dr. Vinod Kumar Varun	Assistant Professor
46.	Dr M.V. Jithin	Assistant Professor
47.	Dr. Ajit Kumar Singh	Assistant Professor
48.	Dr. Jeny K John	Assistant Professor
49.	Dr. Rajeev Singh	Professor & Head
50.	Dr. Harshit Verma	Assistant Professor
51.	Dr. Shailja Katoch	Assistant Professor
52.	Dr. Akshay Garg	Assistant Professor
53.	Dr. Aarti Bhatele	Professor & Head
54.	Dr. Vakas Jaiswal	Assistant Professor
55.	Dr. Naresh Chandra	Assistant Professor
56.	Dr. Shriya Rawat	Assistant Professor & OIC

# **Progress Report for Rabi-2019-20**

## **Experiment: 1**

**Title:** Study of feeding practices of dairy animals in small holder production system in Western U.P.

**Investigators:** Dr. Nazim Ali, Dr. Rajbir Singh, Dr. D. S. Sahu, Dr. Debashis Roy and Dr. Ahmad Fahim

**Year of Start:** 2019-20

### **Objectives:**

- To study the existing feeding and management practices of dairy animals in small holder production system in western Uttar Pradesh.
- To study the role of women and children in urban and rural areas of western Uttar Pradesh in rearing of livestock.

### **Technical Program:**

Hundred Farmers were selected randomly from the five districts *i.e.* Shahjahanpur, Bareilly, Rampur, Bulandshar and Meerut, from each district ten farmers from urban and ten farmers from rural were selected. A questionnaire (schedule) was prepared by keeping in view the objectives of the study and was common for all the respondents. The data were collected through the personal interview with the help of KVK Scientists. All the responses recorded in the interview schedule were tabulated in the master sheet to describe personal, social and economic characteristics of the dairy animal owners, management practices adopted in dairy husbandry practices. The following statistical tools (Snedecor and Cochran 1989) were used for interpreting the data.

### **Results:**

Majority of dairy farmers having good experience in dairy farming 68 and 86%, in overall, the dairy farmers were having moderate income, followed by low and high income group 48, 42 and 12 % respectively, majority of dairy farmers 64.0 and 66.0% informed that they had fed colostrum to calves 1-2 hours after calving followed by immediately after calving 16.0 and 4.0% and 20.0, 30.0% of dairy farmers fed after two hours of calving, respectively, most of the farmers fed concentrate to their animals, majority of dairy farmers 74.0 and 50.0% fed both dry and green roughages together to their animals, all the respondents providing clean drinking water to their animals the sources of drinking water is only tube well, overall, most of the dairy farmers were practicing chaffing 89.0% and 11.0% of dairy farmers fed un-chaffed fodder to animals in the study area and hay making was practiced by only 28.0 per cent of urban farmers, whereas, majority 52.0% of rural farmers followed the hay making.

82.0%, of respondents followed extra concentrate feeding during advanced pregnancy while only 18.0% did not provided extra concentrate to their animals, majority 90.0% of dairy farmers practiced feeding of extra concentrate during early lactation and only 10.0 % of dairy farmers did not follow the practice in the study areas.

Majority of dairy farmers in urban and rural areas provided mineral mixture supplementation to their animals 94.0 and 70.0%, respectively, most of dairy farmers used artificial insemination for conceiving their animals.

**Outcome:** This study was carried out during covid 19. Afgan student was able to complete his thesis in time. Study reveals that further training and demonstration are required for farmers for adaptation of new technology in the field of Animal feeding practices.



## Experiment:2

**Title:** Growth performance and immune-biochemical status of growing Murrah buffalo heifers supplemented with astaxanthin and copper

**Investigators:** Dr. D. S. Sahu, Dr. Nazim Ali, Dr. S.P.Yadav, Dr. D.Roy and Gulab chandra

**Year of Start:** 2019-20

### Objectives:

- To observe the effect of astaxanthin and copper supplementation on growth performance of growing Murrah buffalo heifers
- To determine the immune status of growing Murrah buffalo heifers supplemented with astaxanthin and copper
- To find the changes in biochemical profile of growing Murrah buffalo heifers supplemented with astaxanthin and copper

### Technical Program:

Twenty-eight Murrah buffalo heifers (8-15 months old) were selected from the herd maintained at Livestock Research Complex (LRC), SVPUA&T, Meerut (Uttar Pradesh) India, for period of 90 days. Experimental heifers were divided into four groups (n=7) on body weight and age basis. 1. Group 1<sup>st</sup> was acted as a control and fed on basal diet without any astaxanthin and copper supplementation. 2. Group 2<sup>nd</sup> was supplemented with astaxanthin @ 0.20 mg/kg body weight/day. 3. Group 3<sup>rd</sup> was supplemented with copper @ 10 mg/kg DM/heifer/day. 4. Group 4<sup>th</sup> was supplemented with combination of astaxanthin and copper @ 0.20 mg/kg body weight/day +10 mg/kg DM/calf/day for 90 days. Body weight (BW) and dry matter intake (DMI) was measured fortnightly intervals and ADG and FCR were calculated from the BW and DMI. Blood samples were collected fortnightly during study period and the plasma samples were analyzed for immune- biochemical parameters.

### Results:

- The body weight and ADG were significantly higher ( $p<0.05$ ) in T<sub>3</sub> (astaxanthin and copper) as compared to control, whereas did not differ significantly with body weight of T<sub>1</sub> and T<sub>2</sub>.
- The DMI was 2.92, 3.02, 3.06 and 3.15 kg day<sup>-1</sup> in control, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub>, respectively and was found statistically higher ( $P<0.05$ ) in T<sub>3</sub> as compared to control and observed DMI did not vary between T<sub>1</sub> and T<sub>2</sub>
- FCR was 8.19, 7.27, 7.31 and 6.19 in control, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub>, respectively and was reported significantly lowered ( $p<0.05$ ) in T<sub>3</sub> as compared to control, T<sub>1</sub> and T<sub>2</sub> but there was no significant difference observed between FCR of T<sub>1</sub> and T<sub>2</sub>.
- Total leukocyte count (TLC) was observed significantly higher ( $p<0.05$ ) in astaxanthin and copper supplemented group (T<sub>3</sub>) than control but did not differ with other treatment groups.
- Lymphocyte was significantly higher ( $p<0.05$ ) in T<sub>3</sub> with respect to control, T<sub>1</sub> and T<sub>2</sub> but there was no significant difference observed between T<sub>1</sub> and T<sub>2</sub> whereas neutrophil was significantly lowered ( $p<0.05$ ) in T<sub>3</sub> (25.41) in comparison to control (28.77), T<sub>1</sub> (26.53) and T<sub>2</sub> (26.65) group.
- TIG and TAA were significantly higher ( $p<0.05$ ) in T<sub>3</sub> in comparison to other groups but did not differ statistically in T<sub>1</sub> and T<sub>2</sub>.

- Glucose was significantly greater ( $p < 0.05$ ) in T3 (2.99) as compared to control (2.72), T1 (2.79) and T2 (2.83) but glucose level of control did not significantly differ with level of T1 also statistically increased ( $p < 0.05$ ) with respect to control group.
- NEFA, total cholesterol, HDL cholesterol, ALT, AST and ALP were significantly declined ( $p < 0.05$ ) in astaxanthin and copper supplemented group (T3) with respect to other groups but there was no statistical difference observed between astaxanthin (T1) and copper (T2) supplemented group.

**Outcome:** Astaxanthin and copper supplementation were improved growth performance, immune status and liver function in growing Murrah buffalo heifers.

### Experiment:3

**Title:** Influence of betaine supplementation on immune, biochemical and growth performance of Murrah buffalo calves

**Investigators:** Dr. S.P.Yadav, Dr. D. S. Sahu, Dr. Rajkumar and Dr. Gulab chandra

**Year of Start:** 2019-20

#### Objectives:

- To find out the effect of betaine supplementation on growth performance of Murrah buffalo calves.
- To study the immune status of Murrah buffalo calves supplemented with betaine.
- To observe the changes in biochemical profile of Murrah buffalo calves fed with betaine.

#### Technical Program:

Twenty one Murrah Buffalo calves was selected from the herd maintained at Livestock Research Complex (LRC), SVPUAT, Meerut (Uttar Pradesh) India for period of 90 days. Experimental calves were blocked into three groups ( $n=7$ ) on body weight and age basis. Control group was fed on basal diet without any betaine supplementation, whereas group1-was supplementedwith betaine @7 g/calf/day and 2-group will be supplemented with betaine @ 14 g/calf/day. The effect of betaine supplementation during 90 days of experimental period on body weight, body weight gain, feed consumption, feed conversion ratio (FCR), total leukocyte count (TLC), lymphocyte, Neutrophil, total immunoglobulin, total antioxidant activity (TAA) glucose, non-esterified fatty acid (NEFA), total cholesterol, HDL cholesterol, ALT, AST and ALP were estimated.

#### Results:

- The overall average value of body weight was 109.71, 117.97 and 126.69 in control, T1 and T2, respectively and was observed the body weight significantly higher ( $P < 0.05$ ) in T2 than control and T1.
- The average value of feed consumption was significantly higher ( $P < 0.05$ ) in T2 (2.45) with respect to control (2.15) and T1 (2.30).The mean effect of betaine on FCR was significantly lowered ( $P < 0.05$ ) in T2 as compared to control and T1
- The overall mean value of TLC was 9.45, 9.54, and 9.66 in control T1 and T2 respect and there was no statistical difference observed among the groups.
- The overall average value of lymphocyte was differed statistically ( $p < 0.05$ ) among group and observed highest concentration in T2.
- The mean of TIG was significantly higher ( $p < 0.05$ ) in T2 (37.66) in comparison with control (29.91) and T1 (34.07).Overall mean value of TAA was 835.88, 845.94 and 855.31 in control, T1 and T2, respectively revealed that TAA was significantly higher ( $p < 0.05$ ) in T2 group than all other groups.
- Overall mean value of glucose was 55.91, 55.69, and 55.80 in control, T1 and T2, respectively
- The overall mean of NEFA did not differ significantly among the groups and the value was 144.51, 141.99 and 139.13 in control, T1 and T2 respectively.

- The overall mean of total cholesterol did not differ significantly among the groups and the value was 152.97, 151.66 and 150.32, in control, T1 and T2 respectively. The betaine supplementation also did not affect on the mean HDL cholesterol
- The effect of betaine on the mean of ALT activity did not differ significantly among the groups and the value was 17.51, 17.05, and 16.23, in control, T1 and T2, respectively.
- The overall mean of AST did not differ significantly among the groups and the value was 127.67, 127.14 and 126. in control, T1 and T2, respectively.
- The overall the mean value of ALP activity was 9.12, 8.82 and 8.67 in control, T1 and T2, respectively and did not varied significantly among the groups of Murrah buffalo calves.

**Outcome:**

Betaine supplementation is beneficial for Murrah buffalo calves @ 7 g/calf/day but more beneficial @ 14 @ 7 g/calf/day in terms of improvement of growth performance.

**Experiment No. 4**

**Title:** Ultrasonographic study of Abdominal Viscera in Barbari Goats

**Investigators:** Dr. Prafull Kumar Singh and Dr. Vineet Kumar

**Year of Start:** 2019-20

**Objectives:**

- To provide the ultrasonographic findings of abdominal viscera in healthy Barbari goats.

**Technical programme:**

- Animals - Thirty clinically healthy adult Barbari goats of either sex
- Ultrasonographic examination - performed using a digital ultrasound system (EXAGYNE, ECM Noveko International Inc., France) equipped with a 5-12 MHz transducer (L738P). After clipping of hair and liberal application of sonographic gel ultrasonographic examination of rumen, reticulum, omasum, abomasum, intestine and liver was performed. Location, echotexture and or morphometric measurements were taken.

**Results:** Location, echotexture and or morphometric measurements were taken in most of the animals. Location and echotexture of various viscera were illustrated. Ultrasonographic examinations of abdominal viscera were still remained in few animals. After scanning in all the animals, data will be analysed by suitable statistical techniques and results will be presented.

**Experiment No. 5**

**Title:** Evaluation of end-threaded positive & negative profile intramedullary pins for management of long bone fractures in dogs.

**Investigators:** Dr. Mukesh Shivhare (MVSc Student) & Dr. Surbhi K. Tyagi

**Year of Start:** 2019-20

**Objectives:**

- To evaluate the efficacy of positive and negative profile end threaded intramedullary pins for the management of long bone fractures in dogs
- To compare the positive profile and negative profile end threaded intramedullary pins for the management of long bone fractures in dogs.

**Technical programme:**

**Animals:** Ten client owned dogs suffering from fracture of long bones. On presentation history was recorded. Thereafter, clinical and radiographic examinations were performed to confirm type and location of fracture. Animals were randomly divided into two equal groups. Animals of group I were treated with end threaded negative profile intramedullary pins and animals of group II with end threaded positive profile intramedullary pins. Detailed procedures were illustrated in undermentioned figure. Postoperative evaluation was performed on basis of clinical and radiographic examinations. Data from all the animals were collected and in process of statistical analysis.

**Results:**

Qualitatively better healing of fractured bone was observed in animals of group II with end threaded positive profile intramedullary pins.

**Experiment No. 6**

**Title:** Clinical studies on glycopyrrolate, diazepam-fentanyl and xylazine-pentazocine as preanaesthetics to propofol-isoflurane anaesthesia in dogs

**Investigators:** Dr. Chetan Kumar Singh (MVSc Student) & Dr. Vivek Malik (Associate Professor)

**Year of Start:** 2019-20

**Objectives:**

- To find out the better preanaesthetic and induction protocol for isoflurane anaesthesia in dogs undergoing different surgical procedures especially orthopaedic conditions

**Technical programme:**

**Animals:** Twenty four client owned dogs reported for diagnosis and treatment of different surgical conditions. Animals were randomly divided into four equal groups. The different anaesthetic protocols used in different groups have been given below.

S.NO	Groups	Preanaesthetics	Induction	Maintenance
1	T1 (n=6)	Glycopyrrolate (0.005mg/kg)+Diazepam(1mg/kg)+Fentanyl(5µg/kg)	Propofol (2-6mg/kg)	Isoflurane (2-3% in 100% of oxygen)
2	T2(n=6)	Glycopyrrolate(0.005mg/kg)+Xylazine(0.5-1mg/kg)+Butorphanol(0.2-0.4mg/kg)	Propofol (2-6mg/kg)	Isoflurane (2-3% in 100% of oxygen)
3	T3(n=6)	Glycopyrrolate (0.005mg/kg)+Diazepam(1mg/kg)+Fentanyl(5µg/kg)	Propofol (2-6mg/kg)	Sevoflurane (2-3% in 100% of oxygen)
4	T4(n=6)	Glycopyrrolate(0.005mg/kg)+Xylazine(0.5-1mg/kg)+Butorphanol(0.2-0.4mg/kg)	Propofol (2-6mg/kg)	Sevoflurane (2-3% in 100% of oxygen)

**Parameters recorded:****Clinicophysiological parameters:**

Heart rate (bpm)	Respiratory rate (rpm)
Rectal temperature (°F)	Sedation time (min.)
Sedation quality	Induction quality
Recovery quality	

**Haemodynamic parameters**

Blood pressure (mm Hg)	Spo <sub>2</sub> (%)
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**Haematobiochemical parameters**

Complete blood count	Glucose (mg/dl)
Plasma urea nitrogen (mg/dl)	

## Experiment : 7

**Title:** Utilization of rumen digesta waste from slaughter house as an alternative local protein sources for economic ration production and controlling environmental pollution

**Investigators:** Dr. Ajit Kumar and Dr. Ahmad Fahim

**Year of Start:** 2019-20

### Objectives:

- Treated rumen digesta as alternative protein feed sources for ruminants and poultry and optimizing its level for enhancing nutrient utilization and productivity
- Effective disposal of rumen digesta waste from slaughter house
- Control of environmental pollution arising out of decomposition of slaughter house rumen digesta waste

**Technical Programme:** The study was carried out in different phases, concerning the feasibility and effect of varying levels of dried rumen digesta and optimizing its level for increased nutrient utilization and productivity as described below:

- **Collection and treatment of rumen digesta for pathogenic organism:** Collected rumen digesta processed by methods of Sundrying, Ensiling, Ensiling plus sundrying and Sundrying and autoclaving. Among all, the most effective and economically implicated method without affecting much on nutritive value and absence of pathogen bacteria is used for treatment of rumen digesta
- ***In-vitro* evaluation for optimizing the effective levels of treated rumen digesta (TRD) supplementation:** Supplementation of TRD at graded levels *i.e.*, 0, 10, 20, 30, 40 and 50% of basal substrate and evaluation using *in-vitro* gas production technique for substrate degradation kinetics and efficiency of microbial biomass production
- **Evaluation of TRD supplementation in the diet of ruminants for enhanced nutrient utilization and productivity:** Three TRD levels (10, 15 and 20%) be selected based on the result of *in-vitro* study, *i.e.*, in and around the best-performing level of TRD in order to fine-tune the most effective supplemental level under *in-vivo* conditions in ruminants- Barbari goat with 3 month feeding trial and assessment of relevant parameters concerning nutrient utilization, health and productivity.
- **Feasibility of TRD supplementation in poultry diet for economical poultry production:** The experimental diets with inclusion of TRD at 0, 5, 10 and 15% of diet will be formulated and fed to four equal groups of finisher 3 weeks age chicks (coloured chabro) with 5 weeks feeding trial and assessment of relevant parameters concerning feed utilization, health and productivity

**Results:** Treated rumen digesta have a potential and can serve as a promising alternative protein feed stuff particularly during the periods of scarcity (*i.e.* flood, drought etc.) and high cost of conventional feeds for ruminants and poultry. It can be included in Barbari goat diet up to the level of 15% on dry matter basis and the coloured broiler finisher ration up to level of 5% with availability of balanced nutrients as per their requirement without any adverse effect on performance, health status and productivity. However, this inclusion can be increased upto the level of 10% in coloured broiler finisher ration with compromise on economically viability to some extent but overall benefit gets enhance many folds when non-measurable cost gain for improvement of sanitary condition, public health and environment pollution were considered.

**Outcomes:**

- It lead to validating the treated rumen digesta as an alternative feed sources and increase flexibility of low cost ration production particularly during the periods of scarcity and high cost of conventional feeds for economic upliftments of farmers and livestock owners
- The outcome would also lend support for the concern of environmental pollution by animal waste or by-products of slaughter house
- It further reduces concern for hazards that accrue from inadequate waste disposal

**Recommendations:**

Treated rumen digesta can be very effectively used in ruminants' diets in comparison to poultry but improvements observed were not as conspicuous as was expected. These lukewarm responses have been attributed to its low nutritive value because of high presence of partially digested low quality roughages like straws and stovers, thought of major feed ingredient of the slaughter animals. So, it is hypothesized that the response may be more pronounced when treated rumen digesta is fortified with the deficit nutrients particularly energy, mineral and vitamins and thus need further exploration.

**Experiment : 8**

**Title:** Formulation of area specific mineral mixture for Meerut district and effect of its supplementation on the performance of buffalo heifers

**Investigators:** Dr. Debashis Roy

**Year of Start:** 2019-20

**Objectives:**

- To formulate area specific mineral mixture (ASMM) for Meerut district.
- To study the effect of supplementing ASMM on the performance and blood biochemicals of buffalo heifers

**Technical Programme:**

Present study was conducted in two phases *i.e.* phase I and phase II. In phase I, area specific mineral mixture was formulated on the basis of samples collected from different places of Meerut district. In phase II, ASMM was supplemented to Murrah buffalo heifers.

**Phase I:** Total 140 feed samples, 120 fodder samples, 105 water samples, 58 milk samples, 51 blood samples and 29 soil samples were collected. After processing the samples were analysed for different macro and micro elements by Inductively Coupled Plasma (ICP) instrument (instrument name MY2015CQ05 of Agilent Technologies).

**Phase II:** 18 Murrah buffalo heifers were selected from LRC, SVPUAT. Selected animals were allocated randomly into 3 groups having 6 animals in each group. They were randomly divided into three groups (T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub>) of six animals each on the basis of body weight. The nutrient requirements of growing buffalo heifers were met by feeding concentrate mixture, wheat straw and berseem fodder as per standard nutrient requirement for buffaloes. Control or T<sub>1</sub> groups of animals were fed with a roughage based basal diet composed of wheat straw, chaffed green berseem fodder and compounded concentrate mixture at a ratio of 35:40:25 with no mineral mixture supplementation. T<sub>2</sub> group of animals were supplemented with ASMM whereas T<sub>3</sub> group of animals were supplemented with BIS type I mineral mixture along with basal diet.

Growth performance in terms of body weight, body weight gain, body condition score were measured. Monthly blood collection was done to check haematological and blood biochemical parameters.

### Results:

- Among the feeds, wheat bran was found deficient in copper by 15%. Both copper and zinc content in Mustard oil cake was found marginal. Copper was deficient in bajra fodder, berseem fodder and jowar fodder by 7.5%, 30% and 29.3%, respectively. Sugarcane top, bajra fodder, berseem fodder and jowar fodder were found deficient in zinc by 7.3%, 14.67%, 5% and 2%, respectively. Copper and zinc were also found deficient in blood sample by 15.38% and 1.25%, respectively whereas animal milk samples were deficient in copper by 66.67%. Thus, an ASMM was formulated which was fortified with extra copper and zinc over and above BIS type I specification.
- Fortnightly bodyweight gain and average daily gain were found significantly higher ( $P < 0.05$ ) in ASMM and BIS type I mineral mixture supplemented animals than control. Body condition score was found significantly higher in ASMM supplemented animals than control. Digestibility and digestible nutrient intake of crude protein, ether extract, nitrogen free extract, neutral detergent fibre and acid detergent fibre were also not affected by supplementing mineral mixture. Average haemoglobin, PCV, RBC, Lymphocyte and monocyte (%) value increased in mineral supplemented animals than control. TLC and neutrophil (%) reduced in mineral supplemented animals than control. Plasma glucose, total protein, albumin and total immunoglobulin values were found to be more in mineral supplemented animals. Antioxidant assay revealed that super oxidase dismutase, catalase and total antioxidant activities were higher in mineral supplemented animals than control. Thio-barbituric acid reactive substance (TBARS) activity was decreased in mineral supplemented animals than control.

### Outcomes of the experiment (PI/ Scientist provide good quality photograph)

- Most of the feed, fodder, blood, milk and soil samples were found deficient in copper and zinc content. Thus area specific mineral mixture was formulated fortifying with extra copper and zinc over and above BIS type I specification.
- Supplementation of ASMM improved growth performance in terms of body weight gain and body condition score without affecting nutrient utilization of Murrah buffalo heifers. Haematological status and antioxidant activities were also improved in ASMM supplemented heifers without adversely affecting blood metabolites and liver function.
- **Recommendations (if any):** Area specific mineral mixture fortified with copper and zinc is to be supplemented to dairy animals in Meerut district for better productivity and complete exploration of their genetic potential.

Research project of another two MVSc students are not completed yet due to COVID pandemic situation. The details of their projects are given below.

### Experiment : 9

**Title:** Effect of supplementing mannan oligosaccharide on the performance of muzaffarnagari sheep

**Investigators:** Dr. Debashis Roy

### Objectives:

- To study the effect of mannan oligosaccharides supplementation at different levels on nutrient intake and nutrient utilization of Muzaffarnagari sheep
- To access the effect of supplementing mannan oligosaccharides on growth performance and blood biochemicals of Muzaffarnagari sheep

## Experiment : 10

**Title:** Isolation, characterization and assesment of caprine faecal origin *Lactobacilli* as potent probiotic for improving nutrient utilization, health and productivity in goat.

**Investigators:** Dr. Ajit Kumar

### Objectives:

To isolate and develop caprine faecal origin *lactobacilli* probiotic and validation for its safety and functional attributes in goats, the target animals for enhanced nutrient utilization, health and productivity.

## Experiment No. 11

**Title:** Vertically transmitted *T. annulata* induced corneal opacity in bovine calf

**Investigators:** Dr. Amit Kumar Verma, Dr. Arbind Singh, Dr. Prem Sagar Maurya, Dr. Desh Deepak and Dr. Shivani Sahu,

### Objective:

- Diagnosis and clinical management of bovine theileriosis

### Technical Programme

- History and clinical examination of animal followed by laboratory diagnosis to confirm the case of bovine theileriosis in bovine calf. After confirmation, the clinical management of case.

**Results:** The present case reports an unusual case of vertically transmitted *Theileria annulata* induced corneal opacity in day old crossbred cattle calf. The case was presented with history of severe dejection, sternal recumbency, anorexia, pyrexia, clouding of eye and no response to ceftriaxone and meloxicam administration for last two days. Clinical examinations revealed absence of prescapular lymphadenopathy and presence of exophthalmos and corneal opacity. *Fecal* floatation, complete blood count, blood smear and lymph node biopsy examination were performed to make a confirmatory diagnosis. Blood smear reveals presence of several piroplasm organisms in erythrocytes. Case was efficiently and safely managed by using single deep Intramuscular injection of Buparvaquone at the rate of 2.5 mg/kg body weight along with long acting oxytetracycline @ 20 mg/kg body weight every third day along with supportive therapy. The combination was well tolerated by the calf with complete recovery with subsidence of corneal opacity within one week.

### Outcome of Experiment

**Qualitative:** The combination of drugs was well tolerated by the calf with complete recovery with subsidence of corneal opacity within one week.

**Quantitative:** 100% recovery of animals

**Recommendation :** In conclusion, the neonatal calf was diagnosed with congenital occurrence of theileriosis on the basis of age of calf less than the minimum incubation period of Theileriosis i.e. 7 days, the clinical sign of clouding of cornea and absence of disease transmitting vector as well as no enlargement of superficial lymph nodes in the reported case, positive blood smear and lymph node biopsy examination. Corneal opacity is a rare clinical manifestation of theileriosis and should be considered as differential diagnosis for theileriosis.



## Experiment No. 12

**Title:** Studies on clinical intervention of puerperal metritis in Indian water buffaloes (*Bubalus bubalis*) in Meerut, Uttar Pradesh

**Investigators:** Dr. Amit Kumar Verma, Dr. Arbind Singh, Dr. Desh Deepak and Dr. Amit Kumar

### Objective:

- The present study was designed to determine the clinical interventions, clinical signs, bacteriological examination and evaluation of the treatment efficacy of postpartum metritis in Indian water buffaloes

### Technical Programme

- Collection of uterine discharge from recently calved case of metritis in buffaloes
- Isolation and identification of bacteria from uterine discharge.
- Antibiogram of bacterial isolates
- Clinical management of cases with suitable drugs
- Collation and interpretation of data

**Results :** Puerperal metritis is an inflammation of animal uterus around one month of calving. This condition is usually caused by bacterial infection of uterus and considered as one of the most economically important diseases in Indian water buffaloes. The present study was conducted to determine the clinical interventions, clinical signs, bacteriological examination and evaluation of the treatment efficacy of postpartum metritis in Indian water buffaloes. A total of 18 buffaloes with clinical signs of metritis and calving of approximately 1 month were selected for the study and examined clinically including gross external inspection, transrectal palpation of the cervix, uterus and ovaries. Uterine discharges from the uterine lumen of each buffalo were collected for isolation of bacteria. Uterine discharge samples were cultured on general growth media and selective media for bacterial isolation. Bacteria were identified based on colony, morphological, biochemical characteristics and confirmed by PCR based amplification of specific genes. The most prevalent bacteria in uterine discharge were *Escherichia coli* and *Staphylococcus aureus*. Antibiogram revealed that most of the bacterial isolates were sensitive to cefaperazone and gentamicin with sensitivity of 88.88% and 83.33%, respectively. Buffaloes were treated with intrauterine infusion of 2% povidone-iodine and systemically with cefaperazone and hormonal treatment (cloprostenol). Buffaloes with puerperal metritis showed good clinical recovery, uterine involution with this treatment and conceived after artificial insemination.

### Outcome of Experiment

**Qualitative:** *Escherichia coli* and *Staphylococcus aureus* were the most common bacterial pathogen isolated from cases of puerperal metritis in the Indian water buffalo with prevalence of 66.7 and 44.4%, respectively.

**Quantitative:** Out of 18 buffaloes under study, 17 (94.44%) produced clear secretions with no fetid smell after 14 days post-treatment and subsequent estrous, while 01 (5.55%) did not respond to the treatment and continue to produce purulent discharge.

### Recommendation (If any)

Intrauterine infusion of 2% povidone-iodine and systemic injection of cefaperazone and single use of cloprostenol positively affected a cure and uterine involution in buffaloes with puerperal metritis.

## Experiment No. 13

**Title:** Prevalence and clinical management of anaplasmosis in dairy animals

**Investigators:** Dr. T. K. Sarkar, Dr. Amit Kumar Verma, Dr. Arbind Singh and Dr. Amit Kumar

### Objective:

- To study the prevalence of bovine anaplasmosis and associated risk factors in dairy animals of Meerut and adjoining areas
- To analyze the genetic diversity of *Anaplasma* spp. in dairy animals.
- To evaluate the efficacy of herbal preparation in the therapy of bovine anaplasmosis

### Technical Programme

- Collection of blood samples of dairy animals along with epidemiological data
- Sample analysis using blood smear examination, PCR and serological tests
- Selection of animals on the basis of reported medical history, physical and laboratory examination
- Grouping of the animals in three groups viz., Control, Group 1 and Group 2
- Treatment of group 1 with routine drugs as per standard procedures and group 2 with ITK based herbal preparation
- Periodic collection of blood from the animals
- Processing of blood samples in laboratory for the blood smear, PCR and complete blood count
- Analysis of data collected to assess the prevalence, risk factors and efficacy of ITK based herbal preparation
- Collation and interpretation of data

**Results :** Blood samples from 768 cattle were collected from western part of Uttar Pradesh, India for detecting the *Anaplasma* infection. The prevalence of bovine anaplasmosis was 61.58%. Analysis of prevalence of bovine anaplasmosis in dairy animals with respect to species, place, sex and age of animals revealed that the species, place and sex seems to influence the occurrence of *Anaplasma* infection in dairy animals, while age had no influence on the prevalence of bovine anaplasmosis in animals. The sequencing of 16S rRNA gene and the bioinformatic analysis of sequences revealed the existence of three different populations of *Anaplasma* spp. viz., *Anaplasma marginale* and two other *Anaplasma* spp. genetically related to *Anaplasma capra* and *Anaplasma ovis* circulating in the blood of infected cattle. All the field isolates of *A. marginale* from Uttar Pradesh, India were clustered in a single clade with others isolated from Iran, Brazil, Thailand and Israel, while *A. capra* isolates from India established in same clade of *A. capra* reported from Japan, China and South Korea. Search of literature revealed no reports of *A. capra* and *A. ovis* from cattle in India. To the best of author's knowledge, this is the first report of *Anaplasma capra* and *Anaplasma ovis* from bovine in India and indicates the potential of cattle to serve as reservoirs of these pathogens leading to the requirements of further studies of these emerging zoonotic pathogen and their possible zoonotic potential. The present study based results confirmed the *in vivo* effects of cocktail of the three herbs against anaplasma infection in cattle. The feeding of this herb cocktail in diets can be used for prevention and control of *Anaplasma* infection in ruminants, however still a large scale study and substantial research is required to elucidate the potential of anti-anaplasma activity of present cocktail against other protozoans and also in other ruminant species.

### Outcome of Experiment

**Qualitative:** The sequencing of 16S rRNA gene and the bioinformatic analysis of sequences revealed the existence of three different populations of *Anaplasma* spp. viz., *Anaplasma marginale* and two other

*Anaplasma* spp. genetically related to *Anaplasma capra* and *Anaplasma ovis* circulating in the blood of infected cattle.

**Quantitative:** The prevalence of bovine anaplasmosis was 61.58%. Analysis of prevalence of bovine anaplasmosis in dairy animals with respect to species, place, sex and age of animals revealed that the species, place and sex seems to influence the occurrence of *Anaplasma* infection in dairy animals, while age had no influence on the prevalence of bovine anaplasmosis in animals.

**Recommendation :** The feeding of this herb cocktail in diets can be used for prevention and control of *Anaplasma* infection in ruminants, however still a large scale study and substantial research is required to elucidate the potential of anti-anaplasma activity of present cocktail against other protozoans and also in other ruminant species.

### Experiment No. 14

**Title:** Multi Drug Resistant Zoonotic pathogens and their antibiotypes in the clinical cases of bovine diarrhoea

**Investigators:** Dr. T. K. Sarkar, Dr. Amit Kumar Verma, Dr. Amit Kumar and Dr. Arbind Singh,

**Objective:**

- To isolate and identify the common pathogen (*E. coli*, *Klebsiella* spp and *Pseudomonas* spp) from diarrheic cases of cattle.
- To generate antibiotic resistant profile of *E. coli*, *Klebsiella* spp and *Pseudomonas* spp.
- To characterize the *E. coli* at molecular level and their phylogenetic and matrix analysis

**Technical Programme**

- Collection of approximately 45 samples (faeces) from animals (cattle) suffering from diarrhoea.
- Isolation and Identification of *E. coli*, *Klebsiella* and *Pseudomonas* spp.
- Identification of antibiotic resistance pattern of bacterial isolates by disc diffusion method.
- Molecular characterization of *E. coli*

Phylogenetic analysis of *E. coli* spp will be conducted using MEGA version X. Phylogenetic trees will be constructed by aligning against the other published *Anaplasma* sequences using Clustal W-aligned sequences on MEGA-X, using the Maximum-Likelihood method with 1000 bootstrap replications. The pair-wise sequence identity studies of genomes will be performed using Clustal W in Sequence Demarcation Tool (SDT v1.2) (Muhire *et al.*, 2014).

**Statistical analysis:** Collation and analysis of the data using standard epidemiological/statistical methods.

**Results :** In the present study, a total of 47 clinical cases of bovine diarrhoea from LRC, SVPUAT and villages of Meerut and adjoining area, Uttar Pradesh were studied. Faeces samples were collected from all the animals and kept in an ice-cold condition and cultured in the time period of 24 hours. Nearly 68.09%, 29.79% and 12.77% of the faecal samples were positive for *Escherichia coli*, *Klebsiella* spp and *Pseudomonas* spp, respectively. Herd size and age group were found to be significantly associated ( $p < 0.05$ ) with the occurrence of these pathogens. Antimicrobial susceptibility was tested using agar disk diffusion method, and it was found that all the isolates of *E. coli*, *Klebsiella* spp and *Pseudomonas* spp possessed resistance to metronidazole. A high level of resistance was observed against oxytetracyclin, gentamicin, streptomycin and ceftriaxone. In contrast, enrofloxacin and amikacin were effective against *E. coli*, *Klebsiella* spp and *Pseudomonas* spp. The sequencing of 16S rRNA gene and the bioinformatic analysis of sequences revealed the existence of *Escherichia coli* and one as *Escherichia fergusonii* and shared mostly

the same close relatives. The data in the present study contributes to diagnosis, treatment and control of bovine diarrhoea in Uttar Pradesh, India, in particular, and emphasis the need of good managerial practices to avoid the entry of commensal and nosocomial pathogens in host to induce any diseases conditions. The occurrence of *Klebsiella* and *Pseudomonas* can be managed by improving the environmental contamination.

#### **Outcome of Experiment:**

**Qualitative:** Antimicrobial susceptibility was tested using agar disk diffusion method, and it was found that all the isolates of *E. coli*, *Klebsiella* spp and *Pseudomonas* spp. possessed resistance to metronidazole. A high level of resistance was observed against oxytetracyclin, gentamicin, streptomycin and ceftriaxone. In contrast, enrofloxacin and amikacin were effective against *E. coli*, *Klebsiella* spp and *Pseudomonas* spp. The sequencing of 16S rRNA gene and the bioinformatic analysis of sequences revealed the existence of *Escherichia coli* and one as *Escherichia fergusonii* and shared mostly the same close relatives.

**Quantitative:** Out of 47 faecal samples of diarrhoeic animals, the presence of *Escherichia coli* (n=32), *Klebsiella* spp (n=14) and *Pseudomonas* spp (n=6) were confirmed. The overall prevalence of *Escherichia coli*, *Klebsiella* spp and *Pseudomonas* spp were 68.09%, 29.79% and 12.77%, respectively.

**Recommendation:** Enrofloxacin and amikacin may be used for the treatment of bovine diarrhoea in animals. The data in the present study contributes to diagnosis, treatment and control of bovine diarrhoea in Uttar Pradesh, India, in particular, and emphasis the need of good managerial practices to avoid the entry of commensal and nosocomial pathogens in host to induce any diseases conditions. The occurrence of *Klebsiella* and *Pseudomonas* can be managed by improving the environmental contamination.

## **Action Plan for Kharif-2021**

**Experiment 1:** Feeding effect of garlic (*Allium sativum*) and moringa (*Moringa oleifera*) leaves on growth and biochemical parameters in broilers”.

**Investigators:** Dr. Nazim Ali, Dr. Rajbir Singh Dr. D. S.Sahu, Dr. Ahmad Fahim and Dr. M.K. Bharti

### **Objectives:**

- To observe the feeding effect of garlic (*Allium sativum*) and moringa (*Moringa oleifera*) leaves on growth performance of broiler production.
- To study the feeding effect of garlic (*Allium sativum*) and moringa (*Moringa oleifera*) leaves on blood biochemical parameters of broiler production.

### **Technical Program:**

One hundred eighty (180), day old broiler chicks will be divided into six treatment groups comprising of three replicates containing 10 birds in each replicate. The birds will be reared in deep litter system. The experiment will be conducted for 6 weeks. There will be six dietary treatments as detailed T1- Basal or Control diet

T2- Basal diet+0.5% garlic

T3- Basal diet + 1 % garlic

T4- Basal diet + 1 % Moringa leaves

T5- Basal diet + 2% Moringa leaves

T6- Basal diet+1% garlic+2% Moringa leaves

#### **A) Growth performance parameters**

1. Weekly body weight
2. Average feed consumption
3. Feed conversion Ratio
4. Protein efficiency
5. Mortality if any

#### **B) Blood biochemical parameters**

1. Plasma total protein
2. Plasma uric acid
3. Plasma alkaline phosphatase (ALP)
4. Plasma glutamate Oxaloacetate Transaminase (SGOT)
5. Plasma glutamate Pyruvate Transaminase (SGPT)
6. Plasma cholesterol

**Experiment 2:** Comparative efficiency of Nano mineral on growth performance, blood bio chemical and carcass characteristics in commercial broiler production

**Investigators:** Dr. Nazim Ali, Dr. Rajbir Singh Dr. D. S.Sahu and Dr. D. Roy

### **Objectives:**

- To observe the effect of supplementing different levels of Nano-zinc on growth performance of commercial broiler production
- To study the effect of supplementing different levels of Nano-zinc on blood biochemical attributes, carcass characteristics and sensory evaluation of meat in commercial broiler

### Technical Program:

Two hundred (200), day old commercial broiler chicks will be divided into five treatment groups comprising of four replicates containing ten birds in each replicate. The birds will be reared in deep litter system. The experiment will be conducted for 6 weeks. There will be five dietary treatments as detailed below:

T1- Basal or Control diet from 0-6 weeks (BIS)

T2- Basal diet with supplementation of inorganic Zn @ 80 ppm/kg diet basal diet

T3- Basal diet with supplementation of zinc nano particle @ 60 ppm/kg diet basal diet

T4- Basal diet with supplementation of zinc nano particle @ 80 ppm/kg diet basal diet

T5- Basal diet with supplementation of zinc nano particle @ 100 ppm/kg diet basal diet

#### A) Growth performance parameters

- Weekly body weight
- Average feed consumption
- Feed conversion Ratio
- Protein efficiency
- Mortality if any

#### B) Bloodbiochemical parameters

Plasma biochemical parameters will be recorded after 6 weeks of age. The following parameters will be studied.

- Plasma total protein
- Plasma uric acid
- Plasma alkaline phosphatase (ALP)
- Plasma glutamate Oxaloacetate Transaminase (SGOT)
- Plasma glutamate Pyruvate Transaminase (SGPT)
- Plasma cholesterol

#### C) Carcass Characteristics

After 6 weeks of age, 6 representative birds from each treatment group will be randomly selected and slaughtered to study the gastrointestinal tract development (proventriculus, gizzard, small intestine, large intestine & caeca) and various slaughter traits as follows:

- Preslaughter fasting shrinkage in live weight
- Dressing yield
- Eviscerated yield
- Ready to cook yield
- Giblet yield (heart, liver & gizzard)
- Yield of individual cut-up parts (thighs, drumsticks, breast, back, neck, wings) as % of live weight
- Sensory evaluation

**Experiment 3:** Effect of feeding *Moringa oleifera* leaves on growth performance of Barbari goat kids

**Investigators:** Dr. Rajbir Singh, Dr. Nazim Ali, Dr. D. S.Sahu, Dr. Amit Kumar and Dr. Ahmad Fahim

#### Objectives:

- To study the effect of feeding *Moringa oleifera* leaves on growth performance, feed consumption and efficiency of feed utilization in Barbari goat kids.
- To study the comparative economics in cost of production performance

#### Technical Program:

Following parameters will be considered to study the effect of feeding *Moringa* leaves in Barbari goat kids.

## A. Performance evaluation of goat kids

### 1. Measurement of body weight

Body weights of the goat kids under study will be recorded at weekly interval. Various stages of growth will be studied as under:

- Initial live weight
- Body weight at fortnightly interval
- Final live weight
- Average daily gain

### 2. Body measurements

Body measurements of all the animals will be recorded with utmost precision to the nearest centimeter scale with the help of measuring tape.. The definition of various body measurements which will be studied are as under.

- Body length (BDL): It will be measured as oblique distance from the point of shoulder to the tip of the pin bone.
- Height at wither (HAW): It will be recorded from the highest point of withers to the ground level taking care that the surface is smooth and leveled.
- Chest girth (CG): It will be recorded as circumference of chest in the mid-sternum region just behind the point of elbow.
- Pelvic width (PW): It will be recorded as the horizontal distance between anterior superior spines of ilia.

### Feed consumption pattern

- Dry matter intake: The average daily dry matter intake per goat kids in all the treatment groups will be calculated from the data of feed intake recorded during the study and the values of average fortnightly dry matter intake.
- Efficiency of feed utilization: Efficiency of the experimental ration were worked out for the entire experimental period by taking into consideration the live body weight gain and feed consumption using following formulae.

**Experiment 4:** Growth, antioxidant and hemato-biochemical status of barbary kids supplemented with vanadium

**Investigators:** Dr. D. S. Sahu, Dr. Nazim Ali, Dr. Rajkumar, Dr. S.P.Yadav and Dr. Gulab Chandra.

### Objectives:

- To observe the influence of vanadium supplementation on growth performance of Barbary goat kids.
- To determine the antioxidant status in Barbary goat kids fed diets supplemented with vanadium.
- To find out the effect of vanadium supplementation on hemato- biochemical status of Barbary goat kids.

### Technical Program:

Number of animals	Group	Diet	Supplementation of vanadium
21 Barbary kids	Control, 7 kids	TMR	No supplementation
	T1, 7 kids	TMR	1.5 mg/kg DM/calf/day for 90 days
	T2, 7 kids	TMR	3.0 mg/kg DM/calf/day for 90 days

### A. Growth Parameters: -

- **Live body weight (BW):** Body weight will be measured by digital electronic balance before start of the experiment, and afterward it will be repeated fortnightly for 90 days of study period.

- **Average daily gain (ADG):** ADG will be calculated from the BW of the experimental animals by following formula-
- $BWG = BW \text{ of current fortnight} - BW \text{ of previous fortnight}$
- **Feed intake (FI):** Feed intake calculated at fortnightly intervals by given formula
- $FI = \text{Offered feed} - \text{Residual feed}$
- **Feed conversion ratio (FCR):** FCR will be calculated at fortnightly intervals as -  $FCR = FI \text{ (kg)} / BWG \text{ (kg)}$

**Experiment 5:** Effect of nickel supplementation on growth performance, antioxidant and blood metabolites of Muzaffarnagari sheep.

**Investigators:** Dr. D. S. Sahu, Dr. Rajbir Singh, Dr. Nazim Ali, Dr. D.Roy and Dr. Gulab Chandra

**Objectives:**

- To observe the effect of nickel supplementation on growth performance of Muzaffarnagari sheep.
- To find out the impact of nickel supplementation on antioxidant status of Muzaffarnagari Sheep.
- To study the effect of nickel supplementation on energy and protein metabolites of Muzaffarnagari sheep.

**Technical Program:**

Number of animals	Group	Diet	Supplementation of Nickel
21 Muzaffarnagarisheep	Control(7)	Basal	No supplementation
	T1(7)	Basal	1.5mg/kg DM/day
	T2(7)	Basal	3.0mg/kg DM/day

**(A) Growth performance**

**Live body weight (BW) and body weight gain (BWG)**

BW will be measured by digital electronic balance of all Muzaffarnagari sheep before start of experiment and repeated at fortnightly intervals for 90 days of experiment period. BWG will be calculated as-

**1. Feed consumption (FC) and feed conversion ratio (FCR)**

FC will be calculated as subtraction of residual feed from offered feed per day at fortnightly intervals. The FCR will be calculated  $FCR = FC \text{ (g)} / BWG \text{ (g)}$

**(B) Antioxidant and immune status**

Blood samples will be collected from jugular vein of Muzaffarnagari sheep on fortnightly interval in the EDTA coated Vacuoller tube at 07.00 a.m. before feeding and watering. Fraction of blood will be used in the estimation of Haemoglobin, total leukocyte counts, lymphocyte and neutrophil. Rest of blood sample will be centrifuged at 3000 rpm for 30 min for separating plasma. The plasma will be stored at -20 °C till further analysis of total immunoglobulin, cholesterol, HDL-cholesterol, thio barbituric acid reactive substances, total antioxidant activity, glucose, non-esterified fatty acids. The haemolysate will be used in the estimation of superoxide dismutase, catalase, and glutathione peroxidase.



**Experiment 6:** Impact of nickel supplementation on growth, antioxidant and immune status of Sahiwal growing heifers”

**Investigators:** Dr. S.P.Yadav, Dr. Rajkumar. Dr. D. S.Sahu and Dr. Gulab Chandra

**Objectives:**

- To observe the impact of nickel supplementation on growth performance of growing Sahiwal heifers.
- To study the antioxidant status in Sahiwal growing heifers supplemented with nickel.
- To determine the immune status of Sahiwal heifers supplemented with nickel.

**Technical Program:**

**(A) Growth performance**

**Live body weight (BW) and body weight gain (BWG)**

BW will be measured by digital electronic balance of all calves before start of experiment and repeated at fortnightly intervals for 90 days of experiment period. BWG will be calculated as-

$$\text{BWG} = \text{BW of current fortnight} - \text{BW of previous fortnight}$$

**(B) Feed consumption (FC) and Feed Conversion Ratio (FCR)**

FC will be calculated as subtraction of residual feed from offered feed per day at fortnightly intervals. The FCR will be calculated  $\text{FCR} = \text{FC (g)} / \text{BWG (g)}$

**(C) Antioxidant and Immune Status**

Blood samples will be collected from jugular vein of calves on fortnightly interval in the EDTA coated Vacutainer tube at 07.00 a.m. before feeding and watering. Fraction of blood will be used in the estimation of hemoglobin, total leukocyte counts, lymphocyte and neutrophil. Rest of blood sample will be centrifuged at 3000 rpm for 30 min. for separating plasma. The plasma will be stored at  $-20^{\circ}\text{C}$  till further analysis of total immunoglobulin, cholesterol, HDL- cholesterol, thiobarbituric acid reactive substances, total antioxidant activity, glucose, non- esterified fatty acids. The haemolysate will be used in the estimation of superoxide dismutase, catalase, and glutathione peroxidase

**Experiment N0: 07**

**Title:** Influence of vanadium supplementation on growth performance, immune-antioxidant and blood biochemical status of growing Murrah buffalo calves

**Investigators:** Dr. S.P.Yadav, Dr. Rajkumar. Dr. D. S.Sahu and Dr. Gulab chandra

**Year of Start:** *Kharif 2021-22*

**Objectives:**

- To observe the influence of vanadium supplementation on growth performance of growing Murrah buffalo calves.
- To study the immune-antioxidant of growing Murrah buffalo calves supplemented with vanadium.
- To find out the effect of vanadium supplementation on hemato- biochemical profile of growing Murrah buffalo calves.

**Technical Program:** Twenty-one growing Murrah calves (6-12 month-old) will be selected from LRC, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut. The calves will be

randomly assigned into three groups ( $n = 7$ ) according to their weight and age. 1. Group 1 will be offered total mixed ration (TMR) without any supplementation of vanadium (V). 2. Group 2 will be offered TMR with V supplementation @ 4.0 mg/kg DM/calf/day for 90 days. 3 Group 3 will offered TMR with V supplementation @ 6.0 mg/kg DM/calf/day for 90 days. The calves will be fed a total mixed ration (TMR) containing concentrate, fodder, and straw in the ratio of 45:35:20 to meet their nutrient requirement as per recommendation of NRC (2001).The calculated doses of V mixed in small amount of concentrate and fed individually for 90 days of study period. Clean and fresh tap water will be provided *ad-lib*. The experiment animals will keep in the tie barn condition without accessing the feed of other animals. The shed will be washed and cleaned daily to prevent the chances of any infections. During the entire period of study, various management practices *viz.*, deworming, washing, grooming and treatment etc. will be followed as per standard procedure of Sardar Vallabhbai Patel University of Agriculture and Technology, Meerut. Duration of experiment will be 90 days.

#### **A. Growth Parameters: -**

a) **Live body weight (BW):** Body weight will be measured by digital electronic balance before start of the experiment, and afterward it will be repeated fortnightly for 90 days of study period.

b) **Average daily gain (ADG):** ADG will be calculated from the BW of the experimental animals by following formula-

$$\text{BWG} = \text{BW of current fortnight} - \text{BW of previous fortnight}$$

c) **Daily feed intake (DFI):** Feed intake calculated at fortnightly intervals by given formula

$$\text{DFI} = \text{Offered feed} - \text{Residual feed}$$

d) **Feed conversion ratio (FCR):** FCR will be calculated at fortnightly intervals for 90 days of study period as-  $\text{FCR} = \text{FI (kg)} / \text{BWG (kg)}$

#### **B. Antioxidant and immune status**

Blood samples will be collected from jugular vein of calves on fortnightly interval in the EDTA coated vacutainer tube at 07.00 AM before feeding and watering. Fraction of blood will be used in the estimation Haemoglobin, PCV, total leukocyte counts, lymphocytes and neutrophils. Rest of blood sample will be centrifuged at 3000 rpm for 30 min for separating plasma. The plasma will be stored at  $-20^{\circ}\text{C}$  till further analysis for glucose non-esterified fatty acid, total immunoglobulin, cholesterol, HDL cholesterol, thiobarbituric acid reactive substance, total antioxidant activity, ALT, AST and ALP. The hemolysate will be used in the estimation of superoxide dismutase, catalase and glutathione peroxidase.

### **Experiment N0: 08**

**Title:** Enhancement in digestibility and nutrient utilization efficiency of paddy straw by ammoniation technique.

**Investigators:** Dr. D. S. Sahu, Dr. Nazim Ali and Dr. D. Roy

**Year of Start:** *Kharif 2021-22*

#### **Objectives:**

- To study the impact of feeding treated paddy straw on the growth performance in cattle and buffalo
- To study the impact of feeding treated paddy straw on the digestibility and nutrient utilization efficiency in cattle and buffalo
- To study the impact of feeding treated paddy straw on the blood biochemical profiles
- To popularization the techniques among farmers by training and demonstration

## **Technical Programme (Year wise) and Methodology:**

### **First year**

- Collection of locally available paddy straw samples.
- Treatment of paddy straw
- Nutritional evaluation of treated paddy straw

### **Second Year**

- (i) A feeding trail will be conducted on growing cattle and buffalo calves for
  - Growth performance
  - Daily dry matter intake
  - Feed conversion efficiency
  - Economics of feeding per kg gain
- (ii) Metabolic trail will be conducted to estimation of
  - Chemical composition of feed and fodders
  - Nutrient utilization efficiency
  - Digestibility of nutrients

### **Third year**

- (i) A feeding trail will be conducted on lactating cattle and buffalo for estimation of
  - Total milk production
  - Chemical composition of milk
  - Economics of per kg. Milk production.
- (ii) Farmers training and demonstration at farmers' door
- (iii) Collection of data and preparation of project report and submission

### **Expected Outcomes:**

- Nutritional improvement of paddy straw through modify technique of crop residues to enhance the performance and production potential of the cattle and buffalo
- Improve the nutrient use efficiency, palatability, digestibility and nutritive value of paddy straw
- Improvement of health, reproduction and production performance of cattle and buffalo
- Minimize the cost of feeding through improved technique of paddy straw for dairy farmers



## Seed Production Farm

S.N.	Name of Staff	Designation
1.	Dr. Gaje Singh	G. M. Farm
2.	Dr. Mukesh Kumar	Assistant Director Farm-B
3.	Dr. Atar Singh	Assistant Director Farm-A

### Progress Report for Rabi-2019-20

Year /crop /variety / class wise seed production details

#### *Kharif 2016 PADDY*

Variety	Class of Seed	Net Weight	Area (Ha)
PB-6	F/S	136.99	
PB-1121	F/S	126.76	
PS-5	C/S	27.4	
PB-1	F/S	205.79	44.00
PB-1509	F/S	79.71	
PS-5	Commercial	147	
<b>Total</b>		<b>723.65</b>	

#### **ARHAR**

UPAS120	T/L	3.68	
UPAS120	F/S	14.35	4.50
<b>Total</b>		<b>18.03</b>	

#### **URD**

PU-40	Commercial	10.6	
PU-31	Commercial	6.0	9.10
<b>Total</b>		<b>16.60</b>	

#### *Rabi 2016-17 WHEAT*

Variety	Class of Seed	Net Weight	Area(Ha)
DBW 88	B/S	167.83	
DBW 90	B/S	100.75	
DBW 71	B/S	50.13	
DBW 226	C/S	196.33	
DBW 17	C/S	89.96	
DBW 590	C/S	125.31	
DPW621-50	T/L	115.87	52.30
DBW-17	B/S	167.12	
DBW-17	C/S	187.05	
DBW-16	B/S	72.32	
PBW226	F/S	164.64	
MIXTURE		59.1	
<b>Total</b>		<b>1496.41</b>	

#### **MUSTARD**

Pusa Bold	T/L	18.72	1.50
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#### **LENTIL**

HUL-57	Commercial	6.3	1.20
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**Kharif 2017 PADDY**

Variety	Class of Seed	Net Weight	Area (Ha)
PB-6	F/S	111.65	
PB-1121	F/S	221.34	
PS-5	F/S	177.97	
P1612	C/S	56.32	
PB-1509	F/S	142	40.70
PB-1	F/S	62.64	
PB-1	C/S	120.6	
MIXTURE		22.0	
<b>Total</b>		<b>914.52</b>	

**ARHAR**

PUAS-992	F/S	9.60	
Pusa-2001	F/S	4.24	3.80
MIXTURE		0.45	
<b>Total</b>		<b>14.29</b>	

**Rabi 2017-18 WHEAT**

Variety	Class of Seed	Net Weight	Area (Ha)
DPW621-50	B/S	91.99	
DBW90	F/S	95.73	
DBW90	B/S	35	
DBW17	B/S	52.36	
DBW71	F/S	162.15	59.60
WR544	F/S	81.74	
PBW226	C/S	244.22	
PBW226	C/S	201.78	
HD2967	F/S	52.93	
HD3086	F/S	110.08	
HD2864	F/S	42.35	
PBW226	T/L	120.74	
DBW88	B/S	159.81	
MIXTURE		40.00	
<b>Total</b>		<b>1490.88</b>	

**MUSTARD**

NRCY 502		3.65	0.40
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**Kharif 2018 PADDY**

Variety	Class of Seed	Net Weight	Area (Ha)
PB-1509	F/S	136.98	
PB-1509	C/S	137.82	
PB-1121	C/S	40.82	
PB-1121	F/S	65.73	
PS-6	F/S	47.28	
PB-1	C/S	75.7	40.80
PB-1	F/S	193.14	
PS-5	C/S	206.1	
P1612	C/S	37.81	
MIXTURE		21.27	
<b>Total</b>		<b>962.65</b>	

**ARHAR**

PUAS-992	F/S	10.77	3.00
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**Rabi 2018-19 WHEAT**

Variety	Class of Seed	Net Weight	Area (Ha)
DBW 17	B/S	36.97	
DBW 17	F/S	123.18	
HD2967	F/S	231.85	61.40
HD2967	C/S	111.40	
DPW621-50	F/S	171.02	
HD3059	F/S	145.77	
PBW226	T/L	351.69	
DBW90	C/S	46.95	
DBW 88	B/S	81.65	
DBW 88	F/S	178.34	
DBW 90	C/S	134.55	
DBW 90	F/S	98.96	
DBW 90	B/S	44.24	
DBW 71	C/S	167.36	
DBW 71	B/S	61.68	
W02	B/S	17.80	
MIXTURE		77.89	
	<b>Total</b>	<b>2081.80</b>	

**MUSTARD**

Variety	Class of Seed	Net Weight	Area (Ha)
PUSA VIJYA	T/L	17.13	
NRCY	T/L	8.32	3.20
	<b>Total</b>	<b>25.45</b>	

**LENTIL**

PUSA VAIBHAV	T/L	3.16	0.50
PUSA VAIBHAV	COMMERCIAL	2.84	
	<b>Total</b>	<b>6.00</b>	

**Kharif 2019 PADDY**

Variety	Class of Seed	Net Weight	Area (Ha)
PB-1509	F/S	70.21	
PB-1509	C/S	156.84	
PB-1121	F/S	89.70	
PS-6	F/S	41.71	
PB-1	F/S	165.45	43.40
PB-1728	C/S	113.75	
PB-1728	F/S	79.45	
PB-1718	C/S	24.20	
PB-1718	F/S	43.00	
PS-5	F/S	66.95	
PB 1637	F/S	85.85	
PB 1637	C/S	61.95	
PB-1121	Commercial	68.60	
	<b>Total</b>	<b>1067.66</b>	

**ARHAR**

PUAS-2016	F/S	2.80	1.20
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**URD**

Sekhar-2	C/S	3.76	4.00
Vallabh Urd 1	B/S	6.30	

**Rabi 2019-20 WHEAT**

Variety	Class of Seed	Net Weight	Area (Ha)
DBW 17	B/S	46.69	61.50
DBW 173	F/S	116.09	
DBW71	F/S	83.19	
HD 2967	C/S	115.04	
HD 2967	F/S	131.00	
DBW 90	F/S	48.15	
DBW 90	C/S	50.73	
DBW 90	B/S	71.83	
Mixture		14.91	
DBW 88	B/S	70.60	
PBW 226	F/S	125.10	
PBW 226	T/L	86.00	
DBW 187	F/S	74.05	
WB 02	F/S	51.10	
HD 3226	F/S	47.15	
DBW71	F/S	141.45	
DBW71	B/S	54.80	
DBW 222	F/S	300.10	
	Mixture	53.25	
	<b>Total</b>	<b>1681.23</b>	

**MUSTARD**

PUSA VIJYA	T/L	29.45	3.00
NRCY 50502	T/L	16.25	1.70

**Kharif 2020 PADDY**

Variety	Class of Seed	Net Weight	Area (Ha)
PB-1509	F/S	221.69	39.50
PB-1509	C/S	188.58	
PB-1121	F/S	135.47	
PB-1	F/S	46.47	
PB-1728	F/S	26.59	
PB-1718	F/S	141.11	
PS-5	F/S	8.18	
PB 1637	F/S	155.06	
	Commercial/ Mixture	21.45	
	<b>Total</b>	<b>944.60</b>	



**Rabi 2020-21 WHEAT**

Variety	Class of Seed	Net Weight	Area (Ha)
DBW 17	B/S	108.84	
DBW 173	F/S	248.97	
DBW71	F/S	222.25	
DBW 90	B/S	32.46	
DBW 90	C/S	43.56	
DBW 88	B/S	34.95	
WB 02	F/S	48.12	61.50
PBW 226	F/S	448.65	
DBW 187	F/S	394.23	
HD 3226	F/S	208.25	
DBW-222	F/S	303.91	
Mixture		66.15	
<b>Total</b>		<b>2160.34</b>	

<b>MUSTARD</b>			
PUSA VIJYA / NRCY 50502	Commercial	40.78	6.5

**Action Plan for Kharif-2021**

S.No.	Name of Crop	Variety	Class of Seed to be Produced	Area of Production (ha)
<b>Chirodi Farm "A" Block</b>				
1.	Rice	PB-1637	Foundation	6.5
		PS-5	Foundation	4.0
		PB-1692	Foundation	1.0
		PB-1509	Foundation	17.5
		PB-1121	Foundation	5.0
		PB-1718	Foundation	6.0
		PB-1	Foundation	4.0
2.	Arhar	Pusa-996	Foundation	2.0
3.	Urd	PU-31/ Shekhar-2	Foundation	2.0
4.	Dhaincha	Pant-1	T/L	4.0
5.	Green manuring			10.0
6.	Land Development/ levelling			6.5
7.	Fellow			2.0

## Seed Processing Unit

S.N.	Name of Staff	Designation
1.	Dr. R. B. Yadav	Nodal Officer, Seed
2.	Dr. S.K. Lodhi	OIC Seed Proc. Plant

### Seed Production Achievements (2019) *Kharif*

Crop	Variety	Breeder Seed (q)		Foundation seed (q)		Certified seed (q)		TFL Seed (q)	
		T	P	T	P	T	P	T	P
		<b>Paddy</b>	PB 1509	-	-	160.00	66.81	0.00	150.78
	PB 1121	-	-	80.00	84.80	-	-	-	-
	PB 6	-	-	40.00	0.00	0.00	39.34	-	-
	PB 1718	-	-	90.00	39.41	0.00	22.36	-	-
	Pusa 1728	-	-	0.00	73.91	0.00	106.62	-	-
	PB 1	-	-	160.00	157.10	80.00	0.00	-	-
	PB 1637	-	-	0.00	79.47	18.00	57.58	-	-
	PS 5	-	-	90.00	63.05	-	-	-	-
<b>Sub Total</b>		-	-	<b>620.00</b>	<b>564.55</b>	<b>98.00</b>	<b>376.68</b>	-	-
<b>Urd</b>	Shekhar 2	-	-	7.00	3.76	-	-	-	-
	VU 1	0.00	3.30	-	-	-	-	-	-
<b>Sub Total</b>		<b>0.00</b>	<b>3.30</b>	<b>7.00</b>	<b>3.76</b>	-	-	-	-
<b>Grand Total</b>		<b>0.00</b>	<b>3.30</b>	<b>627.00</b>	<b>568.31</b>	<b>98.00</b>	<b>376.68</b>	-	-

### Seed Production Achievements (2019-20) *Rabi*

Crop	Variety	Breeder Seed (q)		Foundation seed (q)		Certified seed (q)		TFL Seed (q)	
		T	P	T	P	T	P	T	P
		<b>Wheat</b>	DBW 88	160.00	69.06	160.00	0.00	-	-
	DBW 222	-	-	0.00	293.49	-	-	-	-
	DBW 187	-	-	0.00	72.58	-	-	-	-
	WB 02	65.00	0.00	60.00	50.20	-	-	-	-
	HD 3226	-	-	-	-	-	-	0.00	46.19
	PBW 226	-	-	0.00	122.57	85.00	0.00	180.00	84.28
	HD 2967	-	-	0.00	130.00	270.00	115.04	-	-
	DBW 17	0.00	46.69	-	-	-	-	-	-
	DBW 173	0.00	0.00	0.00	116.09	-	-	-	-
	DBW 90	45.00	71.83	45.00	48.15	0.00	50.73	-	-
	DBW 71	70.00	54.00	70.00	221.76	-	-	-	-
<b>Sub Total</b>		<b>340.00</b>	<b>241.58</b>	<b>335.00</b>	<b>1054.84</b>	<b>355.00</b>	<b>165.77</b>	<b>180.00</b>	<b>130.47</b>
<b>Mustard</b>	Pusa Vijay	-	-	-	-	-	-	0.00	25.03
	NRCYS 0502	-	-	-	-	-	-	0.00	11.36
	YSH-401	-	-	-	-	-	-	0.00	4.50
<b>Sub Total</b>		-	-	-	-	-	-	<b>0.00</b>	<b>40.89</b>
<b>Grand Total</b>		<b>340.00</b>	<b>241.58</b>	<b>335.00</b>	<b>1054.84</b>	<b>355.00</b>	<b>165.77</b>	<b>0.00</b>	<b>171.36</b>

### Seed Production of New Varieties (2019-20)

Crop	Variety / Hybrid	Year of release	Class of seed	Quantity of production (q)
<b>PADDY</b>	PB 1728	2016	Foundation & Certified	180.53
	PB 1637	2016	Foundation & Certified	137.05
	PB 1718	2017	Foundation & Certified	61.77
<b>WHEAT</b>	DBW 187	2019	Foundation	72.58
	DBW 173	2018	Foundation	116.09
	HD 3226	2019	TFL	170.71
	DBW 222	2018	Foundation	293.49
<b>MUSTARD</b>	NRCYS 05-02	2009	TFL	11.36

**List of new varieties / hybrids promoted under this project during last three years**

S.No.	Crop	Varieties/Hybrids
1.	<b>Paddy</b>	Pusa Basmati 1509, PB 1718, PB 1728 and PB 1637
2.	<b>Wheat</b>	DBW 88, DBW 90, HD 3086, WB 02, DBW 222, DBW 173 and DBW 187
3.	<b>Mustard</b>	NRCYS 05-02 and Pusa Vijay

**Varietal Replacement Rate (Rice 3.22 % AND WHEAT 1.62%)**

Crop	New Variety popularized	Year of Release	Quantity of Seed Produced (q)	Old Varieties replaced	Remarks
<b>Paddy</b>	PB 1728	2016	180.53	PB 6	This variety has to blast resistance genes. -do- -do-
	PB 1637	2016	137.05	PB 1	
	PB 1718	2017	61.77	PB 1121	
<b>Wheat</b>	DBW 187	2019	72.58	HD 2967	High yielding and disease resistance -do- -do-
	DBW 173	2017	116.09	PBW 226	
	DBW 222	2018	293.49	PBW 343	

**Capacity Building & Technology Dissemination**

S.No.	Title	No.	Kind of Stakeholders	No. of Beneficiaries
<b>I.</b>	<b>Field day/Seed days</b>	03	Farm women/Farmers	171
<b>II.</b>	<b>Gender Parity in Seed Production</b>			
(i)	Seed Production and Multiplication was carried out mainly by female farmers/labourers.			
(ii)	Male and Female both type labour were involved in seed processing of different class of seed of various crops.			
<b>III.</b>	<b>Employment Generation, Entrepreneurship Development</b>			
	Through the SHG/FPO on seed production program in cluster/cooperative manner the farmers are generating the possibilities of employment. It is not possible for a single small land holding farmer/farm women to establish entrepreneurship but a cluster of farmer with small land holding can establish an entrepreneurship and they can provide the opportunity of the job in different activities of seed production.			

**STATUS OF THE REVOLVING FUND**

**(Rs. In Lacs)**

Financial Year	Amount Sanctioned (A)	Amount Available as on 01 <sup>st</sup> April (B)	Expenditure during the entire year (C)	Gross Income during the entire year (D)	Details of revolving fund Reimbursement (E)	Total Money Available at the End of Financial Year (F)
<b>2005-06</b>	0.00	0.00	0.00	0.00	0.00	0.00
<b>2006-07</b>	20.00	20.00	0.00	0.00	0.00	20.00
<b>2007-08</b>	0.00	20.00	25.69	29.23	0.00	23.54
<b>2008-09</b>	0.00	23.54	60.56	73.75	0.00	36.73
<b>2009-10</b>	0.00	36.73	52.82	115.37	0.00	99.28
<b>2010-11</b>	0.00	99.28	90.07	60.44	0.00	69.65
<b>2011-12</b>	0.00	69.65	59.68	64.36	0.00	74.33
<b>2012-13</b>	0.00	74.33	49.80	58.29	0.00	82.82
<b>2013-14</b>	0.00	82.82	59.95	100.45	0.00	123.32
<b>2014-15</b>	0.00	123.32	79.43	97.00	0.00	140.89
<b>2015-16</b>	0.00	140.89	63.07	44.74	12.00	122.56
<b>2016-17</b>	0.00	122.56	63.15	77.07	8.00	136.48
<b>2017-18</b>	0.00	136.48	55.05	55.01	0.00	136.44
<b>2018-19</b>	0.00	136.44	60.13	91.09	0.00	167.40
<b>2019-20</b>	0.00	167.40	71.33	90.76	0.00	186.83

## Action Plan for Kharif-2021

*Kharif Season- 2020*

Crop	Variety	Class of Seed	Area (ha)	Expected Yield (q)	
				Raw Seed	Processed Seed
<i>Paddy</i>	<b>PB 1509</b>	BS to FS	08	325	243.75
	<b>PB 1509</b>	FS to CS	09	325	243.75
	<b>PB 1637</b>	FS to CS	06	240	180.00
	<b>PB 1692</b>	TL to TL	01	35	26.25
	<b>PB 1</b>	BS to FS	04	140	105.00
	<b>PB 1121</b>	BS to FS	04	140	105.00
	<b>PB 1718</b>	BS to FS	02	70	52.50
	<b>PS 5</b>	BS to FS	04	70	52.50
<i>Arhar</i>	<b>Pusa 2001</b>	FS to CS	02	16	12.00
<i>Urd</i>	<b>PU 31</b>	BS to FS	02	16	12.00
	<b>Shekhar 2</b>	BS to FS	01	8	6.00
<b>TOTAL</b>			<b>43</b>	<b>1065.00</b>	<b>744.50</b>

*Rabi Season*

Crop	Variety	Class of Seed	Area (ha)	Expected Yield (q)	
				Raw Seed	Processed Seed
<i>Wheat</i>	<b>HD 3226</b>	BS to FS	04	120.00	96.00
	<b>DBW 187</b>	BS to FS	04	120.00	96.00
	<b>DBW 88</b>	BS to FS	04	120.00	96.00
	<b>DBW 173</b>	BS to FS	06	180.00	144.00
	<b>DBW 71</b>	BS to FS	06	180.00	144.00
	<b>WB 02</b>	BS to FS	04	120.00	96.00
	<b>DBW 222</b>	BS to FS	15	450.00	380.00
	<b>PBW 226</b>	FS to CS	10	700.00	560.00
<i>Mustard</i>	<b>PM 30</b>	BS to FS	02	20.00	16.00
	<b>NRCYS 05-02</b>	BS to FS	02	20.00	16.00
<i>Lentil</i>	<b>PL 8</b>	BS to FS	02	16.00	12.80
<b>TOTAL</b>			<b>59</b>	<b>2046.00</b>	<b>1656.80</b>

### HRD Component

(Training programmes, Field days, Field demonstrations, Kisan mela, Seed days)

S.No.	Title	No.	Kind of Stakeholders	Expected Beneficiaries
1.	Kisan Mela	02	Public Sector	12,000
2.	Kisan Ghosti	03	Public Sector	300
3.	Field Day	03	Farmers	180
4.	Seed Day	03	Farmers	180
5.	Exhibitions	02	Public Sector	1,000

### Transfer of Technology

- ❖ Farmer's field visit - 20
- ❖ Telephonic conversation with farmer's - Unlimited
- ❖ Lecture in ghosti organized by University and other agencies - As per programme
- ❖ Farmer fair - 01
- ❖ TV/Radio talk - 02

## Research Station, Nagina

SN	Name of Staff	Designation
1	Dr. Rajendra Singh	Jr. Breeder and OIC
2	Dr. Vivek Yadav	Jr. Agronomist( AICRP)

### Progress Report for Rabi-2019-20

**Experiment-1 :** Initial Variety Trial -Basmati. (IVT-BT)

**Year of Start:** 2019-20                      **Design:** RBD                      **Replication:** 02

**Objective:** To study the comparative performance of elite basmati cultivars for yield and quality.

**Results:** Highest grain yield (5318.80 kg/ha) was recorded with entry 1909 followed by entry 1901 (4919.89 kg/ha). Entry 1919 takes less time (95 days) to flowering.

**Experiment-2 :** Advance Variety Trial- Basmati (AVT-1-BT ).

**Year of Start:** 2019-20                      **Design:** RBD                      **Replication:** 02

**Objective:** To study the comparative performance of elite basmati cultivars for yield and quality.

**Results:** Highest grain yield (5128.2kg/ha) was recorded with entry 1825 followed by entry 1808 (5073.6kg/ha). Entry 1823 takes less time (93 days ) to flowering and followed by entry 1824 (93 days).

**Experiment-3 :** Initial Hybrid Rice Trial- Early (IHRT-E).

**Year of Start:** 2019-20                      **Design:** RBD                      **Replication:** 03

**Objective:** To study the comparative performance of elite hybrid rice cultivars for yield and quality.

**Results:** Highest grain yield (7008.74 kg/ha) was recorded with entry 3008 followed by entry 3005 (6466.39 kg/ha). Entry 3019 takes less time (80 days) to flowering and followed by entry 3006 (82 days)

**Experiment-4 :** Initial Hybrid Rice Trial- Early (IHRT-ME).

**Year of Start:** 2019-20                      **Design:** RBD                      **Replication:** 03

**Objective:** To study the comparative performance of elite hybrid rice cultivars for yield and quality.

**Results:** Highest grain yield (8260.3kg/ha) was recorded with entry 3132 followed by entry 3113 (7759.7kg/ha). Entry 3124 takes less time (87 days) to flowering and followed by entry 3707 (88 days).

**Experiment-5 :** Initial Hybrid Rice Trial- Early (IHRT-M).

**Year of Start:** 2019-20                      **Design:** RBD                      **Replication:** 03

**Objective:** To study the comparative performance of elite hybrid rice cultivars for yield and quality.

**Results:** Highest grain yield (7884.8 kg/ha) was recorded with entry 3217 followed by entry 3215 (7175.6 kg/ha). Entry 3212 takes less time (93 days) to flowering and followed by entry 3211&3221 (99 days).

**Experiment-6 :** Evaluation of Rice hybrids under different agroclimatic conditions of U.P.

**Year of Start:** 2019-20                      **Design:** RBD                      **Replication:** 03

**Objective:** To study the comparative performance of elite hybrid rice cultures.

**Results:** Highest grain yield (5787.0 kg/ha) was recorded with entry RH 17 followed by entry RH 19 (5420.4 kg/ha). Entry RH 29 takes less time (86 days) to flowering and followed by entry RH 22 (90days).

**Experiment-7:** Development of new Basmati / non Basmati rice genotypes.

**Objective:** Selection of promising Basmati / non Basmati rice genotypes

**Results:** Highest grain yield (5787.0 kg/ha) was recorded with entry RH 17 followed by entry RH 19 (5420.4 kg/ha). Entry RH 29 takes less time (86 days) to flowering and followed by entry RH 22 (90days).

**Experiment-8 :** Station Trial- Basmati

**Objective:** To study the comparative performance of elite basmati cultivars for yield and quality.

**Results:** Highest grain yield (63.5q/ha) was recorded with entry NVB 6 followed by entry NVB3 (52.5 q/ha). Entry NVB 6 take less time (90 days) to flowering and followed by entry NVB3 (95 days).

#### Yield and other traits *Kh-2020*

Entry No.	Parentage	Days to 50% Mean	Plant Ht. (cm) Mean	Grain yield (q/ha)	Yield superiority over PB 1(%)
NVB 11	P 1121 x PS 5	99	110.0	50.5	9.8
NVB 12	PS 3 x IPB1	107	113.5	51.2	11.3
NVB13	PB 1 X PS 2	98	109.5	52.4	13.9
NVB14	PB 1 x PS 4	101	105.8	42.5	-7.6
NVB15	PB 1X Sarbati	98	106.2	48.36	5.1
NVB16	Sarbati x PS 3	94	100.5	58.8	27.8
NVB17	PS 4 X Type-3	105	110.5	43.3	-5.9
PB 1	Check	111	115.0	46.0	-
T. Bas	Check	115	135.0	28.6	-
P S 4	Check	111	109.0	42.1	-

**Experiment-9 :** Collection, evaluation, selection and maintenance of rice germplasm.

**Objective:** Selection of parents for desirable traits. Selection of high yielding, early maturing and disease resistant rice genotypes.

**Results:** 578 rice germplasm has been maintained.

- 454-scented rice germplasm
- 50-non scented rice germplasm
- 35- Blast resistant germplasm
- 39- BLB resistant germplasm

**Experiment-10 :** Advance varietal trial of wheat (timely sown irrigated condition) under All India Coordinated Wheat Improvement Project (AVT-IR-TS-TAS).

**Year of Start:** 2019-20

**Design:** RBD

**Replication:** 04

**Objective:** Screening of high yielding wheat varieties suitable for North Western Plain Zone of U P. under timely sown irrigated condition.

**Results:** Highest grain yield (7099.5 kg /ha) was recorded with NW-TS-108 followed by NW-TS-102 (7076.4 kg/ha). Entry NW-TS-107 takes less time (139 days) followed by NW-TS-109 (140days) to maturity.

**Experiment-11 :** Advance varietal trial of wheat (Late sown irrigated condition) under All India Coordinate Wheat Improvement Project (AVT-IR-LS-TAS).

**Year of Start:** 2019-20

**Design:** RBD

**Replication:** 04

**Objective:** Screening of high yielding wheat varieties suitable for North Western Plain Zone of U P. under timely sown irrigated condition.

**Results:** Highest grain yield (5921.3 kg /ha) was recorded with NW-LS-211 followed by NW-LS-209 (5226.9 kg/ha). NW-LS-206 takes less time (124 days) to maturity.

**Experiment-12 :** Advance varietal trial of wheat (timely sown restricted irrigated condition) under All India Coordinated Wheat Improvement Project (AVT-RI-TS-TAS).

**Year of Start:** 2019-20

**Design:** RBD

**Replication:** 04

**Objective:** Screening of high yielding wheat varieties suitable for North Western Plain Zone of UP under very late sown condition.

**Results:** Highest grain yield (5939.0 kg /ha) was recorded with NWRI -304 followed by NWRI-301 (5828.7 kg/ha). NWRI 301 takes less time (120 days) to maturity.

**Experiment-13 :** ERA Trial NWPZ-IR-TS under All India Coordinated Wheat Improvement Project.

**Year of Start:** 2019-20

**Design:** RBD

**Replication:** 03

**Objective:** Screening of high yielding wheat varieties suitable for North Western Plain Zone of UP.

**Results:** Highest grain yield (7800.8 kg /ha) was recorded with E12 followed by E-11 (7796.10 kg/ha). E-2 takes less time (135 days) followed by E-5 (137days) to maturity.

**Experiment-14:** Field evaluation of herbicide AP03 (5.1% EC) on weeds flora of wheat along with succeeding crop.

**Year of Start:** 2018-19

**Design:** RBD

**Replication:** 03

**Objective:** To evaluate the bio-efficacy and Phytotoxicity of herbicide AP 03 against grassy weed.

**Treatment:**

Treatment Details	Dosage(gm a.i./ha)
T1- AP 03 (5.1 EC)	40
T2- AP 03 (5.1 EC)	45
T3- AP 03 (5.1 EC)	90
T4- Pinoxaden 5.1 EC	40
T5- Pinoxaden 5.1 EC	45
T6 -Clodinafop 15 WP	60
T7- Untreated control	

**Results:** Highest earhead/m<sup>2</sup> (297.64) and grain yield (46.37 q/ha) was recorded with AP03 @ 45 g.a.i /ha which was significantly superior in earhead/m<sup>2</sup> with other chemicals and at par in grain yield with AP 05 different doses. Lowest weed count and weed dry weight was also found with AP03 @ 45 g.a.i /ha however its difference with AP03 @ 40 g.a.i /ha and AP03 @ 90 g.a.i /ha was at par. Highest WCE was recorded with AP03 @ 90 g.a.i/ha. During the study period none of the tested doses of the test chemical AP 03 indicated any phyto-toxicity symptoms *viz.* yellowing, stunting, hyponasty, epinasty, vein clearing etc .





## Progress Report for Kharif 2020

**Experiment-1** : Nitrogen response trials on selected AVT- 2 MS rice cultures under high and low input management.

**Year of Start:** 2020

**Design:** SPD

**Replication:** 03

**Objective:** To study the grain yield potential of promising AVT-2 MS cultures of rice under high & low input management under transplanted conditions.

**Treatment:**

Main Plot (RFD)

N1 - 50% RFD(40 kg N/ha) (60:30:20, N: P: K Kg/ha)

N2 - 100% RFD (120: 60.40, N: P: K Kg/ha)

B - Sub- plot (Varieties)

V1- IET-27394

V2-IET- 27438

V3-IET- 26227

V4-IET- 27117

V5- IET 27118

V6- KRH-4

V7-WGL-14

**Results:** Incremental dose of Nitrogen increase the number of panicles and grain yield up to 100% RDF, highest number of panicles 281 and grain yield 4.72 t/ha was recorded with 100% RDF. Among varieties highest number of panicles was recorded with - IET-27118 (280) which was at par with IET-27438 (265), KRH-4 (272), WGL-14 (266) and was significantly superior over other varieties/ entries. Highest grain yield was found with Entry IET-27118 (4.84t/ha) which was found significantly superior over other entries and checks under test.

**Experiment-2** : Nitrogen response trials on selected AVT- 2 ASG rice cultures under high and low input management.

**Year of Start:** 2020

**Design:** SPD

**Replication:** 03

**Objective:** To study the grain yield potential of promising AVT-2 ASG cultures of rice under high & low input management under transplanted conditions.

**Treatment:**

Main Plot (RFD)

N1 - 50% RFD (40 kg N/ha) (40:30:20, N: P: K Kg/ha)

N2 - 100% RFD (80: 60.40, N: P: K Kg/ha)

B - Sub- plot (Varieties)

V1- IET-25419

V2-Shobini

V3-Ketkijoha

V4- Rajendra kasturi

**Results:** Incremental dose of Nitrogen increase the number of panicles and grain yield up to 100% RDF, highest number of panicles 249 and grain yield 4.11 t/ha was recorded with 100%RDF. Among varieties highest number of panicles (244) and grain yield (3.78 t/ha) was recorded with IET-25419 as significantly superior over other varieties/ entries.

**Experiment-3 :** Nitrogen response trials on selected AVT- 2 IME rice cultures under high and low input management.

**Year of Start:** 2020

**Design:** SPD

**Replication:** 03

**Objective:** To study the grain yield potential of promising AVT-2 IME cultures of rice under high & low input management under transplanted conditions.

**Treatment:**

Main Plot (RFD)

N1 - 50% RFD (40 kg N/ha) (60:30:20, N: P: K Kg/ha)

N2 - 100% RFD (120: 60.40, N: P: K Kg/ha)

B - Sub- plot (Varieties)

V1- IET-27358

V2-IET- 26126

V3-IR-64

V4- PR-113

V5- HUR 1309

**Results:** Among the fertilizer levels, highest grain yield (4.88 t/ha) and number of panicles (313) was recorded with recommended dose of fertilizer. Among varieties highest number of panicles (319) and grain yield (5.18 t/ha) was recorded with IET 26126 which was significantly superior over other varieties/ entries.

**Experiment-4 :** Weed dynamics under different rice establishment methods

**Year of Start:** 2020

**Design:** SPD

**Replication:** 03

**Objective:** To study weed dynamics in different rice establishment methods and effective weed management practice.

**Treatment:**

Main Plot (Establishment methods)

M1- Transplanting

M2- Puddled direct seeding

M3- Direct dry seeding

B - Sub- plot (Weed management practices)

S1- Weed Free

S2- Weedy Check

S3- Mechanical weeding

S4- Chemical weed control (Pre Fb post emergence herbicide)

**Results:** Among the establishment methods highest number of panicles (361) and grain yield (4.98t/ha) was recorded with transplanting which was found significantly superior over puddled direct seeding and wet direct seeding. Among the different weed management practices highest number of panicles (407) and grain yield 5.14 t/ha was recorded with weed free however its difference in number of panicle (396) and grain yield (4.99 t/ha) with chemical weed control (Pre fb Post emergence herbicide) was statistically at par. Different establishment methods failed to bring any significant difference in weed population and weed biomass. Among the different weed management practices apart from weed free significantly lowest population of weed and weed biomass was recorded with chemical weed control *i.e* Pre fb Post emergence herbicide.

**Experiment-5 :** Nano-fertilizers for increasing nutrient use efficiency, yield and economic returns in transplanted rice.

**Year of Start:** 2021

**Design:** RBD

**Replication:** 04

**Objective:** To study the efficiency of nano-fertilizer in increasing the growth and yield of rice crop and to find out nutrient use efficiency of nano-fertilizers in rice crop.

**Treatment:**

T<sub>1</sub>: Recommended dose of nitrogen (RDN) through urea (recommended P and K)

T<sub>2</sub>: 50% of RDN (Urea) + Two foliar spray Nano-Urea at active tillering and panicle initiation stages

T<sub>3</sub>: 75% of RDN + Two foliar spray Nano-urea (AT and PI)

T<sub>4</sub>: 100 % RDN + Two foliar spray Nano-urea (AT and PI)

T<sub>5</sub>: 125% of RDN + Two foliar spray Nano-urea (AT and PI)

T<sub>6</sub>: Control (no application of fertilizer)

**Experiment-6 :** Evaluation of Imazethapyr herbicide -tolerant Aromatic genotypes under dry direct-seeded condition.

**Year of Start:** 2021

**Design:** SPD

**Replication:** 03

**Objective:** To identify the promising herbicide-tolerant cultivars for enhancing the productivity.

**Treatment:**

Main Plot (herbicide )

T1: Imazethapyr 10% SI (x Dose)

T2: Imazethapyr 10% SI (1.25x Dose)

T3: Imazethapyr 10% SI (2x Dose)

T4: Imazethapyr 10% SI fb Imazethapyr 10% SI (x Dose)

T5: Imazethapyr 10% SI fb Imazethapyr 10% SI (1.25x Dose)

T6: Imazethapyr 10% SI fb Imazethapyr 10% SI (2x Dose)

T7: Pendimethalin fb bispyribacsodium

T8: Weed free (2 HW)

T9: Untreated control

Sub Plots (NIL;s)

G1, G2, G3, G4, G5, G6

**Experiment-7 :** Nitrogen response trials on selected AVT- 2 Biofortified rice cultures under high and low input management.

**Year of Start:** 2020

**Design:** SPD

**Replication:** 03

**Objective:** To study the grain yield potential of promising AVT-2 biofortified cultures of rice under high & low input management under transplanted conditions.

**Treatment:**

Main Plot (RFD)

N1 - 50% RFD (40 kg N/ha) (60:30:20, N: P: K Kg/ha)

N2 - 100% RFD (120: 60.40, N: P: K Kg/ha)

B - Sub- plot (Varieties)

V1- IET 28714

V2- IET 27984

V3- IR 64

V4- Kalanamak

**Experiment-8 : Title:** Nitrogen response trials on selected AVT- 2 ETP rice cultures under high and low input management.

**Year of Start:** 2021

**Design:** SPD

**Replication:** 03

**Objective:** To study the grain yield potential of promising AVT-2 ETP cultures of rice under high & low input management under transplanted conditions.

**Treatment:**

Main Plot (RFD)

N1 - 50% RFD (40 kg N/ha) (60:30:20, N: P: K Kg/ha)

N2 - 100% RFD (120: 60.40, N: P: K Kg/ha)

B - Sub- plot (Varieties)

V1- IET 26790

V2- IET 28329

V3- IET 28354

V4- IET28358

V5- IET 28115

V6- PR-124

V7- Govind

**Experiment-9 :** Bio- efficacy & Phytotoxicity of LAATU on growth and yield of Rice.

**Investigators:** Dr Vivek Yadav (PI) Co PI- Dr Rajendra Singh and Dr Mukesh Kumar

**Year of Start:**

**Design:** RBD

**Replication:** 03

**Objective:** To evaluate bio- efficacy & Standardization of dose of LAATU in rice.

**Treatment:**

T1 LAATU GR (Bio stumulant) 2.5

T2 LAATU GR (Bio stumulant) 5.0

T3 LAATU GR (Bio stumulant) 10

T4 LAATU GR (Bio stumulant) 15

T5 LAATU GR (Bio stumulant) 20

T6 Triacontanol 0.05% E.C 25

T7 Untreated control

**Experiment-10 :** Bio- efficacy & Standardization of dose of Danza Power in Okra.

**Investigators:** Dr Vivek Yadav (PI) Co PI- Dr Rajendra Singh, Dr Mukesh Kumar and Dr D.P. Singh

**Year of Start:**

**Design:** RBD

**Replication:** 03

**Objective:** To evaluate bio- efficacy & Standardization of dose of Danza Power in Okra.

**Treatment:**

T1 Danza Power 100

T2 Danza Power 175

T3 Danza Power 250

T4 Danza Power 325

T5 Danza Power (Phototoxic study) 500

T6 Triacantanol 0.05% E.C 250

T7 Untreated control

## **Action Plan for Kharif-2021**

**Experiment-1 :** Initial Variety Trial -Basmati. (IVT-BT).

**Year of Start:** 2019-20

**Design:** RBD

**Replication:** 02

**Objective:** To study the comparative performance of elite basmati cultures for yield and quality.

**Experiment-2 :** Advance Variety Trial- Basmati (AVT-1-BT).

**Year of Start:** 2019-20

**Design:** RBD

**Replication:** 03

**Objective:** To study the comparative performance of elite basmati cultures for yield and quality.

**Experiment-3 :** **Title:** Initial Hybrid Rice Trial- Early (IHRT-E).

**Year of Start:** 2019-20

**Design:** RBD

**Replication:** 03

**Objective:** To study the comparative performance of elite hybrid rice cultures for yield and quality.

**Experiment-4 :** Initial Hybrid Rice Trial- Early (IHRT-ME).

**Year of Start:** 2019-20

**Design:** RBD

**Replication:** 03

**Objective:** To study the comparative performance of elite hybrid rice cultures for yield and quality.

**Experiment-5 :** Initial Hybrid Rice Trial- Early (IHRT-M).

**Investigators:**

**Year of Start:** 2019-20

**Design:** RBD

**Replication:** 03

**Objective:** To study the comparative performance of elite hybrid rice cultures for yield and quality.

**Experiment-6 :** Evaluation of Rice hybrids under different agroclimatic conditions of U.P.

**Year of Start:** 2019-20

**Design:** RBD

**Replication:** 03

**Objective:** To study the comparative performance of elite hybrid rice cultures.

**Experiment-7 :** Development of new Basmati / non Basmati rice genotypes.

**Objective:** Selection of promising Basmati / non Basmati rice genotypes

**Results:** 63 Basmati and 14 non Basmati SPS will be evaluated during *Kh* 2021

**Experiment-8 :** Station Trial- Basmati

**Year of Start:** 2019-20

**Design:** RBD

**Replication:** 03

**Objective:** To study the comparative performance of elite basmati cultures for yield and quality.

**Experiment-9 :** Collection, evaluation, selection and maintenance of rice germplasm.

**Year of Start:** 2019-20

**Design:** RBD

**Replication:** 03

**Objective:** Selection of parents for desirable traits. Selection of high yielding, early maturing and diseases resistant rice genotypes.

**Results:**

578 rice germplasm has been maintained.

- 454-scented rice germplasm
- 50-non scented rice germplasm
- 35- Blast resistant germplasm
- 39- BLB resistant germplasm

**Experiment-10 :** Initial Variety Trial -ASG. (IVT-ASG)

**Year of Start:** 2019-20

**Design:** RBD

**Replication:** 02

**Objective:** To study the comparative performance of elite ASG cultures for yield and quality.

# Research Station, Ujhani

S. N.	Name	Designation
1.	Dr. S. B. Singh	Prof. Plant Breeding and OIC
2.	Dr. A.K. Chaubey	Prof. Soil Science

## Progress Report for Rabi-2019-20

**Experiment-1** : Collection, selection, evaluation and maintenance of germplasm and segregating populations of groundnut.

**Investigators:** Dr S.B. Singh and Dr A.K. Chaubey

**Year of Start:** 2019-20

**Objectives:** Selection of a donor parents for hybridization. Evaluation of high yielding, early maturing and disease resistant varieties of groundnut.

**Experiment-2** : Effect of potassium and boron nutrition on yields and economic of groundnut (*Arachis hypogaea* L) in light- textured Entisol.

**Investigators:** Dr S.B. Singh and Dr A.K. Chaubey

**Year of Start:** 2019-20

**Design:** RBD

**Replications:** 03

### **Treatments**

A:- Potassium Levels :-

T1. Recommended dose of potassium (RDK by basal)

T2. RDK : ½ by basal + ½ at 45 DAS

T3. 150% of RDK by basal.

T4. 150% of RDK : ½ by basal + ½ at 45 DASB:- Boron

Levels:- 0.0 , 1.0, and 2.0 kg B/ha

**Results:** First year data indicated that application of recommended dose of potassium, half as basal and half as topdressing at 30 DAS +2.0kg B/ha along with recommended N,P&S gave significantly higher pod yield. However, maximum pod yield was recorded with higher level of nutrients application (Table – 2.1).

**Table 2.1 : Pod yield of groundnut (Kg/ha)**

	Potassium		Boron (kg/ha)	
	0.0	1.0	2.0	Mean
RDK (basal)	1250	1479	1563	1431
RDK: ½ basal +½ TD at 30 DAS	1396	1611	1917	1641
150% RDK (basal)	1528	1653	2118	1766
150% RDK: ½ basal +½ TD at 30 DAS	1690	1819	2188	1900
Mean	1467	1641	1946	

**Experiment-3 :** Seed and oil yield of Sesame (*Sesamum indicum* L.) as influenced by Sulphur and Boron nutrition grown in light textured Entisol.

**Investigators:** Dr. A.K. Chaubey, Dr. S. B. Singh

**Year of Start:** 2019-20

**Design:** RBD

**Replications :** 03

**Results:** First year seed yield data (Table 2.2) indicated that application of 40.0 kg sulphur and 2.0 kg boron along with recommended dose of fertilizers gave maximum seed yield of Til and it was significantly higher over all the remaining treatments.

**Table – 2.2 : Seed yield of Til (kg/ha)**

Sulphur (kg/ha)	Boron (kg/ha)			Mean
	0.0	1.0	2.0	
0.0	375	417	439	410
20.0	396	465	500	454
40.0	472	513	550	512
Mean	414	465	496	

**Experiment-4 :** Response of hybrid Pearl millet (*Pennisetum glaucum*) to soil and foliar application of iron and zinc.

**Investigators:** Dr. A.K. Chaubey and Dr. S. B. Singh

**Year of Start:** 2019-20

**Design:** RBD

**Replications :** 03

**Objectives:** To examine the growth and yield response of pearl millet to soil and foliar application of Fe & Zn in loamy sand soil of Mid-western Plains of U.P..

**Treatments**

- Recommended Dose of Fertilizer (100:40:40 kg N, P<sub>2</sub>O<sub>5</sub>, & K<sub>2</sub>O /ha)
- Foliar spray of 0.1% Fe EDTA at 30 & 50 DAS.
- Foliar spray of 0.1% Zn EDTA at 30 & 50 DAS.
- Foliar spray of 0.1% Fe EDTA & Zn EDTA at 30 & 50 DAS
- Soil application of Fe EDTA @ 5.0 kg/ha.
- Soil application of Zn EDTA @ 5.0 kg/ha.
- Soil application of FeSO<sub>4</sub> @ 20.0kg/ha.
- Soil application of ZnSO<sub>4</sub> @ 20.0kg/ha.
- Soil application of Fe & Zn EDTA @ 2.5kg/ha.
- Soil application of 10.0kg FeSO<sub>4</sub> & 10.0kg ZnSO<sub>4</sub>/ha

**Experiment-5 :** Collection, evaluation, selection and maintenance of germplasm and segregating populations.

**Investigators:** Dr. S. B. Singh and Dr. A.K. Chaubey

**Year of Start:** 2019-20

**Design:** RBD

**Replications :** 03

**Variety:** Mustard (*Brassica juncea* L.)

**Objectives:**

- Selection of donar parents for yield and maturity.
- Evolution of high yielding genotypes of mustard suitable for timely/late sowing in mid- western plain zone of U.P.

**No. of Accessions**

No. of germplasm : **25**

No. of segregating populations :

**F<sub>5</sub> - 4**

- PUR 9106 X PHR 1
- PUR 9101 X Varuna.
- PUR 9101 X Pusa bold
- PR 8998 X Varuna

**F<sub>3</sub> - 6**

- PR 96016 X PR 9343
- PR 9601 X Vardan
- PR 9026 X Varuna
- PUR 9503 X Baibhav(v). PR 9696 X

**Advance lines selected for station varietal trial : –**

- PUR 9015 X Varuna (ii). Vardan X PHR-1
- PUR 90-7 X Pusa Agrani (iv). CSR 90-7 X Varuna
- CSR 89-44 X Varuna (vi). CSR 83-139 X Varuna (vi). PR 9203 X PUR 90-7

**Experiment-6 :** Advance varietal trial on late sown irrigated wheat.

**Investigators:** Dr. S. B. Singh and Dr. A.K. Chaubey

**Year of Start:** 2019-20

**Design:** RBD

**Replications :** 04

**Variety:** Wheat

**Objectives:**

Screening of high yielding varieties of wheat suitable for Mid-Western plain zone of U.P.

**Result :** Highest grain yield (45.60 q/ha) was recorded by Entry LS - 206 followed by LS –204 (41.78 q/ha) and LS - 214 (40.86 q/ha) Table no.1.2 .



**Table 1.2: Grain yield of wheat varieties (ls- ir)**

Sl.No.	Varieties Name	Grain yield (q /ha)	
1	LS 201	38.94	
2	LS 202	40.33	
3	LS 203	33.56	
4	LS 204	41.78	II
5	LS 205	27.73	
6	LS 206	45.60	I
7	LS 207	36.92	
8	LS 208	34.95	
9	LS 209	38.89	
10	LS 210	40.00	
11	LS 211	39.41	
12	LS 212	39.93	
13	LS 213	39.58	
14	LS 214	40.86	III
15	LS 215	35.77	
16	LS 216	40.51	
17	LS 217	33.56	

**Experiment-7 :** Advance varietal trial on timely sown irrigated wheat.

**Investigators:** Dr. S. B. Singh, Dr. A.K. Chaubey

**Year of Start:** 2019-20

**Design:** RBD

**Replications :** 04

**Variety:** Wheat

**Objectives:**

- Screening of high yielding varieties of wheat
- Suitable for Mid-Western plain zone of U.P.

**Result :** Highest grain yield (54.22 q/ha) was recorded with variety DBW - 187 followed by HD – 2967 (51.72 q/ha) and DBW- 222 (46.04 q/ha) Table no. 1.3.

**Table 1.3 : Grain Yield of Wheat varieties (TS- IR)**

Sl.No.	Varieties Name	Grain yield (q /ha)	
1	DBW – 88	43.02	
2	DBW – 187	54.22	I
3	HD – 2967	51.72	II
4	WH – 1105	38.70	
5	DBW -222	46.04	III
6	HD – 3086	42.66	
7	TS – 107	41.04	
8	TS – 108	37.55	
9	PBW – 550	39.95	

**Experiment-8 :** Response of Chickpea (*Cicer arietinum*) to Sulphur and Boron nutrition in coarse – textured soils of Mid- Western Plain Zone of U.P..

**Investigators:** Dr. S. B. Singh and Dr. A.K. Chaubey

**Year of Start:** 2019-20

**Design:** RBD

**Replications :** 04

**Variety:** Wheat

**Objectives:** Legumes with their adaptability to different crop- based cropping patterns and their ability to fix Nitrogen may offer opportunities to increase and sustain productivity in any cropping systems. Chickpea is the world's third most important food legume with 96% cultivation in the developing countries. It is one of the most important winter (*rabi*) pulses in India, grown on 8.3 million ha. area, with production of 7.7 million tones registering the productivity of 928 kg/ha.

**Treatments:**

- Levels of Sulphur: 0, 20 & 30 kg/ha Levels of Boron: 0, 1.0 & 1.5 kg/ha
- Recommended Dose of Fertilizers (20: 60: 40 kg N, P<sub>2</sub>O<sub>5</sub> & K<sub>2</sub>O/ ha) for all treatments.

**Results:** Data presented in Table No. 2.1 (A, B & C) clearly indicate that there was a linear increase in grain yield of Chick pea with increasing level of B & S application. Grain yield increased significantly with the application of 1.0 kg B /ha level while, S application did not increased grain yield significantly during 2017 – 18. Significant increase in grain yield with the application of 1.0 kg B /ha & 30.0 kg S /ha level were recorded during 2018 – 19, while during 2019-20, significant increase in grain yield was recorded with the application of 1.0 kg B /ha & 20.0 kg S/ha level. Maximum grain yield was recorded with the application of 1.5 kg B x 30.0 kg S /ha along with R.D.F. during all the year of experimentation but interaction effect of B x S was observed statistically non significant during 2017 – 18 and 2019-20 and significant at 1.0 kg B x20.0kg S /ha level during 2018 - 19.

**Table -2.1A : Grain yield of chick pea (kg/ha) during 2017 – 18**

Fertilizer (kg/ha)	B - 0	B -1.0	B – 1.5	Total
S –o	2489	2850	2947	2762
S-20	2786	3025	3222	3011
S -30	2900	3194	3253	3116
Total	2725	3023	3141	

**Table -2.1B Grain yield of chick pea (kg/ha) during 2018-19**

Fertilizer (kg/ha)	B - 0	B -1.0	B – 1.5	Total
S –o	2378	2606	2850	2611
S-20	2444	2878	2883	2735
S -30	2778	2961	3039	2926
Total	2533	2815	2924	

**Table -2.1C Grain yield of chick pea (kg/ha) during 2019 – 20**

Fertilizer (kg/ha)	B-0	B1	B2	Total
So	2211	2533	2546	2430
S1	2472	2686	2858	2672
S2	2577	2853	2867	2766
Total	2420	2691	2757	

**Experiment-9 :** Growth and yield response of field pea (*Pisum sativum*) to level and mode of application of boron fertilizer in loamy sand soils.

**Investigators:** Dr. S. B. Singh and Dr. A.K. Chaubey

**Year of Start:** 2019-20

**Design:** RBD

**Replications :** 04

**Objectives:** To work out the balance dose of boron for harvesting the maximum grain yield of field pea and to assess the mode of application of boron fertilizer in loamy sand soil.

**Treatments:**

- Control /R.D.F. (20:60:40:20 kg N, P<sub>2</sub>O<sub>5</sub>, K<sub>2</sub>O & S/ ha).
- Boron @ 1.0 kg / ha.
- Boron @ 0.5 kg / ha.
- Boron @ 2.0 kg / ha.
- Boron @ 2.5 kg / ha.
- Boron @ 3.0 kg / ha.
- Boron @ 1.0 kg / ha. + One foliar application of 0.25% Borax at 45 DAS.
- Boron @ 1.5 kg / ha. + One foliar application of 0.25% Borax at 45 DAS.
- Boron @ 1.0 kg / ha. + Two foliar application of 0.25% Borax at 45 & 60 DAS

**Result:** Grain yield data presented in Table No. 2.2 revealed that application of boron along with recommended dose of fertilizers (20:60:40:20 kg N, P<sub>2</sub>O<sub>5</sub>, K<sub>2</sub>O & S/ ha) significantly increased grain yield of field pea. A linear increase was recorded with increasing levels of B application, maximum grain yield (33.33 & 33.86 q/ha, respectively) was recorded with application of 3.0 kg B /ha along with R.D.F.. However, differences among grain yield with increasing levels of boron were statistically at par.

**Table No-2.2 : Grain yield of Field Pea (Q./ha)**

Sl.No.	Treatments	Grain yield(Q./ha)	
		2018 - 19	2019 -20
1.	Control /R.D.F.(20:60:40:20 kg N,P <sub>2</sub> O <sub>5</sub> , K <sub>2</sub> O & S/ ha).	27.33	26.81
2.	Boron @ 1.0 kg / ha.	31.56	32.22
3.	Boron @ 1.5 kg / ha.	31.61	32.44
4.	Boron @ 2.0 kg / ha.	32.31	33.11
5.	Boron @ 2.5 kg / ha.	32.97	33.67
6.	Boron @ 3.0 kg / ha	33.33	33.86
7.	Boron @ 1.0 kg / ha.+ One foliar application of 0.25% Borex at 45DAS.	31.81	32.72
8.	Boron @ 1.5 kg / ha. .+ One foliar application of 0.25% Borex at 45DAS.	32.47	32.89
9.	Boron @ 1.0 kg / ha. + Two foliar application of 0.25% Borex at 45 & 60 DAS.	32.58	33.44

# Research Station, Bulandshahar

S.N.	Name of Staff	Designation
1	Dr. Shiv Singh	Prof. Agronomy and OIC

## Progress Report for Rabi-2019-20

**Experiment-1** : NIVT-1A

**Investigators:** Dr. Shiv Singh

**Year of Start:** 2019-20

**Design:** RBD

**Replication:** 02

**Varieties:** 36

**Objective:** Screening of timely sown high yielding varieties of wheat suitable for NWPZ.

**Treatment:** N-111 yielded the maximum (68.95 q/ha) followed by N-104,117 (64.68, 66.64 q/ha), N 129 was found to be lowest (40.58q/ha).

S.No	Variety	Average yield q/ha
1	N-101	56.50
2	N-102	56.55
3	N-103	45.20
4	N-104	64.68
5	N-105	45.58
6	N-106	62.33
7	N-107	47.87
8	N-108	46.04
9	N-109	57.60
10	N-110	62.16
11	N-111	68.95
12	N-112	53.60
13	N-113	45.16
14	N-114	50.20
15	N-115	52.54
16	N-116	40.93
17	N-117	66.64
18	N-118	47.22
19	N-119	41.29
20	N-120	41.35
21	N-121	58.12
22	N-122	46.35
23	N-123	44.85
24	N-124	54.35
25	N-125	48.14
26	N-126	42.93
27	N-127	45.56
28	N-128	49.89
29	N-129	40.58
30	N-130	47.60
31	N-131	43.85
32	N-132	42.06
33	N-133	45.52
34	N-134	46.87
35	N-135	52.83
36	N-136	46.25

**Experiment-2 : NIVT-1B****Investigators:** Dr. Shiv Singh**Year of Start:** 2019-20**Design:** RBD**Replication:** 02**Objective:** Screening of timely sown high yielding varieties of wheat suitable for NWPZ.**Treatment:** N-212 yielded the maximum (65.72 q/ha) followed by N-209,216,226 (65.31,64.79,65.00 q/ha), N 232 was found to be lowest (41.14q/ha).

S.No	Variety	Average yield q/ha
1	N-201	51.16
2	N-202	55.52
3	N-203	45.66
4	N-204	44.18
5	N-205	42.95
6	N-206	42.81
7	N-207	55.77
8	N-208	64.37
9	N-209	65.31
10	N-210	44.83
11	N-211	60.95
12	N-212	65.72
13	N-213	49.60
14	N-214	61.31
15	N-215	54.47
16	N-216	64.79
17	N-217	51.31
18	N-218	48.54
19	N-219	47.04
20	N-220	43.43
21	N-221	42.00
22	N-222	56.16
23	N-223	49.39
24	N-224	59.47
25	N-225	42.60
26	N-226	65.00
27	N-227	62.08
28	N-228	51.68
29	N-229	43.12
30	N-230	56.64
31	N-231	51.10
32	N-232	41.14
33	N-233	42.50
34	N-234	49.58
35	N-235	41.25
36	N-236	60.10

**Experiment-3 : AVT-RI-TS-TAS****Investigators:** Dr. Shiv Singh**Year of Start:** 2019-20**Design:** RBD**Replication:** 04**Objective:** Screening of timely sown high yielding varieties of wheat suitable for limited irrigation in NWPZ.**Result:** NW-RI-308 yielded maximum grain yield (57.61q/ha) and NW-RI-301, 307 was found to be the lowest (39.16, 39.16 q/ha).

S.No	Variety	Average yield q/ha
01	NW-RI-301	39.16
02	NW-RI-302	47.06
03	NW-RI-303	53.75
04	NW-RI-304	45.83
05	NW-RI-305	43.80
06	NW-RI-306	50.41
07	NW-RI-307	39.16
08	NW-RI-308	57.61
09	NW-RI-309	42.50

**Experiment-4 : AVT-IR-TS-TAS****Investigators:** Dr. Shiv Singh**Year of Start:** 2019-20**Design:** RBD**Replication:** 04**Objective:** Screening of timely sown high yielding varieties of wheat suitable for limited irrigation in NWPZ.**Result:**

NW-TS-104 yielded maximum grain yield (66.54/ha)

NW-TS-108 was found to be the lowest (53.87q/ha).

S.No	Variety	Average yield q/ha
01	NW-TS-101	58.08
02	NW-TS-102	54.04
03	NW-TS-103	65.62
04	NW-TS-104	66.54
05	NW-TS-105	63.62
06	NW-TS-106	65.10
07	NW-TS-107	59.63
08	NW-TS-108	53.87
09	NW-TS-109	63.72

### Experiment No: 05

**Title:** Era Trial

**Investigators:** Dr. Shiv Singh

**Year of Start:** 2019-20

**Design:** RBD

**Replication:** 03

**Objective:** Screening of timely sown high yielding varieties of wheat suitable for NWPZ.

**Result:** E-12 yielded maximum grain yield (66.52/ha) and E-4 was found to be the lowest (42.83q/ha).

S.No	Variety	Average yield q/ha
01	E-1	59.16
02	E-2	47.70
03	E-3	53.72
04	E-4	42.83
05	E-5	59.69
06	E-6	60.20
07	E-7	65.83
08	E-8	58.48
09	E-9	61.65
10	E-10	60.05
11	E-11	64.35
12	E-12	66.52
13	E-13	48.89

### Experiment-6 : NIVT-3A

**Investigators:** Dr. Shiv Singh

**Year of Start:** 2019-20

**Design:** RBD

**Replication:** 02

**Objective:** Screening of Late sown high yielding varieties of wheat suitable for NWPZ

**Result:** N-428 yielded the maximum (62.29 q/ha) followed by N-409,415 (58.70, 58.95 q/ha), N 432 was found to be lowest (40.52q/ha).

S.No	Variety	Average yield q/ha
1	N-401	42.08
2	N-402	44.68
3	N-403	48.33
4	N-404	50.31
5	N-405	48.33
6	N-406	50.31
7	N-407	50.72
8	N-408	48.64
9	N-409	58.70
10	N-410	58.02
11	N-411	48.22
12	N-412	47.33
13	N-413	42.18
14	N-414	57.08
15	N-415	58.95
16	N-416	48.22
17	N-417	57.81
18	N-418	56.45
19	N-419	41.77

20	N-420	47.39
21	N-421	50.52
22	N-422	46.66
23	N-423	56.66
24	N-424	52.81
25	N-425	42.29
26	N-426	54.47
27	N-427	50.10
28	N-428	62.29
29	N-429	43.33
30	N-430	48.22
31	N-431	48.54
32	N-432	40.52
33	N-433	49.58
34	N-434	51.66
35	N-435	43.12
36	N-436	44.27

**Experiment-7 : AVT-IR-LS-TAS**

**Investigators:** Dr. Shiv Singh

**Year of Start:** 2019-20

**Design:** RBD

**Replication:** 04

**Objective:** Screening of Late sown high yielding varieties of wheat suitable for limited irrigation in NWPZ

**Result:** NW-LS-212 yielded maximum grain yield (55.65/ha) and Variety NW-LS-215 was found to be the lowest in yield (34.21q/ha).

S.No	Variety	Average yield q/ha
01	NW-LS-201	48.75
02	NW-LS-202	38.49
03	NW-LS-203	42.09
04	NW-LS-204	51.52
05	NW-LS-205	39.53
06	NW-LS-206	39.08
07	NW-LS-207	37.63
08	NW-LS-208	48.77
09	NW-LS-209	51.66
10	NW-LS-210	49.86
11	NW-LS-211	40.25
12	NW-LS-212	55.65
13	NW-LS-213	50.25
14	NW-LS-214	39.58
15	NW-LS-215	34.21
16	NW-LS-216	36.92
17	NW-LS-217	39.03

**Experiment-8 : Assessment of Poly-4(Polyhalite) for Productivity, quality of Potato and K, S use efficiency in soil of NWPZ of UP**

**Investigators:** Dr. Shiv Singh

**Year of Start:** 2019-20

**Design:** RBD

**Replication:** 03



**Seed production of Wheat RABI 2019-20**

S.No	Variety	Area (ha)	Production (qt)
1	HD-2967	0.80	38.10
2	DBW-17	0.40	19.00
3	DBW-88	0.80	30.80
4	DBW-71	0.40	22.00
5	DBW-90	0.56	19.00
6	WB-02	0.64	26.50
7	Varietal mixture	-	6.80
<b>Total</b>		<b>3.60</b>	<b>162.20</b>

**Progress Report for Kharif-2020**

During *Kharif 2020* three station varietal trials were conducted, one on desi Cotton and two on American cotton .

**1. Kharif 2020 Desi cotton :**

**Design: RBD      Replication: 03      Plot Size : 50 cm x 60 cm x 5 meter**

**Table -1 Evaluation of desi cotton germplasms during kharif 2020**

S.No.	Germplasm	Seed cotton yield kg/ha(2020)
1.	BD-1	1003.00
2.	BD-2	1464.6
3.	BD-3	1273.0
4.	BD-4	1595.7
5.	BD-5	1726.0
6.	BD-6	1416.0
7.	BD-7	1029.8
8.	CAD-3	1258.0
9.	CAD-4	1419.6
10.	CAD-29	1311.2
11.	LD-327	1135.8
12.	HD-123	1077.5
13.	LD-230	1292.8
14.	RG-8	553.3
15.	Lohit	910.8
	CD at 5%	136.0
	CV	23.7%

During 2020, 15 germplasm of desi cotton were evaluation in RBD with 3 Replications in 5 rows plot were 60 cm apart and 5 meter row length. BD 5 produced highest seed cotton yield (1726.00 kg/ha) which was significantly higher than that of all the germplasm were included in the study axcept BD-4 (1595.7kg/ha) where the differences between BD-5 and BD-4 were non significant the study along with the check Lohit (1013.33 kg/ha).

**Table -2 Evaluation of American cotton germplasm during *kharif*-2010**

Trial -I (2020)			Trial- II (2020)		
S.No.	Germplasm	Cotton seed yield kg/ha	S.No.	Germplasm	Cotton seed yield kg/ha
1.	BH-1	1120.00	1	BH-11	1373.33
2	BH-2	1126.70	2	BH-12	1273.33
3	BH-3	980.00	3	BH-13	1300.00
4	BH-4	1060.00	4	BH-14	1480.00
5	BH-5	1140.00	5	BH-15	1080.00
6	BH-6	1066.70	6	BH-16	1160.00
7	BH-7	1133.33	7	BH-17	926.67
8	BH-8	1113.30	8	BH-18	546.67
9	BH-9	1360.00	9	BH-19	1333.33
10	BH-10	1046.70	10	BH-20	1173.33
11	LRA-5166	1053.30	11	BH-21	1313.33
12	Sima	826.70	12	BH-22	566.67
13.	LH-900	1260.00	13	BH-23	920.00
14	Vikas	1113.33	14	BH-24	826.67
15	SH-131	1273.30	15	RS-2013	1006.67
			16	SH-131	1120.00
	CD at 5%	233.33			86.67
	CV	11.98%			13.31 %

American cotton germplasm were evaluation in RBD with 3 replications in plot 5 rows 60 cm apart an 5 meter row length .BH-9 produced highest seed cotton Yield of (1360 kg/ha) followed by BH-2, (1126.7 kg/ha), BH-5 (1140.00kg/ha) BH-7 (1133.3 kg/ha) LH-900 (1260.0 kg/ha) and SH-131 (1273.3 kg/ha) (Trial-1) In second trial with American cotton where 16 germplasm were tested in RBD with 3 replications in plot of 5 rows of 60 cm apart and 5 meter row length . BH-14 produced highest seed cotton yield of 1480 kg/ha which was significantly higher than that of other germplasm included in the study (Trial-2).1.3 Collection and evaluation of cotton germplasm-242 germplasm of deshi cotton and 162 gemplasm of *Amerian* cotton were also maintained by sowing in single row of 5 m length.

#### **Seed production Paddy Kharif-2020**

S.No	Variety	Area(ha)	Production(qt)
1	Pusa-1121	0.40	13.20
2	Pusa-1509	1.20	44.65
3	Pusa-1637	0.364	10.25
	<b>Total</b>	<b>1.964</b>	<b>68.10</b>

#### **Action Plan for Kharif-2021**

Three experiments continued during *Kharif-2021*

Exp: 1 Evaluation of Desi cotton -15 germplasm

Exp: 2 Evaluation of American cotton-15 germplasm

Exp: 3 Evaluation of American cotton -16 germplasm

Collection and evaluation of cotton germplasm-242 germplasm cotton and 162 gemplasm of *Amerian* cotton will also be maintained in single row of 5 m length.