प्रकाशन के लिये नहीं
केवल कार्यालयीन उपयोग हेतु

अखिल भारतीय समन्वित सोयाबीन अनुसंधान परियोजना

(भारतीय कृषि अनुसंधान परिषद्)

53वीं वार्षिक समूह बैठक

मई 16-17 2023

All India Coordinated Research Project on Soybean
(Indian Council of Agricultural Research)

भाकृअनुप
ICAR

53rd Annual Group Meeting (Hybrid mode)

May16-17 2023

कार्यवाही एवं तकनीकी कार्यक्रम (2023-24)

Proceedings and Technical Programme (2023-24)

Coordination and Compilation

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2. Dr Sanjay Gupta, Principal Scientist and I/C AICRPS, ICAR-Indian Institute of Soybean Research, Indore

अखिल भारतीय समन्वित सोयाबीन अनुसंधान परियोजना
All India Coordinated Research Project on Soybean
(भारतीय कृषि अनुसंधान परिषद्)
(Indian Council of Agricultural Research)

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Acknowledgement

I extend our heartfelt gratitude and sincere appreciation to all individuals and organizations who have contributed to the successful completion of the 53rd Annual Group Meeting of the All India Coordinated Research Project on Soybean, held at RVSKVV Gwalior from 16 to 17 May 2023. I am deeply thankful to Dr. Himanshu Pathak, Secretary, DARE, Govt. of India, and Director General, ICAR, for his ceaseless guidance and direction in framing policies and providing necessary infrastructure and support to all of the institutes of ICAR, New Delhi. I acknowledge the permission granted by the Deputy Director General (Crop Science),who not only supported the program but also chaired the inaugural session of the event. I am grateful for your invaluable support and the assistance received from the headquarters of the Indian Council of Agricultural Research (ICAR). My sincere appreciation goes to the Vice Chancellor for providing the venue at RVSKVV Gwalior for hosting the Annual Group Meeting. I am also grateful for his presence as the esteemed chief guest during the inaugural session. I express my gratitude to Dr. Sanjeev Gupta, Assistant Director General (Oilseed and Pulses) from ICAR, for his unwavering support in organizing this event. His assistance and active involvement in all the sessions were instrumental in its success, and I am truly thankful. Special recognition is extended to Dr. Sanjay Sharma, the Organizing Secretary, and all members of the different committees formed for their untiring efforts in ensuring the smooth execution of the event. Your dedication and commitment were pivotal to its success. I extend my gratitude to the Chairman, Co-Chairman, and experts for their valuable technical guidance in evaluating previous research work and formulating the technical program for the upcoming year. Their expertise and insights have greatly contributed to the advancement of soybean research. I would also like to acknowledge the committee members of the Varietal Identification Committee for their thorough discussions and diligent efforts in finalizing the candidate varieties for release in different parts of India. Their commitment to excellence is highly appreciated. My deepest appreciation goes to all the Principal Investigators from various disciplines for presenting research findings from previous years and contributing to the development of the technical program for 2023-24. Lastly, I express our gratitude to all the participants for their active participation, deliberation, discussion, contribution, cooperation, and interaction during the Group Meeting. Their enthusiasm and engagement have made this event a resounding success.

Once again, I extend my sincere thanks to everyone involved in the 53rd Annual Group Meeting of the All India Coordinated Research Project on Soybean.

(Kunwar Harendra Singh)
Director
ICAR-Indian Institute of Soybean Research, Indore

A. Summary Recommendations of 53rd Annual Group Meeting

The recommendations made during 53rd Annual Group hybrid mode meeting of AICRP on Soybean held from May 16-17, 2023 are as follows:

A. Plant Breeding:

a) Varietal Identification:

Zone	Entries
Northern Plain Zone	PS 1670
Eastern Zone	RSC 2011-35
Central Zone	JS 22-12, JS 22-16, NRC 165, NRC 181, NRC 188

B. Agronomy

1. The application of thiourea as foliar spray @ 750 ppm/ha at 20 -25 and 50 -55 days after sowing is recommended across all the zones.
2. Inclusion of maize in crop rotations found beneficial over continuous soybean mono-cropping.
3. Since the difference between minimum and conventional tillage were found non-significant, so minimum tillage is recommended due to high B: C ratio.

C. Entomology:

The combination of *Nomuraea rileyi* @2kg/ha and *Bacillus thuriengiensis* @1kg/ha was found most effective treatment in managing of defoliator insect-pests viz., bihar hairy caterpillar, tobacco caterpillar, semiloopers and leaf webber.

D. OPENING SESSION

The inaugural session of the 53rd Annual Group Meeting of the All India Coordinated Research Project on Soybean commenced under the leadership of Dr. T.R. Sharma, who chaired the event. The session was graced by the esteemed presence of Hon'ble Vice Chancellor of RVSKVV, Gwalior Dr. Arvind Kumar Shukla as the chief guest, along with Dr. Sanjeev Gupta, ADG (Oilseed and Pulses), Dr Kunwar Harendra Singh, Director ICAR-IISR Indore, Dr. Sanjay Sharma, Organizing Secretary & Director of Research at RVSKVV, Gwalior and Dr. Sanjay Gupta, In-charge of AICRP on Soybean. The function witnessed the participation of numerous delegates and employees of the university.

The proceedings began with a warm welcome extended by Dr. Sanjay Sharma, the Director of Research Services at RVSKVV, Gwalior. He greeted the dignitaries, including Dr. T.R. Sharma, DDG (CS) at ICAR, New Delhi, Dr. Arvind Kumar Shukla, the Vice Chancellor of RVSKVV, Gwalior, Dr. Sanjeev Gupta, ADG (O&P) at ICAR-New Delhi, and Dr. K.H. Singh, the Director of ICAR-IISR, Indore. Dr. Sanjay Sharma also extended a warm welcome to all the delegates, faculty and students of RVSKVV who were present.

In his introductory remarks, Dr. Sanjeev Gupta, ADG (O&P), emphasized the significance of soybean as an industrial and medicinal crop. He highlighted how soybean cultivation has brought about a transformative change in the agricultural sector, spreading rapidly from the hills to the Malwa region of Madhya Pradesh, Marathwada and Vidarbha regions of Maharashtra, and the southern region of the country. Dr. Gupta also stressed the major challenge of low productivity and the need for research and development in the country. He emphasized the importance of varietal diversification to overcome the yield stagnation and mentioned specific efforts such as organizing germplasm days, breeding for new horizons, gene pyramiding, and gene editing to enhance the national average.

Dr. K.H. Singh, the Director of ICAR-IISR, Indore, presented the Director's report and provided an update on the action taken on last year's recommendations. He informed the gathering about the newly released varieties that would contribute to improving the national average. The session proceeded with the release of three publications on DUS characters, improved soybean farming, and insect pests on soybean.

The chief guest, Dr. A.K. Shukla, the Honorable Vice Chancellor of RVSKVV, highlighted the research efforts undertaken at ICAR-IISR, Indore, to enhance the area, production, and

productivity of soybean crops in India. He expressed concern over the decline in productivity over the past 10 years, attributing it to the effects of climate change. Dr. Shukla urged the scientists to focus on breeding multiple stress-resistant varieties and varieties suitable for mechanical harvesting. He also emphasized the need for breeding varieties with increased seed weight and seed number per pod.

As the session's chairman, Dr. T.R. Sharma, DDG (Crop Science), emphasized that soybean plays a crucial role in addressing malnutrition in India. He acknowledged that India's low productivity (1200 kg/ha) compared to countries like China is mainly due to the narrow genetic base of soybean crops. Dr. Sharma highlighted the primary reason behind India's lower productivity (1200 kg/ha) compared to countries like China, attributing it to the limited genetic diversity within soybean crops. He emphasized the urgent need to broaden the genetic base through pre-breeding efforts. Furthermore, he extended his congratulations to the scientists at ICAR-IISR for their remarkable achievements in developing KTI and beany flavor-free soybean varieties. Dr. Sharma urged the scientists to utilize advanced breeding techniques such as MAS, GWAS, and haplotype-based breeding to enhance the agronomic foundation of soybean cultivation.

Concluding the session, Dr. Sanjay Gupta, In-charge of AICRP, expressed his gratitude and proposed a vote of thanks to all the participants and contributors who made the inaugural session of the 53rd Annual Group Meeting of All India Coordinated Research Project on Soybean a success.

ब. तकनीकी सत्र की कार्यवाही

B. PROCEEDINGS OF TECHNICAL SESSIONS

A. Proceedings of Plant Breeding And Genetics Resources Session

Chairman : Dr Sanjeev Gupta, ADG (O & P), ICAR, New Delhi

Co-Chairman : Dr K.H. Singh, Director, ICAR-IISR, Indore

Rapporteurs : Dr B.S. Gill and Dr Shivakumar M

At the outset, Dr K.H. Singh, Director, ICAR-IISR, Indore, welcomed the Chairperson. Dr Sanjay Gupta presented results of breeding trials conducted during *kharif,* 2022. He presented the details of different trials *viz*., coordinated trials of IVT, AVT I and AVT II (Normal and early). He also presented the results of pre-breeding, multilocation evaluation of germplasm, National hybridization program and results of vegetable soybean trials. During the session, entries being promoted to next round of various AICRP trials were finalized. The following points were raised during the discussion. After in-depth discussion following recommendations emerged.

1. Rezoning of the AICRPs cenres were discussed in detail, and it was decided that an expert committee will be formulated by ICAR to look into the matter.
2. Quarantined *G. soja* accessions will be tested at hot spots for reaction to various diseases like, YMV, RAB, Charcoal rot, IBB, FLS and rust.
3. The new accessions will be screened with a focus on missed traits in cultivated soybean like rapid grain filling, insect resistance and early maturity.
4. In multilocation evaluation of germplasm top ranking genotypes will be identified for grain yield per plot, early maturity, short inter nodal length and 100 seed weight. The identified donor lines will be crossed with good agronomic base under National hybridization program.
5. The matter regarding rejection of trials based on low grand mean of the trials than the state average yield was discussed and apprehensions were raised about low grand mean due to susceptibility of few genotypes against the diseases which may result in low grand mean of trials. It was decided that the matter shall be further deliberated to reach at an appropriate conclusion in NPZ.
6. Hot spot for specific diseases shall be designated after thorough discussion with plant pathologist.
7. Discussions on designating varieties as AR/HR/R/MR etc. were made. It was decided that trials in which disease incidence on susceptible check is lower than the bench mark, shall be excluded from estimation of average.
8. In Central Zone, yield of IVT normal maturity trial will be rechecked.

9. It was decided to give a relaxation of 2 days on maturity duration over the best check for promotion of entries. On the basis of this relaxation 2 more entries, JS 24-33 and |AMS 2022-1 shall also be promoted from IVT to AVT I (early maturity trial).

10. The entry DS 1547 will be repeated in IVT normal maturity.

11. Following promotion criteria's, as decided by ICAR, were presented in the meeting

- Under the normal maturity group entry shall be promoted on the basis of 10 percent superiority of candidate entry over the best check for grain/oil yield. However, under the early maturity group, entry would be promoted on the basis of numerically at par or less maturity duration than the early maturity check and 10 percent higher grain/oil yield over the best check. It was decided that there would not be extra early trial only early trial would be there.
- Under the food grade category, entry shall be promoted on the basis of at par (numerically) grain yield with the best check and 5 percent superiority over the best food grade variety check for grain yield. Food grade quality for null KTi, null Lox and oleic acid shall be determined on the basis of biochemical analysis for these traits.
- Vegetable soybean trial will continue but collaboration with ICAR-IIVR would be taken and parameters for vegetable type shall be decided. There should be at least 3 participating institutions for contributing entries for constitution of trials for vegetable type.
- Rejection criteria of trial was discussed and **it was decided that trials with more than 20% CV and less than state average (previous three-year average) would be rejected.**
- There will be no separate trial for drought, water logging, salinity. For entries having drought, salinity tolerance and water logging trait will be tested initially in IVT separately in hot spot or for specific traits imposing the stress and entries performed better than best check for those traits for which they are tested will be directly included in AVT-I. All the entries with special traits (salinity, drought tolerance and waterlogging) will be tested in regular yield trials during AVT-I and AVT-II. However, these entries shall be verified for claimed traits at such locations where testing facilities exist.

B. Proceedings of Entomology Session

Chairman	:	Dr. R.K. Pandya, Professor (Plant Pathology), RVSKVV, Gwalior
Co-Chairman	:	Dr. M.L. Sharma, Professor (Entomology), RVSKVV, Gwalior
Expert		Dr Ashwani Basandrai, Ex-Dean, CSKHPKVV, Palampur
Rapporteurs	:	Dr. Nilima Karam, Jr. Entomologist, CAU, Imphal
		Dr. Amar Singh, Principal Scientist, CSKHPKVV, Palampur

The technical session started with welcome address by the Chairman, Dr. R.K. Pandya, Professor (Plant Pathology), RVVRSKVV, Gwalior. Dr Lokesh Kumar Meena, Principal Investigator (Entomology), ICAR-IISR, Indore presented the Annual progress report of seven entomological experiments conducted at 11 coordinated centres across the country. He mentioned about two main research areas focused on by the entomologists i.e. identification of potential sources for resistance/tolerance against major insects-pests and tapping new approaches for insect-pest management and monitoring the incidence of insect-pests and bio-control agents in soybean followed by presentation of technical programme of entomology 2023-24".

The first trial on seasonal incidence of insect-pests of soybean recorded 21 insect species from different zones. In North plain zone, whitefly, *Spodoptera litura*, stem fly and aphids, in North eastern hill zone, Bihar hairy caterpillar, leaf webber, aphids, in Central zone, stem fly, semiloopers, tobacco caterpillar and girdle beetle and in southern zone, pink pod borer and leaf folder were the major pests of concern. He also reported the potential of natural bio-control agents (entomopathogenic fungus, *B. bassiana* and *N. rileyi*) in suppression of insect-pests population in the coordinated centres.

Dr. Meena informed that emphasis was given on identification of insect resistant/tolerant genotypes through field and laboratory screening by employing different methods. Genetic material (entries of IVT, AVT-I, AVT-II, germplasm lines) were tested under natural infestations at hot spots. Potential sources identified in field screening trials and AVT-II

entries were further tested under laboratory condition using antixenosis and antibiosis criteria. Dr Meena mentioned several promising genotypes for insect resistance/tolerance. Antixenosis and Antibiosis studies were taken up with AVT-II entries. None of the genotypes was found to exhibit strong antixenosis reaction against test insect *S. litura*. On the basis of various digestibility indices viz. approximate digestibility (AD), efficiency of conversion index (ECI) and efficiency of conversion of digested food (ECD), entries NRC 165 and PS 1670 were found good antibiosis. While presenting the results of management of insect-pests with microbial consortia to widen the scope of insect management, he stated that variability in efficacy was observed across the locations, and explained that it could be due to varying weather conditions prevailing at these locations as well as it might be due to different concentrations of microbial agents available at different locations in the market. However, the trial is being completed and based on three year's data of 2020, 2021 and 2022, the best microbial combination could be identified and recommended for management of soybean defoliator pests.

The trial on evaluation of "Management of major defoliators of soybean through intercropping with Suva, *Anethum graveolens"* in different rows combinations of soybean with suva was conducted at four centres and it was found that combination of soybean+suva (3 soybean: 2 suva: 3 soybean rows combination) found significantly superior in defoliators population management.

The session ended with thanks to the Chairman, Co-chairman, Expert and Rapporteurs.

Recommendation of Entomology 2023: The combination of *Nomuraea rileyi* @2kg/ha and *Bacillus thuriengiensis* @1kg/ha was found most effective treatment in managing defoliator insect-pests viz., bihar hairy caterpillar, tobacco caterpillar, semiloopers and leaf webber.

Suggestions

A. Re-evaluation of promising germplasm line of previous years along with new germplasm lines against major insect-pests of soybean.

B. Prepare insect distribution map of soybean across the country.

C. Proceedings of Plant Pathology Session

Chairman	:	Dr. R.K. Pandya, Professor (Plant Pathology), RVSKVV, Gwalior
Co-Chairman	:	Dr. M.L. Sharma, Professor (Entomology), RVSKVV, Gwalior
Expert		Dr Ashwani Basandrai, Ex-Dean, CSKHPKVV, Palampur
Rapporteurs	:	Dr. Nilima Karam, Jr. Entomologist, CAU, Imphal
		Dr. Amar Singh, Principal Scientist, CSKHPKVV, Palampur

The technical session commenced with a warm welcome from the Chairman, Dr. R. K. Pandya, followed by the presentation of research results by Dr. K. P. Singh, Professor & PI Plant Pathology from G B Pant University of Agriculture & Technology, Pantnagar. During his presentation, Dr. Singh shared the findings of nine coordinated plant Pathology experiments conducted at 14 coordinated centres of AICRP on soybean in six zones. He highlighted that a total of 17 diseases were identified on soybean, with Anthracnose/ Pod blight, YMV, and Rusts being the most widely prevalent and destructive. Different coordinating centres recorded varying levels of disease incidence, with Jabalpur having the highest number of diseases (09), Pantnagar and Amravati recording seven diseases each, and Indore and Dharwad observing five diseases. In terms of disease prevalence in different zones, YMV, RAB, and Anth/ PB (ct) were major concerns in North Plain Zone, RAB and Anth/ PB (ct) in North Eastern Hill Zone, YMV, SMV, BP, Anth/ PB (ct), and RAB in Central Zone, Rust and Anth/ PB (ct) Southern Zone, FLS in North Hill Zone, and Anth/ PB (ct) and IBB in Eastern Zone.

Dr. Singh also discussed the outcomes of the trap nursery trail, where the highest disease severity was observed on susceptible varieties for different diseases in different locations. The highest severity of CR and YMV was reported at Jabalpur, anthracnose and Rhizoctonia arial blight at Indore, frogeye leaf spot at Sehore, rust at Dharwad, frogeye leaf spot and anthracnose at Palampur, RAB and pod blight at Pantnagar appeared on susceptible varieties. However, some entries were found to have a resistant reaction against the diseases in IVT. The majority of diseases - such as RAB at Pantnagar, Medziphema, and Jorhat; CR, ALS, and BP at Amravati; YMV at Pantnagar, Amravati, and Jorhat; BP at Indore; PSS at Dharwad and Ugarkhurd centre; and SMV at Ludhiana centre - appeared to be resistant to moderately resistant. However, these results were deemed unreliable due to low disease pressure in test

entries, as well as the susceptible check in IVT trials. Conversely, Dharwad, Ugarkhurd, and K. Digraj centre for Rust, K. Digraj for Pod blight, and IBB at Raipur centre appeared to be susceptible to highly susceptible in both susceptible checks and test entries. During the Initial Varietal Trial (Early), the entries RSC 11-75 exhibited high resistance to MLS, CR, Anth, RAB, and YMV. Similarly, in the Advance Varietal Trial-1, multiple entries - including NRC 189, NRC 190, RSC-11-42, JS 23-09, and JS 23-03 demonstrated a high level of resistance against CR and YMV. Additionally, entries RSC 11-75, NRC 152, NRC 261, and AUKS 238 exhibited a high resistance reaction against RAB in the same trial. During the AVT (Early), entries JS 22-12 and JS 22-18 demonstrated an AR reaction against CR, RAB, Anth, MLS, and YMV diseases. Moreover, in long-term evaluations of previous resistant lines, it was revealed that JS-20-98 exhibited resistance reaction against CR, YMV, and RAB. Additionally, in germplasm evaluations, EC 251865 was found to be resistant against PB (ct) and YMV, while EC 333876 showed a resistant reaction against BLB, YMV, and Anth. However, it should be noted that entries of EC 281462 displayed an AR reaction against CR and Anth.

Dr. Singh also discussed the use of microbial insecticides for the management of economically important diseases and explained that seed treatment and foliar spraying with Bacillus sp. EF 53 and Trichoderma viride at different DAS was found effective in managing different diseases and improving yield. Similarly, management of various diseases and improvement in yield were found to be possible with the use of Thiophanate Methyl + Pyraclostrobin and one foliar spray of Tebuconazole at 30, 45, 60 and 75 DAS. Overall, Dr. Singh concluded that full protection of soybean diseases with chemical application could prevent up to 47% of avoidable yield losses. Regarding disease prediction, weather factors play a crucial role in providing reliable forewarning about disease outbreaks. While most of the centres developed disease predictions based on one year, more data is necessary to ensure accurate disease predictions.

During the discussion session chaired by the Chairman, several suggestions were made. Firstly, it was proposed that diseases should be surveyed and tracked using GPS technology to identify disease-free areas. The issue of SMV identification was raised by Dr. S.K. Lal from IARI Delhi and Dr. Sanjeev Gupta proposed that virus diagnosis facilities should be established at IARI Delhi/IISR Indore. The issue of non-availability of seeds was discussed and it was suggested that the Pathologist at IISR Indore should maintain trails. Additionally, it was proposed that resistant lines evaluated under PP-4 trail should be evaluated for three more years under National Genetic stock Nursery Screening. Lastly, Dr. A.K. Basandrai

suggested the development of a pictorial monograph on identification of soybean diseases and emphasized the importance of screening lines exhibiting disease resistance under artificial epiphytotic conditions. The session ended with the Chairman thanking the speaker and delegates for their participation and interaction, followed by a vote of thanks.

The Plant Pathology session was chaired by Dr. R.K. Pandya, Professor of Plant Pathology at RVSKVV, Gwalior, with Dr. M.L. Sharma, Professor of Entomology at RVSKVV, Gwalior, serving as the co-chairman. Dr. Ashwani Basandrai, Ex-Dean of CSKHPKVV, Palampur, and Dr. Nilima Karam, Jr. Entomologist at CAU, Imphal, acted as the expert and rapporteurs respectively. Dr. K.P. Singh from G.B. Pant University of Agriculture & Technology, Pantnagar presented the annual progress report .

Dr. Singh shared the results of nine coordinated plant pathology experiments conducted at 14 centers, focusing on soybean diseases. Anthracnose/Pod blight, Yellow Mosaic Virus (YMV), and Rusts were identified as the most prevalent and destructive diseases. Disease incidence varied among different coordinating centers and zones. The trap nursery trial showed varying disease severity on susceptible varieties in different locations. Some entries displayed resistance reactions against specific diseases, while others were susceptible. Various entries were found to have resistance against different diseases in different trial phases.

Dr. Singh also discussed the use of microbial insecticides for disease management and highlighted the effectiveness of seed treatment and foliar spraying with Bacillus sp. EF 53 and Trichoderma viride. Chemical application was found to provide up to 47% protection against yield losses due to diseases. Weather factors were identified as crucial for disease prediction, and more data is required for accurate predictions.

During the discussion session, suggestions were made to survey and track diseases using GPS technology, establish virus diagnosis facilities, address seed availability issues, and evaluate resistant lines under different conditions. The development of a pictorial monograph on soybean disease identification was proposed, along with the screening of disease-resistant lines under artificial epiphytotic conditions.

The session concluded with thanks to the speaker and participants, expressing appreciation for their participation and interaction.

D. PROCEEDINGS OF AGRONOMY SESSION

Chairman	:	Dr. Pratap Singh, Director Research, Agriculture University, Kota
Expert	:	Dr Yashvir Singh Shivay, Principal Scientist, ICAR-IARI, New Delhi
Rapporteurs	:	Dr. Raghavendra Nargund, Scientist (Agronomy), ICAR-IISR, Indore

Principal Investigator (Agronomy) Dr. R K Verma, Scientist, ICAR-IISR, Indore, presented the results of five agronomical trials conducted during *Kharif* season 2022 at all the coordinating centers. The PI also presented the tentative technical program for forthcoming *Kharif* season-2023. Based on the results of agronomy trails and technical program-2023, the following discussion and recommendations were made by chairman and expert of the agronomy session.

1. Make zone wise recommendation for concluding experiment (Agron 5/20)
2. Reframe the organic farming experiment with three main treatments (Integrated crop management, Natural farming and Organic farming).
3. Specific bioformulations/Biocontrol agents should be used from single authorized sources across the centers in organic farming experiment.
4. New experiment: Should made on "combination of herbicide and novel microbial strains after discussion with microbiology PI.

Suggestions/comments were well noted and addressed accordingly by the Dr. R. K. Verma, PI (Agronomy), ICAR-IISR, Indore.

The following recommendation was made from previously conducted experiments:

1. The application of thiourea as foliar spray @ 750 ppm/ha at 20 -25 and 50 -55 days after sowing is recommended across all the zones.
2. Inclusion of maize in crop rotations found beneficial over continuous soybean mono-cropping.
3. Since the difference between minimum and conventional tillage were found non-significant, so minimum tillage is recommended due to high B: C ratio.

The session ended by felicitation with memento to chairman and expert.

E. Proceedings of Microbiology Session

Chairman	:	Dr. A K Saxena, Former Director, ICAR-NBAIM
Expert	:	Dr Swarna Lakshmi, Principal Scientist (Microbiology), IARI, New Delhi
Rapporteurs	:	Dr. V. Govindasamy, Senior Scientist (Agril. Microbiology), IARI, New Delhi

The session was held in the presence of Dr Sanjeev Gupta, ADG (Pulses & Oil Seeds) & Director, ICAR-IISR, Indore along with all the participants. Dr. MP Sharma, Principal Scientist (Agril. Microbiology), ICAR-IISR, Indore & PI AICRPS (Microbiology) presented the significant results of the works carried out in the *Kharif* 2023 by different centres of soybean microbiology. The following recommendations were emanated after the detailed discussions on the proposed technical program of AICRP soybean microbiology for 2023.

In the proposed technical program of AICRP soybean microbiology for 2023 following suggestions were made:

- It was recommended to focus only on the isolation and characterization of soybean rhizobia and according suggested to revise the MB 1/16 trial.
- The MB 2 field trial, since the results are from first year experimentation, it was recommended to continue this trial for another one year to validate the response of microbial consortia.
- MB 3/21a which dealt on aassessing the impact of pre and post emergence herbicides with PGPR on soybean nodulation and yield under field conditions). It was recommended to club this trial with agronomy discipline and validate in the field. After detailed discussions on different treatments it was suggested to include only best performing herbicides and evaluate them along with microbial consortia. Necessary support for providing cultures should be rendered by soybean microbiologists to the agronomist team.
- Chairman Dr AK Saxena suggested that the group should evaluate the potential of already developed microbial consortia developed by ICAR-DGR endophyte Junagarh, ICAR-CRIDA Hyderabad, and archaea formulation from NBAIM-Mau for mitigating moisture stress in soybean.
- ADG (O&P) suggested to include plot yields in MB 4/13 trial (Nodulation ability of AVT-II entries of respective centres) along with nodulating parameters.

- It was recommended to have a demonstration on IISR Microbial consortia (*Bradyrhizobium daqingense+B. aryabhataii)* through agronomists and cultures should be supplied by the IISR, Indore. Demonstration will be conducted by agronomists at the selected agronomy centres.

At the end of the session during the chairmen remarks, Dr. AK Saxena, asked at IISR, Indore to develop more soybean rhizobial strains and relook the status of soybean rhizobial populations in Madhya Pradesh soils so as to improve the soybean rhizobial populations by field inoculations.

F. TRANSFER OF TECHNOLOGY

Chairman	:	Dr. Sanjeev Gupta, ADG (O&P), ICAR-New Delhi
Co-chairman		Dr R. K. Mathur, Director, ICAR-IIOR, Hyderabad
Expert	:	Dr S.K. Jha, Pr. Scientist, ICAR, New Delhi
Rapporteurs	:	Dr. G. K. Naidu, Associate Prof. UAS, Dharwad, Dr R. K. Verma, Scientist (Agronomy), ICAR-IISR, Indore

Principal Investigator (Agronomy) Dr. Raghavendra Nargund, Scientist, ICAR-IISR, Indore, presented the progress of the results of the FLDs conducted during Kharif, 2022. He also presented on the allotment of new FLDs for the year 2023. Dr Sanjay Gupta, Narrated the progress of the TSP and NEH activities under AICRPS.

Based on the deliberations the following points were suggested.

1. Involvement of state dept. and KVK staffs during the field day and field visits of FLDs plots.
2. Inviting the industries persons for FLDs involving food grade technologies especially in central zone
3. Proper scientific base needs to be given for increase in yield under FLDs over farmers practices
4. Data quality of FLDs has to be improved by rejecting the data if the yield level of FLDs is less than farmers practices or less than state average.
5. During allotment of FLDs only <5 years varieties has to be considered.
6. Impact analysis of the FLDs needs to be done by revisiting the already FLDs demonstrated places.
7. Geotagging of all FLDs compulsory
8. ID proof (Aadhar card, Mobile no.) needs to collected from the beneficiaries of NEH and TSP programs under AICRPs.

The session ended by felicitation with memento to chairman and expert

Proceedings of Food Technology Session

Chairman	:	Dr. Sanjeev Gupta, ADG (O&P), ICAR-New Delhi
Rapporteurs	:	Dr Gyanesh Kumar Satpute, Principal Scientist (Genetics & Plant Breeding), ICAR-IISR, Indore

Dr L. Sophia Devi, Jr. Food Scientist, AICRP (Soybean), CAU, Imphal presented the results of kharif 2023. Based on the discussion it was decided that

- Only AVT II entries will be evaluated
- Food grade parameters for oil, soya milk, tofu must be clearly specified. These will be decided with wider consultation
- All released varieties should be profiled for KTI and Lox 2
- It was also suggested that overnight / 4-5 hours soaking in water during winter/ summer season, respectively, should be followed for cooking time.
- Tofu yield should also be presented as Tofu processed per kg soybean grain for better comparison among the genotypes tested.
- Estimation of starch and protein content should be included as one of the food grade parameters.
- Research emphasis must be given on product development including fermented products.
- ICAR-IISR, Indore should develop strong collaboration with Centre for Excellence on Soybean Processing and Utilization (CESPU) at ICAR-CIAE, Bhopal.

स. तकनीकी कार्यक्रम

C. TECHNICAL PROGRAMMES

A. TECHNICAL PROGRAMME OF PLANT BREEDING FOR KHARIF 2023

1. CO-ORDINATED VARIETAL TRIALS

A. NORTHERN Hill ZONE (NHZ):

Advanced Varietal Trial II (AVT II)

DESIGN	R.B.D.
GROSS PLOT SIZE	8 rows, 5m long (3.6 x 5 m sq)
NET PLOT SIZE	6 rows, 4.8m long (2.7 x 4.8 m sq)
REPLICATION	**Four**
LOCATIONS	Palampur, Almora, Majhera
ENTRIES	NRC 197 (null KTi & high oil yield)
CHECKS	Palam Early Soya 1, VLS 89, VLS 99, VLS 63, Filler1
SEED	1.250 kg/entry/location

B. EASTERN ZONE (EZ):

Advanced Varietal Trial II (AVT II)

DESIGN	R.B.D.
GROSS PLOT SIZE	8 ro-ws, 5m long (3.6 x 5 m sq)
NET PLOT SIZE	6 rows, 4.8m long (2.7 x 4.8 m sq)
REPLICATION	**Four**
LOCATIONS	Raipur, Ranchi, Bhawanipatna
ENTRIES	RSC 11-42,
CHECKS	NRC 128, JS 20-116, AMS 2014-1, Filler 2
SEED	1.250 kg/entry/location

C. CENTRAL ZONE (CZ):

Advanced Varietal Trial I (AVT I) Normal Maturity

DESIGN	R.B.D.
GROSS PLOT SIZE	8 rows, 5m long (3.6 x 5 m sq)
NET PLOT SIZE	6 rows, 4.8m long (2.7 x 4.8 m sq)
REPLICATION	Four
LOCATIONS	Amreli, Amravati, Anand, Indore, Jabalpur, Kota, Morena, Nagpur, Mandsaur, Parbhani, Sanosara, Sehore,
ENTRIES	NRC 258, MAUS 824, NRC 259
CHECKS	RVSM 2011-35, JS 20-98, RSC 10-52, JS 21-72
SEED	1.250 kg/entry/location

Advanced Varietal Trial I + II: Early (AVT I + II)

DESIGN	R.B.D.
GROSS PLOT SIZE	8 rows, 5m long (3.6 x 5 m sq)
NET PLOT SIZE	6 rows, 4.8m long (2.7 x 4.8 m sq)
REPLICATION	Four
LOCATIONS	Amreli, Amravati, Anand, Indore, Jabalpur, Kota, Morena, Nagpur, Mandsaur, Parbhani, Sanosara, Sehore,
ENTRIES	NRC 262, JS 24-33, AMS 2022-1**,** JS 23-09*, JS 23-03*
CHECKS	JS 20-34, NRC 152, NRC 138, NRC 130, JS 95-60
SEED	1.250 kg/entry/location

Based on the decision of giving 2 days maturity margin over the best early maturing check JS 24-33 and AMS 2022-1 are included in AVT 1.*AVT II Entires

D. South Zone Advanced Varietal Trial I (AVT I) Essentially Derived Variety

DESIGN	R.B.D.
GROSS PLOT SIZE	8 rows, 5m long (3.6 x 5 m sq)
NET PLOT SIZE	6 rows, 4.8m long (2.7 x 4.8 m sq)
REPLICATION	Four
LOCATIONS	Pune, K. Digraj, Bengaluru, Dharwad, Adilabad, Bidar and Ugarkhurd
ENTRIES	MACSNRC 1900
CHECKS	JS 93-05, DSb 21, MACS 1188, NRC 142, **MACS 1460**
SEED	1.250 kg/entry/location

E. INITIAL VARIETAL TRIAL (IVT) Normal Maturity (ACROSS ZONES):

Centre wise entries for IVT Trial across zones. (Grain Yield)

S.No.	Entry	Pedigree	Contributing Centre
1.	THPS 6	TS 98-91 (mutant JS 80-21) × P-4-2	Palampur
2.	VLS 106	VLS 75 x VLS 59	Almora
3.	SL 1315	SL 525 x EC 390977 (PP 6)	Ludhiana
4.	DS 1589	SL 958 X JS 90-41	Delhi
5.	DS 1547	SL 900 X PS 1505	
6.	RSC 11-95	JS 20-34 x RSC 10-46	Raipur
7.	JS 25-08	JS 20-71x JS 20-87	Jabalpur
8.	BAUS (M) 6	Mutant of BSS 2	Ranchi
9.	DLSb 5,	DSb 28 x SL 958	Dharwad
10.	NRC 268 (Null Lox 2)	NRCSL2 X NRC 142	Indore
11.	NRC 269,	NRC 128 X JS 95-60	
12.	NRC 270,	NRC 128 X JS 95-60	
13.	NRC 271	JS 93-05 x AGS 25	
14.	AMS 22-16	JS 93-05 x AMS 79 B	Amravati
15.	KDSIS1394	JS 20 98 x JS 20 34	Kasbe Digraj
16.	MACS 1810	MACS 1188 X AGS 459	Pune
17.	MAUS 816	JS 335 X EC 538828 6A-20-2	Parbhani
18.	Asb 101	JS 97-52 x Lee	Adilabad
19.	Pusa Sipani BS 8	JS-335 x RVS-2001-4	Mandsore
20.	Lok Soya -03	JS 20-98 X JS 20-34	Sanosara
21.	KSS 225	JS-9560 x G line	Basant Agro
22.	TS 101	Mutant derivative of JS 20-116x DSb 32	BARC, Mumbai
23.	KBSL 23-36	DSB-31 x MACS1460	Bengaluru

Design	**Alpha Lattice Design (See Layout Below)**
GROSS PLOT SIZE	5 rows, 5 m long (2.25 x 5 m sq)
NET PLOT SIZE	3 rows, 4.8 m long (1.35 x 4.8 m sq)
Plant to Plant Distance	5 cm
Plant Population	450-550 plants / plot
Latest Sowing Date	10 July
Observations	Days to Flower, Plant Height, Days to Maturity, 100 Seed Weight, Grain Yield, Plant Population at maturity

Zone	**Centre**
NHZ	Almora, Palampur, Majhera ,
NPZ	Pantnagar, Delhi, Ludhiana
EZ	Ranchi, Raipur and Bhawanipatna
NEHZ	Umiam, Imphal and Jorhat
CZ	Amreli, Amravati, Anand, Indore, Jabalpur, Kota, Morena, Nagpur, Mandsaur, Parbhani, Sanosara, Sehore,
SZ	Pune, K. Digraj, Bengaluru, Dharwad, Adilabad, Bidar and Ugarkhurd
SEED Requirement	16 kg/entry
CHECKS: There will be following checks in each zone:	
NHZ	VLS 89, VLS 63, VLS 99, NRC 142
NPZ	PS 1347, NRC 149, PS 1670, NRC 142
EZ	NRC 128, RSC 11-07, RSC 10-46, NRC 142
NEHZ	MACS 1407, JS 20-116, KDS 753, NRC 142
CZ	RVSM 2011-35, JS 20-98, RSC 10-46 , NRC 142
SZ	DSb 34, KDS 992, KDS 753, NRC 142

Lay out plan for ALPHA DESIGN for the conduct of Soybean IVT (Normal Maturity) during 2023

Randomized α Lattice Design Layout

Layout of IVT Normal maturity 2023

v = 27, b = 9, r = 3, k = 9, AE = 0.9626, DE = 0.9832 α(0,1,2,3)

DE - Lower bound to D-Efficiency; 2. AE - Lower bound to A-Efficiency; 3. α(#, #, #) represents different concurrences of the treatments

REPLICATION 1									
Block 1	8	24	1	17	26	14	6	21	12
Block 2	9	19	2	15	22	10	27	4	18
Block 3	23	5	16	13	3	25	7	20	11

REPLICATION 2									
Block 1	24	6	13	7	12	16	2	19	26
Block 2	15	9	5	21	11	1	18	23	25
Block 3	3	27	17	14	10	4	22	20	8

REPLICATION 3									
Block 1	24	21	27	6	9	12	15	18	3
Block 2	16	4	25	10	1	13	22	7	19
Block 3	5	26	17	14	23	20	11	8	2

F. Repeat IVT Trial at NEHZ:

S.No.	Entry	Pedigree	Contributing Centre
1.	NRC 190	JS 97-52 x JS 335	Indore
2.	AMS 2021-4	JS 97-52 x JS 20-79	Amrawati
3.	Himso 1696		Palampur
4.	KDS 1188	KDS 344 x NRC 101	Kasbe Digraj
5.	RSC 1172		Raipur
6.	NRC 259	Sl 958 X JS 97-52	Indore
7.	NRC 260	Sl 958 X JS 97-52	Indore
8.	AMS 2021-3		Amrawati
9.	VLS 105	VLS 75 x VLS 63	Almora
10.	MAUS 824	JS 335 x EC 538828-7A-86-1	Parbhani
11.	Pusa Sipani 433	JS-335 x NRC-86	Mandsaur
12.	NRC 191	NRC7 X EC538828	Indore

Checks	MACS 1407 (ZC1), JS 20-116 (ZC 2), KDS 753 (LR), NRC 142 (QC)
Design	Randomized Block Design
GROSS PLOT SIZE	5 rows, 5 m long (2.25 x 5 m sq)
NET PLOT SIZE	3 rows, 4.8 m long (1.35 x 4.8 m sq)
Centres	Umiam, Imphal and Jorhat
Plant to Plant Distance	5 cm
Plant Population	450-550 plants / plot
Latest Sowing Date	10 July
Observations	Days to Flower, Plant Height, Days to Maturity, 100 Seed Weight, Grain Yield, Plant Population at maturity, pod insertion height

G. Table 2: INITIAL VARIETAL TRIAL-EARLY (IVT-EARLY) CENTRAL ZONE

S.No.	Entry	Pedigree	Contributing Centre
1.	DS 1480	NRC 37 X JS 97-52	Delhi
2.	JS 25-03	JS 20-53 x JS 20-34	Jabalpur
3.	JS 25-06	JS 20-29 x JS 93-05	
4.	NRC 264	JS 95-60 x AGS 25	Indore
5.	NRC 265	JS 95-60 x AGS 25	
6.	NRC 266	JS 95-60 x AGS 25	
7.	NRC 267	JS 95-60 x AGS 25	
8.	AUKS 21-5	JS 20-53 x JS 20-34-3-1	Kota
9.	MACS 1834	JS 93-05 x DSb 21	Pune
10.	MAUS 787	JS 335 X EC 538828 6A-26-5	Parbhani
11.	Pusa Sipani 33	JS-335 x NRC-86	Mandsore
12.	KDS 1193	KDS 344 x NRC 101	Kasbe Digraj
13.	KDS 1201	KDS 344 x NRC 101	

DESIGN	R.B.D.
GROSS PLOT SIZE	5 rows, 5 m long (2.25 x 5 m sq)

NET PLOT SIZE	3 rows, 4.8 m long (1.35 x 4.8 m sq)
REPLICATION	Three
LOCATIONS	Jabalpur, Sehore, Parbhani, Amrawati, Kota, Morena,
	Anand, Amreli, Indore, Lok Bharti and Nagpur, Mandsaur
SEED	6 kg/entry
CHECKS	JS 20-34, NRC 150 and NRC 138

2. Pre-Breeding

A. Wide hybridization of soybean (*G. max*) with *Glycine* species of tertiary gene pool (Indore).

B. Fresh hybridizations, back crossing and generation advancement of *G max* x *G soja*.

C. Evaluation of 25 of the recently introduced *G soja* accessions at hot spots of diseases like Jabalpur (Charcoal Rot), Indore (Anthracnose), Pantnagar (RAB), Almora and Palampur (FLS), Rust (Dharwad and Kasbe Digraj), YMV (Ludhiana), Indian Bud Blight (Raipur),

Name of the *G soja* accessions	**Number**
EC1165891, EC1165824, EC1165933, EC1165787, EC1165790, EC11655850, EC1165879, EC1165842, EC1165822, EC1165791, EC1165914, EC1165863, EC1165789, EC1165820, EC1165892, EC1165826,EC1165813, EC1165849, EC1165808, EC1165807, EC1165839, EC1165814, EC1165897, EC1165923, EC1165928,	25

Important Instructions for Evaluation of *G soja* accessions:

D. Sowing to be taken up in petri plates with moist germination paper.

E. A cut in seed coat is required to be made. An online demonstration would be arranged by ICAR-IISR Indore

F. After germination plants are to be transferred in pots

G. Scoring to be done for diseases and observations on plant height, growth habit(determinate, semi-determinate, indeterminate), days to 50% flower, days to maturity, maturity habit (Synchronous or not), 100 seed weight, seed yield / plant, number of pods / plant to be recorded.

H. It is a very precious material so utmost care is required.

3. Multi-location Germplasm Evaluation TrialAccessions:

Germplasm: 221 (211 Germplasm with 10checks)

S. No	Germplasm/check
1	IC 501585
2	IC 0501670
3	IC 0501775
4	EC 30208
5	EC 287456
6	IC 0501258
7	IC 0345660
8	IC 296874

S. No	Germplasm/check
9	EC 0241902-X
10	IC 0501663
11	EC 0172599
S. No	Germplasm/check
12	EC 172654
13	IC 0118085
14	EC 37098
15	EC 0241848

S. No	Germplasm/check
16	IC 0501813
17	IC 0128999
18	IC 0128991
19	EC 0241924
20	IC 0263304
21	EC 99991
22	IC 128960
S. No	Germplasm/check

S. No	Germplasm/check
23	IC 0338577
24	IC 0501755
25	EC 25150-1
26	IC 501469
27	EC 2638
28	IC 0501699
29	EC 76757
30	IC 0501416
31	EC 34500
32	IC 0241852
33	EC 0341825
34	EC 0061398
35	EC 57042
36	EC 0309534
37	IC 26178
38	IC 0316163
39	IC 0117914
40	IC 0296199
41	IC 0501627
42	IC 42147
43	EC 39718
44	IC 0024996
45	IC 0015974
46	EC 0241809
47	IC 24071
48	IC 0024055
49	EC 0457236
50	IC 0117989
51	EC 0456537
52	EC 0241861
53	EC 0241920
54	EC 0039730-A
55	EC 0241913
56	IC 0501360
57	IC 0018646
58	IC 0243143
59	IC 0243726
60	IC 0100324
61	IC 0243754
62	IC 0501200
63	EC 0093747
64	IC 0243142
65	IC 501548

S. No	Germplasm/check
66	EC 62376
67	IC 0501249
68	IC 5001261
69	IC 0006426
70	EC 0251392
71	IC 0243741
72	IC 118593
73	IC 0501196
74	IC 0243816
75	IC 0128933
76	IC 0243662
77	IC 0243814
78	IC 0501208
79	IC 0243565
80	IC 0243588
81	EC 0095795
82	IC 0128982
83	IC 100338
84	IC 243794
85	IC 0243688
86	IC 15971
87	IC 0901376
88	IC 0243043
89	IC 501585
90	IC 0501245
91	EC 0308281
92	EC 0016729
93	EC 39502
94	IC 0501672
95	EC 0241773
96	EC 274701
97	IC 0618728
98	IC 0016813
99	IC 0128979
100	IC 328971
101	IC 0009476
102	IC 0243034
103	IC 0118611
104	EC 0241706
105	EC 0039755
106	IC 501603
107	EC 0039501
108	IC 0383477

S. No	Germplasm/check
109	IC 0501954
110	IC 21747
111	IC 24069
112	IC 0042148
113	EC 689154
114	EC 291400
115	IC 050182
116	IC 0129025
117	IC 0538042
118	EC 76755
119	IC 24060
120	IC 0501789
121	IC 0128949
122	IC 128935
123	IC 0501733
124	IC 0026133
125	IC 0564120
126	IC 444241
127	IC 0501438
128	IC 0391452
129	IC 436997
130	IC 0567504
131	IC 118480
132	IC 0501962
133	IC 01186562
134	IC 25764
135	IC 0501885
136	IC 0501876
137	IC 050170
138	IC 0042150
139	IC 049771
140	IC 0128937
141	IC 0501967
142	IC 128933
143	IC 0049863
144	IC 0096342
145	EC 0100801
146	IC 0118567
147	IC 0118490
148	IC 0016833
149	IC 0118335
150	IC 0009442
151	IC 0355881

S. No	Germplasm/check
152	IC 0391584
153	IC 202
154	EC 0456620
155	IC 0096352
156	IC 0243730
157	IC 0501972
158	IC 0392479
159	IC 0501791
160	IC 0567507
161	EC 0393228
162	EC 0251372
163	IC 243017
164	IC 0243065
165	IC 0501804
166	IC 0243130
167	IC 241852
168	IC 0243758
169	IC 0113775
170	IC 0118314
171	IC 0501903
172	IC 0118614
173	IC 13056
174	IC 0392508
175	EC 0026691

S. No	Germplasm/check
176	IC 0026932
177	EC 69729
178	EC 104872
179	EC 18645
180	IC 0501429
181	IC 0081830
182	EC 37184
183	EC 39088
184	EC 0039498
185	EC 0251439
186	EC 172659
187	IC 0501815
188	IC 0501815
189	IC 0356030
190	IC 0501861
191	EC 0076754
192	EC 0232044
193	EC 99551
194	EC 0528662
195	EC 34041
196	VLGSDL- 27
197	VLGSDL - 36
198	VLGSDL - 17
199	VLGSDL -12

S. No	Germplasm/check
200	VLGSL - 38
201	JS 20-116
202	PS 1437
203	NRC- 138
204	JS 20-34
205	RVSM 2011-35
206	NRC 130
207	KDS 992
208	PS 26
209	DSB 21
210	AMS 2014-1
211	KDS 753
212	PS 1670
213	JS 93-05
214	JS 95-60
215	NRC 128
216	RSC 10-52
217	VLS 89
218	VLS 99
219	DSB 34
220	VLS 63
221	EC 915908

Design: Augmented design in replications.
Row length:1.5 m
Layout:

Replication-I

1-40 Germplasm 10zonalchecks(c1,c2,c3,c4,c5,c6, c7,c8,c9,c10) (Checks to berandomized inblock) Block1	**41-80 Germplasm** 10 zonal checks (c1, c2, c3, c4, c5,c6,c7,c8,c9,c10) (Checks to be randomized in block) Block2	**81-120 Germplasm** 10 zonal checks (c1, c2, c3, c4, c5,c6,c7,c8,c9,c10) (Checks to berandomized inblock) Block3	**121-160 Germplasm** 10 zonal checks (c1, c2, c3, c4, c5,c6,c7,c8,c9,c10) (Checks to berandomized inblock) Block4	**161-200 Germplasm** 10 zonal checks (c1, c2, c3, c4, c5,c6,c7,c8,c9,c10) (Checks to berandomized inblock) Block5

Replication-II

200-161 Germplasm 10zonalchecks(c1,c2,c3,c4,c5,c6, c7,c8,c9,c10) (Checks to berandomized inblock) Block1	**160-121 Germplasm** 10 zonal checks (c1, c2, c3, c4, c5,c6,c7,c8,c9,c10) (Checks to be randomized in block) Block2	**120-81 Germplasm** 10 zonal checks (c1, c2, c3, c4, c5,c6,c7,c8,c9,c10) (Checks to berandomized inblock) Block3	**80-41 Germplasm** 10 zonal checks (c1, c2, c3, c4, c5,c6,c7,c8,c9,c10) (Checks to berandomized inblock) Block4	**40-1 Germplasm** 10 zonal checks (c1, c2, c3, c4, c5,c6,c7,c8,c9,c10) (Checks to berandomized inblock) Block5

Characters

1. Daysto 50 % flowering
2. Daysto 90% maturity,
3. Plant height (cm)
4. Numberofnodes/plant,
5. Numberofpods/plant,
6. Number of plants in a row at harvesting
7. 100 seed weight (g)
8. Grain yield/plant (g)
9. Row yield (g)
10. Internodal length (Plant Height / Number of nodes)

Centres:
NHZ:Palampur,Almora; **NPZ**:PantnagrNEHZ: Manipur ; **EZ**: Raipur; **CZ: Indore,** Parbhani ; .
SZ: Pune
Checks: Zonal Checks after every 4 rows of the accessions. Same checks are to berepeated inallblocks.

NHZ:VLS59, VLS63, VLS 89, VLS 99, Palam Early Soya, Himso1685,Harasoya, PS 1556,
NPZ:SL 958,SL 955,PS1347, PS 1670, NRC 149, SL 1074, PS 26, NRC 128
NEHZ:MACS 1460,RKS113,KDS753,RSC10-46, JS 97-52, DSb 32, JS 20-116, MACS 1407 (8)
EZ:MACS 1460,RKS 113,KDS753,RSC10-46, RSC 11-42, JS 20-116, NRC 128, RSC 11-07 (8)
CZ:: JS 20-34,JS20-69,RSC 10-46, JS 20-116, NRC 138, NRC 142, JS 21-17, NRC 157, NRC 150, RVSM 2011-35 (10)
SZ:MACS1460,KDS 753,DSb23,DSb21,MACS1188, KDS 726, KDS 992, DSb 28, DSb 34, RSC 11-07 (10)

Important Note for Block: A particular block with mentioned germplasm and checks to be at a stretch and not to be splitted.

4. National Hybridization Programme

A. F3 of 2021 crosses distribution to centres

Crosses Contributed by Dr Sanjay Gupta and Dr Rajesh Vangala (1-91)		
1	NHP 2023-89	MACS 1460 X VLS 63
2	NHP 2023-90	VLS 59 X Palamsoya
3	NHP 2023-91	VLS 59 X LJ 119
4	NHP 2023-92	VLS 59 X LJ 124
5	NHP 2023-93	VLS 59 X JS 20-34
6	NHP 2023-94	VLS 59 X LJ 137
7	NHP 2023-95	VLS 59 X LJ 140
8	NHP 2023-96	SKUA -202 X VLS 59
9	NHP 2023-97	SKUA -202 X NRC 138
10	NHP 2023-98	LJ-137 X VLS 59
11	NHP 2023-99	JS 20-34 X SKUA -202
12	NHP 2023-100	JS 20-34 X VLS 59
13	NHP 2023-101	Harasoya X Palamsoya
14	NHP 2023-102	Harasoya X SKUA-202
15	NHP 2023-103	Harasoya X VLS 59
16	NHP 2023-104	Palamsoya X VLS 59
17	NHP 2023-105	Palamsoya X NRC 138
18	NHP 2023-106	LJ 124 X VLS 59
19	NHP 2023-107	LJ 140 X VLS 59
20	NHP 2023-108	SKUA-202 X Harasoya
21	NHP 2023-109	EC 602288 X RSC 10-46
22	NHP 2023-110	NRC 181 X RSC 10-46
23	NHP 2023-111	JS 20-69 X EC 456556
24	NHP 2023-112	JS 20-98 X VLS 63
25	NHP 2023-113	RVSM 2011-35 X RSC 10-46
26	NHP 2023-114	RVSM 201 1-35 X JS 20-34
27	NHP 2023-115	JS 20-69 X NRC 146
28	NHP 2023-116	AMS MB 5-18 X NRC 128
29	NHP 2023-117	JS 20-98 X NRC 146
30	NHP 2023-118	JS 20-76 X NRC 138
31	NHP 2023-119	EC 602288 X TGX 37- E
32	NHP 2023-120	RVSM 2011-35 X NRC 130
33	NHP 2023-121	JS 20-69 X NRC 128
34	NHP 2023-122	JS 20-34 X RSC 10-46
35	NHP 2023-123	NRC 181 X NRC 128
36	NHP 2023-124	MACS 1460 X RSC 10-46
37	NHP 2023-125	JS 20-69 X RSC 10-46
38	NHP 2023-126	MACS 1460 X NRC 128
39	NHP 2023-127	EC 602288 X NRC 128
40	NHP 2023-128	MACS 1460 x LJ 137
41	NHP 2023-129	MACS 1460 X LJ 140
42	NHP 2023-130	MACS 1460 X 138
43	NHP 2023-131	MACS 1460 X U 119
44	NHP 2023-132	MACS 1460 X NRC 130
45	NHP 2023-133	MACS 1460 X LJ 124
46	NHP 2023-134	MACS 1460 X RSC 10-46
47	NHP 2023-135	LJ -137 X Dsb 34
48	NHP 2023-136	NRC 138 X Dsb 34
49	NHP 2023-137	Dsb 34 x LJ 140
50	NHP 2023-138	Dsb 34 X LJ 137
51	NHP 2023-139	Dsb 34 X NRC 138
52	NHP 2023-140	Dsb 34 X LJ 124
53	NHP 2023-141	LJ 124 X Dsb 34
54	NHP 2023-142	RSC 10-46 X LJ 124
55	NHP 2023-143	RVSM 20 11-35 X LJ-124
56	NHP 2023-144	LJ 124 X NRC 128
57	NHP 2023-145	NRC 130 X JS 20-34
58	NHP 2023-146	RSC 10-46 X LJ 140
59	NHP 2023-147	JS 9305 X AGS 25
60	NHP 2023-148	NRC 130 X LJ 124
61	NHP 2023-149	LJ 140 X NRC 128
62	NHP 2023-150	LJ 124 X RSC 10-46
63	NHP 2023-151	LJ 137 X NRC 138
64	NHP 2023-152	RVSM 20 11-35 X JS 20-34
65	NHP 2023-153	LJ 140 X JS 20-34
66	NHP 2023-154	NRC 138 X LJ - 140
67	NHP 2023-155	LJ137 X NRC130
68	NHP 2023-156	NRC138 X LJ137
69	NHP 2023-157	LJ140 X NRC138
70	NHP 2023-158	RSC 10-46 X LJ - 137
71	NHP 2023-159	LJ 137 X RSC10-46
72	NHP 2023-160	LJ 124 X NRC138
73	NHP 2023-161	LJ 124 X NRC 130
74	NHP 2023-162	JS20-24 X NRC 138
75	NHP 2023-163	RSC 10-46 X NRC 138
76	NHP 2023-164	NRC 130 X LJ 137
77	NHP 2023-165	NRC 130 X LJ- 140
78	NHP 2023-166	JS 20-34 X LJ -137
79	NHP 2023-167	JS 20-34 X LJ -119
80	NHP 2023-168	JS 20-34 X NRC 130
81	NHP 2023-169	NRC 138X JS 20-34
82	NHP 2023-170	RVSM 11-35 X NRC- 138
83	NHP 2023-171	NRC 138 X LJ - 124
84	NHP 2023-172	LJ-140 X NRC -130
85	NHP 2023-173	LJ 137 X NRC 128
86	NHP 2023-174	AGS 25 X JS 9305

87	NHP 2023-175	NRC 128 X LJ 124
88	NHP 2023-176	NRC 128 XLJ137
89	NHP 2023-177	JS 20-34 X LJ 124

90	NHP 2023-178	NRC 128 X LJ 140
91	NHP 2023-179	LJ 140 X RS 10-46

Crosses Contributed By Dr Rajesh Vangala (92-111)		
92	NHP 2023-180	Basara X VLS 63
93	NHP 2023-181	Basara X (F4P21 X Line 220)
94	NHP 2023-182	Basara X EC 481369
95	NHP 2023-183	Basara X Karune
96	NHP 2023-184	Basara X RSC 10-46
97	NHP 2023-185	Basara X 20-98
98	NHP 2023-186	Basara X NRC 130
99	NHP 2023-187	JS 9560 X RSC 10-46
100	NHP 2023-188	RSC 10-46 X AGS 25
101	NHP 2023-189	JS 20-69 X VLS 59
102	NHP 2023-190	RKS 113 X SL 1104

Crosses Contributed By Dr Rajesh Vangala (92-111)		
103	NHP 2023-191	F4P21 X RSC 10-46
104	NHP 2023-192	F4P21 X EC 481369
105	NHP 2023-193	JS 20-98 X G5P22
106	NHP 2023-194	F4P21 X Line 202
107	NHP 2023-195	F3P18 X Line 202
108	NHP 2023-196	F3P18 X JS 335
109	NHP 2023-197	RSC 10-46 X EC 481369
110	NHP 2023-198	JS 20-34 X EC 481369
111	NHP 2023-199	F4P21 X Line 220

Centre wise distribution of F3s of National Hybridization Programme

Note: NHP Seed must be space planted (at least 10 cm plant to plant distance)

S. No	**Northern Hill Zone** Palampur, Srinagar and Almora
1.	MACS 1460 X VLS 63
2.	VLS 59 X Palamsoya
3.	VLS 59 X LJ 119
4.	VLS 59 X LJ 124
5.	VLS 59 X JS 20-34
6.	VLS 59 X LJ 137
7.	VLS 59 X LJ 140
8.	SKUA -202 X VLS 59
9.	SKUA -202 X NRC 138
10.	LJ-137 X VLS 59
11.	JS 20-34 X SKUA -202
12.	JS 20-34 X VLS 59
13.	Harasoya X Palamsoya
14.	Harasoya X SKUA-202
15.	Harasoya X VLS 59
16.	Palamsoya X VLS 59
17.	Palamsoya X NRC 138
18.	LJ 124 X VLS 59
19.	LJ 140 X VLS 59
20.	SKUA-202 X Harasoya

S. No	**North Eastern Hill Zone** Imphal
1.	MACS 1460 X RSC 10-46
2.	MACS 1460 x LJ 137
3.	MACS 1460 X LJ 140
4.	MACS 1460 X U 119
5.	MACS 1460 X NRC 130
6.	MACS 1460 X LJ 124
7.	RSC 10-46 X LJ 124
8.	RSC 10-46 X LJ 140
9.	JS 9305 X AGS 25
10.	LJ 140 X NRC 128
11.	LJ 124 X NRC138
12.	RSC 10-46 X NRC 138
13.	LJ 137 X NRC 128
14.	NRC 128 X LJ 124
15.	NRC 128 X LJ 140
16.	JS 9560 X RSC 10-46
17.	RSC 10-46 X AGS 25
18.	JS 20-69 X VLS 59
19.	RKS 113 X SL 1104
20.	F4P21 X RSC 10-46
21.	F4P21 X EC 481369
22.	JS 20-98 X G5P22
23.	F4P21 X Line 202
24.	F3P18 X Line 202
25.	F3P18 X JS 335
26.	RSC 10-46 X EC 481369
27.	JS 20-34 X EC 481369
28.	F4P21 X Line 220

S. No	**Northern Plain Zone** Ludhiana and Pantnagar
1.	AMS MB 5-18 X NRC 128
2.	JS 20-69 X NRC 128
3.	NRC 181 X NRC 128
4.	MACS 1460 X NRC 128
5.	EC 602288 X NRC 128
6.	LJ 124 X NRC 128
7.	LJ 140 X NRC 128
8.	LJ 124 X NRC138
9.	LJ 137 X NRC 128
10.	NRC 128 X LJ 124
11.	NRC 128 XLJ137
12.	NRC 128 X LJ 140

S. No	**Eastern Zone:** Raipur
1.	RVSM 2011-35 X RSC 10-46
2.	AMS MB 5-18 X NRC 128
3.	JS 20-69 X NRC 128
4.	JS 20-34 X RSC 10-46
5.	NRC 181 X NRC 128
6.	MACS 1460 X RSC 10-46
7.	JS 20-69 X RSC 10-46
8.	MACS 1460 X NRC 128
9.	MACS 1460 x LJ 137
10.	MACS 1460 X LJ 140
11.	MACS 1460 X U 119
12.	MACS 1460 X NRC 130
13.	MACS 1460 X LJ 124
14.	MACS 1460 X RSC 10-46
15.	RSC 10-46 X LJ 124
16.	LJ 124 X NRC 128
17.	RSC 10-46 X LJ 140
18.	LJ 140 X NRC 128
19.	LJ 124 X RSC 10-46
20.	NRC 138 X LJ - 140
21.	RSC 10-46 X LJ - 137
22.	LJ 137 X RSC10-46
23.	LJ 124 X NRC138
24.	RSC 10-46 X NRC 138
25.	LJ 137 X NRC 128
26.	NRC 128 X LJ 124
27.	NRC 128 XLJ137
28.	NRC 128 X LJ 140
29.	LJ 140 X RS 10-46
30.	NRC 181 X RSC 10-46
31.	EC 602288 X NRC 128

S. No	**Eastern Zone:** Ranchi
1.	RVSM 2011-35 X RSC 10-46
2.	AMS MB 5-18 X NRC 128
3.	JS 20-69 X NRC 128
4.	JS 20-34 X RSC 10-46
5.	NRC 181 X NRC 128
6.	MACS 1460 X RSC 10-46
7.	JS 20-69 X RSC 10-46
8.	MACS 1460 X NRC 128
9.	MACS 1460 x LJ 137
10.	MACS 1460 X LJ 140
11.	MACS 1460 X U 119
12.	MACS 1460 X NRC 130
13.	MACS 1460 X LJ 124
14.	MACS 1460 X RSC 10-46
15.	RSC 10-46 X LJ 124
16.	LJ 124 X NRC 128
17.	RSC 10-46 X LJ 140
18.	LJ 140 X NRC 128
19.	LJ 124 X RSC 10-46
20.	NRC 138 X LJ - 140
21.	RSC 10-46 X LJ - 137
22.	LJ 137 X RSC10-46
23.	LJ 124 X NRC138
24.	RSC 10-46 X NRC 138
25.	LJ 137 X NRC 128
26.	NRC 128 X LJ 124
27.	NRC 128 XLJ137
28.	NRC 128 X LJ 140
29.	LJ 140 X RS 10-46
30.	JS 9560 X RSC 10-46
31.	RSC 10-46 X AGS 25
32.	JS 20-69 X VLS 59
33.	RSC 10-46 X EC 481369
34.	JS 20-34 X EC 481369

S. No	**SZ: Bidar**
1.	MACS 1460 X RSC 10-46
2.	MACS 1460 X NRC 128
3.	MACS 1460 x LJ 137
4.	MACS 1460 X LJ 140
5.	MACS 1460 X U 119
6.	MACS 1460 X LJ 124
7.	MACS 1460 X RSC 10-46
8.	LJ -137 X Dsb 34
9.	NRC 138 X Dsb 34
10.	Dsb 34 x LJ 140
11.	Dsb 34 X LJ 137
12.	Dsb 34 X LJ 124
13.	LJ 124 X Dsb 34
14.	LJ 140 X NRC 128
15.	LJ 137 X NRC 138
16.	NRC 138 X LJ - 140
17.	LJ 137 X RSC10-46
18.	LJ 124 X NRC138
19.	NRC 138 X LJ - 124
20.	LJ 137 X NRC 128
21.	NRC 128 X LJ 124
22.	NRC 128 X LJ 140
23.	JS 9560 X RSC 10-46
24.	RSC 10-46 X AGS 25
25.	JS 20-69 X VLS 59
26.	RSC 10-46 X EC 481369
27.	JS 20-34 X EC 481369
28.	JS 20-34 X EC 481369

S. No	**SZ: Pune**
1.	MACS 1460 X RSC 10-46
2.	MACS 1460 X NRC 128
3.	MACS 1460 x LJ 137
4.	MACS 1460 X LJ 140
5.	MACS 1460 X U 119
6.	MACS 1460 X LJ 124
7.	MACS 1460 X RSC 10-46
8.	LJ -137 X Dsb 34
9.	NRC 138 X Dsb 34
10.	Dsb 34 x LJ 140
11.	Dsb 34 X LJ 137
12.	Dsb 34 X LJ 124
13.	LJ 124 X Dsb 34
14.	JS 9305 X AGS 25
15.	LJ 140 X NRC 128

S. No	**SZ: Bengaluru & Kasbe Digraj**
1.	MACS 1460 X RSC 10-46
2.	MACS 1460 X NRC 128
3.	MACS 1460 x LJ 137
4.	MACS 1460 X LJ 140
5.	MACS 1460 X U 119
6.	MACS 1460 X NRC 130
7.	MACS 1460 X LJ 124
8.	MACS 1460 X RSC 10-46
9.	LJ -137 X Dsb 34
10.	NRC 138 X Dsb 34
11.	Dsb 34 x LJ 140
12.	Dsb 34 X LJ 137
13.	Dsb 34 X NRC 138
14.	Dsb 34 X LJ 124
15.	LJ 124 X Dsb 34

S. No	SZ: Pune	S. No	SZ: Bengaluru & Kasbe Digraj
16.	LJ 137 X NRC 138	16.	LJ 140 X NRC 128
17.	NRC 138 X LJ - 140	17.	LJ 137 X NRC 138
18.	LJ 137 X RSC10-46	18.	NRC 138 X LJ - 140
19.	LJ 124 X NRC138	19.	LJ 137 X RSC10-46
20.	NRC 138 X LJ - 124	20.	LJ 124 X NRC138
21.	LJ 137 X NRC 128	21.	NRC 138 X LJ - 124
22.	NRC 128 X LJ 124	22.	LJ 137 X NRC 128
23.	NRC 128 X LJ 140	23.	NRC 128 X LJ 124
24.	JS 9560 X RSC 10-46	24.	NRC 128 X LJ 140
25.	RSC 10-46 X AGS 25		
26.	JS 20-69 X VLS 59		
27.	RSC 10-46 X EC 481369		
28.	JS 20-34 X EC 481369		

S. No	SZ: Dharwad	S. No	SZ: Adilabad	S. No	CZ: Morena, Jabalpur, Sehore, Mandsaur, Indore, Sanosara
1.	MACS 1460 X RSC 10-46	1.	MACS 1460 X RSC 10-46	1.	JS 20-69 X EC 456556
2.	MACS 1460 X NRC 128	2.	MACS 1460 X NRC 128	2.	RVSM 2011-35 X RSC 10-46
3.	MACS 1460 x LJ 137	3.	MACS 1460 x LJ 137	3.	RVSM 201 1-35 X JS 20-34
4.	MACS 1460 X LJ 140	4.	MACS 1460 X LJ 140	4.	AMS MB 5-18 X NRC 128
5.	MACS 1460 X U 119	5.	MACS 1460 X U 119	5.	EC 602288 X TGX 37- E
6.	MACS 1460 X NRC 130	6.	MACS 1460 X NRC 130	6.	RVSM 2011-35 X NRC 130
7.	MACS 1460 X LJ 124	7.	MACS 1460 X LJ 124	7.	JS 20-69 X NRC 128
8.	MACS 1460 X RSC 10-46	8.	MACS 1460 X RSC 10-46	8.	JS 20-34 X RSC 10-46
9.	LJ -137 X Dsb 34	9.	LJ -137 X Dsb 34	9.	NRC 181 X NRC 128
10.	NRC 138 X Dsb 34	10.	NRC 138 X Dsb 34	10.	MACS 1460 X RSC 10-46
11.	Dsb 34 x LJ 140	11.	Dsb 34 x LJ 140	11.	JS 20-69 X RSC 10-46
12.	Dsb 34 X LJ 137	12.	Dsb 34 X LJ 137	12.	MACS 1460 X NRC 128
13.	Dsb 34 X NRC 138	13.	Dsb 34 X NRC 138	13.	MACS 1460 x LJ 137
14.	Dsb 34 X LJ 124	14.	Dsb 34 X LJ 124	14.	MACS 1460 X LJ 140
15.	LJ 124 X Dsb 34	15.	LJ 124 X Dsb 34	15.	MACS 1460 X LJ 124
16.	LJ 140 X NRC 128	16.	JS 9305 X AGS 25	16.	MACS 1460 X RSC 10-46
17.	LJ 137 X NRC 138	17.	LJ 140 X NRC 128	17.	Dsb 34 x LJ 140
18.	NRC 138 X LJ - 140	18.	LJ 137 X NRC 138	18.	Dsb 34 X LJ 137
19.	LJ 137 X RSC10-46	19.	NRC 138 X LJ - 140	19.	Dsb 34 X LJ 124
20.	LJ 124 X NRC138	20.	LJ 137 X RSC10-46	20.	RSC 10-46 X LJ 124
21.	NRC 138 X LJ - 124	21.	LJ 124 X NRC138	21.	RVSM 20 11-35 X LJ-124
22.	LJ 137 X NRC 128	22.	NRC 138 X LJ - 124	22.	NRC 130 X JS 20-34
23.	NRC 128 X LJ 124	23.	LJ 137 X NRC 128	23.	RSC 10-46 X LJ 140
24.	NRC 128 X LJ 140	24.	NRC 128 X LJ 124	24.	NRC 130 X LJ 124

B. Suggested Crossing Programme to Centres in National Hybridization Programme

(a) Suggested Crossing Programme For Widening of Genetic Base

Zone	Cross
NHZ	1. VLS 89 x EC 38916; 2. VLS 89 x EC 39177 3. VLS 89 x EC 389167 4. VLS 59 x TGX 328-049
NPZ	**1.** PS 26 x AGS 205

Zone	Cross
CZ	1. NRC 138 x EC 100778 2. RVSM 2011-35 x TGX 311-101 F 3. JS 20-116 x TGX 825-17 E
NEHZ	1. JS 20-116 x EC 287754 2. KDS 753 x TGX B 1435 E

Zone	Cross
EZ	1. MACS 1407 x EC 274713 2. RKS 113 x TGX 849-47 F

Zone	Cross
SZ	1. MACS 1188 x TGX 780-5A 2. KDS 753 x WT 150

(b) Suggested Crossing Programme For Developing Food Grade Varieties

Northern Hill Zone: NRC 197 (null KTi) x NRC 142 ((null KTi & Null Lox 2)

North Eastern Hill Zone: NRC 127 (null KTi) x NRC 142 ((null KTi & Null Lox 2)

Eastern Zone: NRC 132 (null lox 2) x NRC 142 ((null KTi & Null Lox 2)

Central Zone: NRC 142 ((null KTi & Null Lox 2) x NRC 150 (null lox 2); NRC 142 ((null KTi & Null Lox 2) x NRC 152 ((null KTi & Null Lox 2), NRC 142 (null KTi & Null Lox 2) x NRC 132 (null lox 2), NRC 142 ((null KTi & Null Lox 2) x NRC 150 (null lox 2)

Southern Zone: NRC 142 ((null KTi & Null Lox 2) x NRC 132, NRC 142 ((null KTi & Null Lox 2) x MACSNRC 1667

These crosses would not segregate for food grade traits and selection is to be made for adaptation and yield by centres.

Note: Pure seed of above varieties would be provided by Dr Vineet Kumar and Dr Anita Rani

B. TECHNICAL PROGRAMME OF AGRONOMY FOR KHARIF 2023

A. Evaluation of New AVT II Entries

AGRON-1/23: Evaluation of AVT-II entries under different row spacing

Zone	Centre
North hill	Almora, Palampur,
4North plain	Pantnagar, Ludhiana
Central	Sehore, Kota, Amravati
Eastern	Raipur, Ranchi, Bhawani Patna
Southern	Dharwad, Adilabad, Pune
North Eastern Hill	Imphal, Medziphema

Treatment:
(A) Main plot: Row spacing (2)
1. 30 cm 2. 45 cm

(B) Sub plot: Entries

Zone	Entries
North Hill Zone	NRC 197; **Checks = Palam early soya 1, VLS 89, VLS 99, VLS 63**
Central Zone	JS 23-09, JS 23-03; **Checks = JS 20-34, NRC 138, NRC 130**
Eastern Zone	RSC 11-42; **Checks = NRC 128, JS 20-116, AMS 2014-1**

Design: Split plot, **Replication:** 3, **Plot Size:** 3.6 x 6 m
Observations: Branches per plant, pods per plant, seed index, dry weight per plant 30, 45 and 60 DAS, CGR, RGR, seed yield kg/ha, straw yield kg/ha, harvest index, grain production efficiency (kg/ha/day) and RUE
Note: *Concerned breeder will provide 4 kg seed of each entries up to 31stMay, 2023.*

AGRON-3/21: Evaluation of novel bio formulations for yield enhancement in soybean (All Centres)

Zone	Centre	Variety	RDF (N: P2O5:K2O:S kg/ha)
North plain	Pantnagar, Ludhiana, Delhi	PS 1347/SL 958	25:75:25:37.5
North hill	Almora		As per zonal recommendations
Central	Sehore, Kota, Amravati, Devgarh Baria	-	25:60:40:20
North Eastern	Raipur, Ranchi, Bhawani Patna	JS 97-52	25:100:50:50
Southern	Dharwad, Adilabad, Pune	DSb 21	25:80:20:30
North Eastern Hill	Imphal, Medziphema	JS 97-52	As per zonal recommendations

Treatments:

1 Control
2 RDF only
3 75% RDF
4 75% RDF + Bio Zn
5 75% RDF + Bio NPK
6 75% RDF + Bio Zn + Bio NPK
7 75% RDF + Rhizobium + MDSR14+12c
(12c=*Burkholderia arboris*-High P solubilizing)

Design: RCBD **Replications**: 3 **Plot size:** 6 m x 3.6 m (21.6 m^2)

Dose of bioformulations: 250 ml for 1 ha seed

Time and method of application: Mix 100 mL with 900 mL of water + 10 g of sugar. Take seeds in a bucket and pour the formulation and mix it thoroughly so as to coat the seeds uniformly. Spread the seeds under shade (prevent direct sunlight). Sow the seeds after half an hour of drying. The seed coating has to be done on the day of sowing only.

For treatment with BioNPK and Bio Zn together, mix 100 mL of BioNPK and 100 mL of BioZn with 800 mL of water and +10 g sugar. The rest procedure is the same as given above.

Observations to be recorded

1. Growth parameters: Plant dry matter 30, 45 and 60 at DAS, CGR, RGR, nodule number and their fresh and dry weight at R2 and R5 stage
2. Yield attributes (No. of branches/plant, No. of pods/plant, seed index)
3. Seed yield, Straw yield, biological yield (kg/ha), Harvest index
4. Soil data: Initial N, P, K, Zn and Fe; At harvest: N, P, K, Zn and Fe
5. Crop uptake data: N, P, K, Zn and Fe; At harvest N, P, K, Zn and Fe

AGRON-4/23: Standardization of sustainable management practices (Natural/organic/integrated crop management) for soybean-based cropping systems (2023-2033)

(A) Main plot treatment (cropping systems)

(A) Main plot treatment (cropping systems)				
North Plain (Pantnagar, Ludhiana)	Central (Kota, Amravati, Sehore Devgadhbaria)	Southern (Dharwad, Adilabad, Pune)	Eastern (Raipur, Ranchi)	North Eastern Hill (Imphal, Medziphema)
CS1- Soybean-wheat CS-2 Soybean-chickpea	CS1- Soybean-wheat CS-2 Soybean-chickpea	CS1- Soybean-wheat CS-2 Soybean-chickpea	CS1- Soybean-wheat CS-2 Soybean-maize	CS1- Soybean-Mustard (rape seed) CS-2 Soybean-maize

(B) Sub plot treatment

1. **Organic farming (OF)***
2. **Natural farming (NF)**
3. **Integrated crop management (ICM)**

Replication= 3 **Design= Split plot design**
***At least 2 years' old organic field required (2 years' conversion period).**
Plot size: 8 m x 3.6 m (fixed site)

CS1			CS2		
OF	**NF**	**ICM**	**OF**	**NF**	**ICM**
R1 (8 x 3.6m)	R1 (8 x 3.6m)	R1 (8 x 3.6m)	R1 (8 x 3.6m)	R1 (8 x 3.6m)	R1 (8 x 3.6m)
R2 (8 x 3.6m)	R2 (8 x 3.6m)	R2 (8 x 3.6m)	R2 (8 x 3.6m)	R2 (8 x 3.6m)	R2 (8 x 3.6m)
R3 (8 x 3.6m)	R3 (8 x 3.6m)	R3 (8 x 3.6m)	R3 (8 x 3.6m)	R3 (8 x 3.6m)	R3 (8 x 3.6m)

Observations: Seed yield, straw yield, HI, SEY, Net Return, B:C ratio, initial N, P, K in soil and N, P, K uptake, the balance sheet of N, P, K, Organic carbon, soil pH, microbial count, and physical properties (Initial and completion= bulk density)

Operations	NF	OF	ICM
Land preparation	Tillage operations (need based) which involved less cost.	One deep ploughing once in 3-4 years, otherwise one normal ploughing in summer followed by 2 criss-cross harrowings.	One deep ploughing once in 3-4 years, otherwise one normal ploughing in summer followed by 2 criss-cross harrowings.
Seed treatment	Beejamritha @ 50-100 ml/kg seed or 20 lit/acre (Seed soaking-Shade dry-sowing, for legumes: Dip in beejamritha-shade dry and sowing).	Soybean seed inoculated with biofertilizers such as rhizobium culture, phosphate solubilizing micro-organisms and vesicular arbuscular mycorrhizal (VAM) fungi @ 5-10 g kg^{-1} seed before sowing (Biofertilizers can be procured from recognized govt. agencies such as NAFED/ICAR Institutes).	Thiophanate-methyl + Pyraclostrobin (45%+5%) @ 3 ml kg^{-1} seed. Thiamethoxam (70 WS) (3 ml/kg of seed). *Bradyrhizobium* @ 10 g/kg and MDSR 14 @ 10g/kg seed
Sowing	Sowing with normal seed drill	Sowing is done with a normal seed cum fertilizer drill.	Sowing is done with a normal seed cum fertilizer drill.
Nutrient management	1. Jeevamritha (200 lit/acre or 10% foliar spray at 15, 30 and 45 days after sowing). 2. Ghanajeevamritha (200 kg/acre at sowing, 30 and 45 days after sowing) 3. Crop residue mulching *Note: use one component among Jeevamritha/Ghanajeevamritha based on resource availability*	Well-decomposed FYM @ 10 t ha^{-1} must be applied/incorporated to soil 20-25 days before kharif and rabi crops sowing. Additional P requirements can be supplied through rock phosphate (As per the P_2O_5 content of RP).	Nutrients are supplied through inorganic and organic sources: 1. 50% nutrient through inorganic sources (50% of the RDF- NPK) 2. 50% nutrient through organic sources (FYM)
Water management	Maintain 50% moisture + 50% air in the root zone of all crops. (Whaphasa: Alternate furrow irrigation).	Irrigation is applied as per the standard practices of respective crops.	Irrigation is applied as per the standard practices of respective crops.

Weed management	1. Crop residue mulching. 2. Need-based hand weeding	Two-hand weeding at 20 and 40 days after sowing. Hoeing of the field with bullocks/tractor Dora between 15-25 DAS.	Pre-emergence herbicide (Diclosulum @ 26 g/ha) + one hand weeding at 40 DAS or Dora at 20-25 DAS.
Plant protection	5% spray Agniastra (Pod borers, fruit bores, sucking pests and leaf-eating caterpillars), 5% bramhastra (Sucking pests and leaf-eating caterpillars) and 5% neemastra (Aphids, jassid, whitefly) @ 6-8lit/acre at 7-10 days' intervals.	Fungal Diseases: Seed treatment with *Trichoderma viride* @ 5 g kg^{-1} seed, *Pseudomonas syringae/fluorescens* @ 5 g kg^{-1} seed. *Pseudomonas syringae* is also used as foliar spray @ 10 g per litre of water at the initiation of fungal diseases. Insect pest control: *Bacillus thuringiensis* (Dipel) @ 1.0 l ha^{-1}, *Nomuriya rileyi* @ 1 kg ha^{-1}, *Beauveria bassiana* @ 1 kg ha^{-1} and nuclear polyhedrosis virus (NPV) @ 250 larval equivalent per hectare. Trap/border crops such as Suva (*Anethum graveolens*), Marigold (*Tagetes patula*), cowpea (*Vigna unguiculata*), and Dhaincha (*Sesbania rostrata or Sesbania aculeata*). c) Physical method includes yellow sticky trap and pheromone traps @ 5-10 ha^{-1} for monitoring purposes, 20-25 ha^{-1} for mass trapping, and 80-100 ha^{-1} for mating disruption	Need-based application of chemical pesticide + bio pesticide as per zonal recommendation.

Agron 2/23: Assessing the impactof herbicides with PGPR on soybean productivity (All centres)

(A) Main plot

1. Pre-emergence: Diclosulam @ 26 g/ha
2. Pre-emergence: Diclosulam @ 26 g/ha + One hand weeding at 40 days after sowing
3. Post emergence (15-20 DAS): Propaquizafop 2.5% + Imazethapyr 3.75% (Saked) at 2.0 litre/ha
4. Weedy check
5. Weed-free check (2 hand weeding at 20 and 40 DAS)

(B) Sub plot

Microbial strains:

1. *B. daqingense* (Rhizobial strain) @ 10 g/kg seed
2. *Bacillus aryabhataii* (Zn & P-solubilizing bacteria) @ 10 g/kg seed
3. *B. daqingense* @ 10 g/kg seed + *Bacillus aryabhataii* @ 10 g/kg seed (Consortia)
4. Uninoculated

Design: Split plot design
Replications: 03
Plot size: 6 m x 3.6 m
* 500 L water will be used/ha for all the herbicides

Centres:

Zone	Centre	RDF (N: P2O5:K2O:S kg/ha)
North plain	Pantnagar, Ludhiana, Delhi	As per zonal recommendations
Central	Sehore, Kota, Amravati, Devgarh Baria	
North Eastern	Raipur, Ranchi	
Southern	Dharwad, Adilabad, Pune	
North Eastern Hill	Imphal, Medziphema	

Observation to be recorded:

1. Growth parameters: Plant dry matter 30 DAS, 60 DAS, and at harvest
2. Nodulation (nodule dry weight), chlorophyll content (SPAD meter) at R5 stage
3. Yield attributes (No. of pods/plant, seed index)
4. Seed yield, biological yield (kg/ha) and harvest index
5. Cost of cultivation, Gross returns, net returns and net B: C ratio
6. Soil data: Initial N, P, K, Zn and Fe; At harvest: NPK, Zn and Fe
7. Crop uptake data: N, P, K, Zn and Fe at harvest
8. Weed density, weed dry matter at 30 and 60 DAS
9. Weed control efficiency at 30 and 60 DAS and weed index

Formulae

1. ***Crop growth rate (CGR)*** = 1/p x (W2 – W1) / T2-T1 (g/m^2/day)
2. ***Relative crop growth rate (RGR)*** = (loglnW2 - loglnW1) / T2 – T1 (g/g/day)
3. ***Rainfall use efficiency*** (RUE kg/ha-mm) = grain yield (kg/ha) / rainfall (mm) received during the crop growing period.
4. Soybean equivalent yield= [(rabi crop yield x Price of rabi crop)/ Price of soybean] + soybean yield

C. TECHNICAL PROGRAMME OF PLANT PATHOLOGY FOR Kharif 2023

PP-1Surveyand surveillanceforsoybean diseases

Centres: Almora,Amravati,Dharwad,Jabalpur,Jorhat,KasbeDigraj,Medziphema

Pantnagar,Palampur, Ludhaina, Raipur, Indour andSehore

Note:

1. Diseasescore0-9,andproceduregivenforcalculatinginfectionindex(I.I.)atAppendix
2. VII, pages 57-59 of "Technical Programme 2009-10" should strictly befollowed.
3. Dateofthe appearanceof diseaseandperiodofitsrapid spread shouldbementioned.
4. Previouscropsto berecordedbeforesoybeancropping.
5. **Prepare disease map with help of GPS locations.**
6. Probable yield loss due to disease in the region should also be mentioned based onsurvey.
7. Pathogen of every disease should clearly be spelt out. Name and abbreviated form ofdiseases as given in page no. 35 of "Technical Programme 2009-10" should uniformlybefollowed.
8. Plantprotectionmeasuresusedbyfarmerstoberecorded.
9. In case of viral diseases weed and insect population around the field and weatherfactorsto berecorded.

PP-2:Trapnurserytrialfordiseaseincidence

Centres:Almora, Amravati, Dharwad, Delhi, Indore, Jabalpur,

Jorhat,Medziphema,Pantnagar,Palampurand Sehore

Plotsize :Threerowsof3 mlength
Design :R.B.D.
Replications:Two

Treatments: Varietieslistedbelow

1. JS 95-60	2. JS 335	3. Shivalik	4. JS 93-05	5. Punjab 1
6. Bragg	7. Monetta	8. NRC 7	9. PK 262	10. PK 472

Observations:

1. For root rot diseases exact value of % mortality should be mentioned. Additionally, %mortalityshouldalsobereflectedintermsof0-9scoretocalculateinfectionindex(I.I.) asmentioned atpage58(AppendixVII,"Technical Programme2008-09).
2. For diseases (foliar, cotyledonary spot (CS), PSS and viral diseases), scoring should bemade in 9 scale as given in page 57; IB, C and D. Infection index should also becalculated. For foliar diseases observation is to be made on 10 plants/plot selected atrandomignoringtop 3 leaves.
3. Pathogen of everydisease should clearlybe spelt out.
4. Observationsofdiseaseswillberecordedatinitiationandatweeklyintervalandusedforforecasti ngmodel development.
5. To correlate with weather parameters and develop correlation coefficient andregressionequations for various observed diseases.

PP-3:Evaluation ofbreedingmaterialsforresistantdonor(s).

Centres:Almora, Amravati, Dharwad, Delhi, Indore, Jabalpur, Jorhat, Kasbe Digraj,Kota,Ludhiana,Medziphema,Pantnagar,Palampur,RaipurSehoreandUgarKhurd (Glasshouse screening of AVT II entries for rust through artificialinoculationwill betaken up at Dharwadcenter).

Trials: IVT & IVT (early); AVT I & AVT I (early), AVT II

Design and Plot Size: Replicated 2rowsx 3 m(2replications)underRBD.

Note1: SeedsfortheIVTtrial willbesuppliedbythe ICAR-IISR,Indore

Note2: AllthecentreswillevaluatetheAVT-I&IIentriesof**allthezones**.SeedsofpreviousyearIVTand AVTIcan beutilized.

Note3: Photographof susceptiblevarietyshouldbesubmitted alongthereport

Note4:AVTII entrieswillbeevaluatedunderartificiallyinoculatedconditions/hotspotlocationsfor centrespecific diseasesasgiven below:

S.N.	Centre	Disease(s)
1.	RVSKVV,Sehore	TLS,RAB,Anthracnose(Anth.),YMVandCR
2.	GBPU&T,Pantnagar	RABand YMV
3.	VPKAS,Almora	FLSandAnth.
4.	UAS,Dharwad	Rust, CLS/PSSand Anth.
5.	K.Digraj	Rust and Anth.
6.	JNKVV,Jabalpur	CR,YMV,Anth.andRAB
7.	AAU,Jorhat	Coll RandAnth.
8.	IGKVV,Raipur	IBBand Anth.
9.	CSKHPKVV,Palampur	Anth. andFLS
10.	Medziphema	Rust,Anth. andRAB
11.	Ludhiana	YMV andSMV
12.	UgarKhurd	Rust, CLS/PSSand Anth.
13.	Dholi	YMV
14.	Amravati	CR,Anth. andYMV
15.	Indore	Anth.,CRandSMV

Note 5: Pathologists should include susceptible checks for each disease as given below.However, more than one susceptible check should be used for each disease and theirname should be mentioned. **In case of breeder's checks, use only zonal checks of yourzone.**

Zone	Breeder's checks	Pathological Checks
NHZ	Breedersc hecks ofrespecti vezones	Shivalik,VLS2
NPZ		JS 335,JS 93-05
NEHZ		JS 93-05,JS 335
EZ		NRC37, JS 95-60
SZ		JS 335,JS 93-05
CZ		JS 95-60,JS 335

Note 6: ForIVT, AVT-I and AVTII, after every five entries one row of susceptiblechecks should be planted. The disease reaction should be given on 0-9

scale only.Classify the entries based on 0-9 scale. For virus disease (s) screening followinstructiongiven in note9.

PP-4:Performanceofthepreviousyear'sresistantentries

	Centres	Diseases
1.	RVSKVV,Sehore	TLS,Anth.andCR
2.	GBPUA&T,Pantnagar	RABandYMV
3.	VPKAS,Almora	FLS
4.	UAS,Dharwad	Rust and PSS
5.	JNKVV,Jabalpur	CR, YMVand RAB
6.	Ugarkhurd	Rustand Anth.
7.	IGKV,Raipur	IBBandAnth.
8.	Amravati	CRand YMV
9.	Palampur	FLSandAnth.
10.	Ludhiana	YMV
11.	K.Digraj	Rustand Anth.

Plot size should be maintained uniformly as 3 rows of 3 meter length at all centers(non replicated). The disease reaction should be given on 0-9 scale only. Classify theentries based on 0-9 scale. Each centre will identify AR or HR entries (MR, where AR orHR entries is not available) for the diseases as given above and maintain nursery underinoculated conditions. Eachyear variety identified asAR or HR in PP 3 (a,b,c) andgermplasm trial material will be added to this nursery**.** Entry should be rejected aftershowing susceptibility withyear of testing. {**Note 6 : Year oftesting of the entrymustbe shown in bracket with the entry. The exchange of resistant material for YMV,Anth., Rust, FLS, RAB and CR be taken up among the centers with intimation to PI(Plant Pathology).**

PP 5: Evaluation of germplasm lines for identification of multiple disease resistantsources

Centers: Dharwad (Rust, PSS and Anth.), Jabalpur (YMV, CR, RAB and Anth), Indore(Anth., YMV and SMV),Palampur (FLS, Anth. and BS), Pantnagar (YMV,RABandAnth.)

Design: Augmented (2lines x3 m)

Observations: The disease reaction should be given on 0-9 scale only. Classify the entriesbasedon 0-9 scale.

Number of Germplasm: 50 (List given below)

S. No	Germplasm
1	IC 0419798
2	IC 27150
3	IC 107903
4	IC 0548724

S. No	Germplasm
5	EC 0528663
6	IC 13005
7	EC 341825
8	IC 0129014

S. No	Germplasm
9	IC 0501894
10	EC 57048
11	IC 0501765
12	IC 0118465

S. No	Germplasm
13	IC 0118428
14	EC 025478
15	IC 0338729
16	IC 0118427
17	IC 0241857
18	IC 0574385
19	EC 14674
20	EC 76750
21	EC 39743
22	EC 0528651
23	EC 99552
24	IC 0501916
25	EC 76757

S. No	Germplasm
26	IC 0548721
27	EC 0241711
28	IC 0501941
29	EC 50057
30	IC 419847
31	EC 0097789
32	EC 76752
33	IC 0574382
34	EC 58526
35	IC 0316142
36	IC 0128988
37	IC 9468
38	EC 0257977

S. No	Germplasm
39	IC 0281845
40	EC 114570
41	IC 0118431
42	EC 0039494
43	IC 0118409
44	EC 39766
45	IC 0128992
46	IC 0538013
47	IC 0501867
48	EC 0251874
49	EC 172669
50	IC 0574362

Note7:Seeds willbesuppliedfromGermplasmCentreof ICAR-IISR,Indore

PP 6 (2022): Biological management of major diseases of soybean

Locations: Amravati, Dharwad, Indore, Jabalpur, Jorhat, Pantnagar, Palampur and Sehore Target Disease: Amravati (CR), Dharwad (Rust and Anth), Indore (Anth) Jabalpur (CR and RAB), Jorhat (Coll R, Anth), Pantnagar (RAB), Palampur (FLS and Anth) and Sehore (TLS)

Objective: To develop integrated disease management strategies against major diseases of soybean

Variety: JS 335; **Design:** RBD; **Plot size:** 6 rows of 3 m length, **Replications:** Three

Treatment Details:

Treatments	Chemicals	Seed treatment Dosage (g/kg seed)	Foliar application Dosage (g/l of water)
T1	Seed application of *Bacillus amyloliquefaciens* instead of Alcaligenes sp.	5	
T2	Seed and foliar application of *Bacillus subtilis* instead of *Proteus mirabilis*	5	
T3	Foliar application of *Bacillus amyloliquefaciens*		10
T4	Foliar application of *Bacillus subtilis*		10
T5	Seed application of local strain of *Trichoderma*	5	
T6	Foliar application of local strain of *Trichoderma*		10
T7	Seed application of local strain of *Pseudomonas fluorescence*	5	
T8	Foliar application of local strain of *Pseudomonas fluorescence*		10
T9	Control	-	-

Note: Foliar application will be done after 40 DAS and 55 DAS

Spraying with chlorantroniprole 0.2ml/L at 15 and 35 DAS and other pest will be control as per recommendation of ICAR IISR, Inodre.

Observations to be recorded: 1) % Field Stand, 2) % Disease severity at 45 DAS, 60 DAS, 75 DAS, 3) AUDPC, 4) Plant ht (cm), 5) No. of branches per plant, 6) No. of pods per plant, 7) 100 seed weight (g), 8) Seed yield (q/ha)

PP 7: Development of Forewarning systems against major diseases ofsoybean.

Source:Trapnurserydataatweeklyinterval
Source: Diseasedata generated atthesecentersWeatherdataofrespectivecenters.
Modules: Correlation&Regression

PP-8:Estimation of avoidable losses soybean diseases

Targetdisease and location

S.N.	Centre	Susceptibl evariety	Moderateresistance/ Resistancevariety	Disease(s)
1.	Indore	JS 95-60	JS 20-98	ANTH
2.	RVSKVV,Sehore	JS 95-60	JS 20-98	TLSandCR
3.	UAS,Dharwad	JS 335	DSb23	Rustand ANTH
4.	JNKVV,Jabalpur	JS 95-60	JS 20-29	CR,FLSand RAB
5.	GBPU&T, Pantnagar	JS 335	JS 20-98	RAB
6.	PAU,Ludhiana	JS 335	SL955	YMV
7.	CSKHPKVV, Palampur	JS 335	VLS59	ANTH.andFLS
8.	AAU,Jorhat	JS 9305	JS335, Himso 1688	CollRot, ANTH
9.	Medziphema	JS 335	JS 97-52	ANTH,RAB
10.	IGKVV,Raipur	JS 335	RSC10-46	IBB,ANTH
11	IARI,New Delhi	JS 335	DS3050	YMV,IBB
12.	R & D Center, Ugarkhurd	JS 335	DSb21	Rust
13.	ICAR-VPKAS, Almora	JS 335	KDS992	FrogeyeLeaf spot
14.	ARS,Amarvati	JS 335	AMS1002	Charcoalrot

Design: SplitPlotdesign with3replication

Treatments:

MainTreatmentT1:Susceptiblevariety
Main Treatment T2: Resistance/Moderate resistance variety
Sub T1 = Seed treatment + one spray (at 30 days after sowing);
SubT2=Seedtreatment+twosprays(at30and45DAS);
SubT3=Seed treatment+Threespraysat30, 45and 60DAS;
Sub T4= Seed treatment + Four sprays at 30, 45, 60 and 75 DASSubT5=Seed treatment+Waterspray
SubT6=No sprayno seed treatment
Seed treatment:
Thiophanate Methyl 450g/l + Pyraclostrobin 50g/l w/v FS @ 2ml/ kg ofseed
Foliarspray:

Tebuconazole@625ml/ha

ForYMV/IBB:

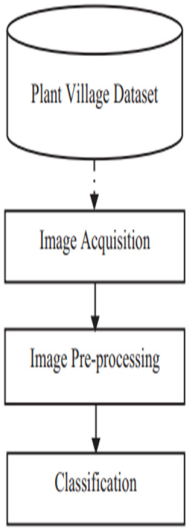
MainTreatmentT1:Susceptiblevariety
Main Treatment T2: Resistance/Moderate resistance variety
T1 = Seed treatment+one spray (at 30 days after sowing);
T2=Seed treatment+two sprays (at 30and 45DAS);
T3= Seed treatment+Three sprays at 30, 45 and 60 DAS;
T4= Seed treatment+Four sprays at 30, 45, 60 and 75 DAS
T5=Seed treatment+Waterspray
T6=No spraynoseed treatment
Seedtreatment:Thiomethoxam70S/600FS @3g/kgseed
Foliarsprayof Thiomethoxam 25 WG @100 gm/hastarted from21 DAS

Observation:

1. PDI will be calculated of 10 randomly selected plant at 30 DAS, 45 DAS, 60 DAS, 75DASforeach disease
2. Percentage Incidence of each disease will be recorded at 30 DAS, 45 DAS, 60 DAS and75DAS foreach disease.
3. Avoidable yield loss will be calculated as (YP – YU)/YP x 100, where YP = yield underprotectedcondition, YU=yield underunprotected condition.
4. AUDPCwillbecalculatedat 30DAS, 45DAS,60DAS and75 DAS
5. Yieldlosswill becalculatedas(EY –OY)/EY x100,whereEY=Expectedyield,OY=Observedyield.EY=Expectedyieldwillbefiveyearsaverageyieldin correspondingarea.

PP-9:Image-based identification of soybean diseases

Centres :Indore, Jabalpur, Pantnagar,



The prime aim is to build a model that can classify the input leaf images of a plant as healthy or diseased.

1. Collection of Dataset- Images of healthy plant leaves and infected with the diseases, will be collected throughout the disease cycle.
2. Image pre-processing and augmentation-Labelling or classification of images.
3. Model establishment- Model training, testing and validation
4. Result and evaluation

**Note: Methodologyforrecordingdiseaseseverity. **

Uniformmethodof diseaserating

Point scale (0 to 9) divided into 6 categories should be followed.Generalinterpretation ofthescale is asfollows:

0 = Highly resistant1=Resistant
3=Moderatelyresistant
5 =Moderatelysusceptible
7=Susceptible
9 =Highlysusceptible

Ratingscalesfordifferentdiseases

A. Charcoalrot/Collarrot/Rhizoctoniarot

RatingDescription

0: Nomortality
1: 1%mortality
3: 1.1 to10%mortality
5: 10.1-25%mortality
7 : 25.1-50%mortality
9: more than 50%mortality

Bacterialpustule/Rhizoctoniaaerialblight/Cercosporaleafspot/Alternarialeafspot/rust/Myrotheciumleafspot/Target leafspot/Frogeyeleafspot

RatingDescription

0:No lesions/spots
1:1%leafarea coveredwithlesions/spots
3: 1.1-10% leaf area covered with lesions/spots, no spots on stem.5:10.1-25%oftheleafareacovered,nodefoliation;littledamage.
7: 25.1-50% leaf area covered; some leaves drop; death of a Few plants; damageconspicuous.
9 : More than 50% area covered, lesions/spot very common on All plants, defoliationcommon;death of plantscommon; Damagemorethan 50%.

B. **Cotyledonary spot/Purple seed stain/ Pod blightRatingDescription**

0:Nolesions/spots/discoloration
1:1%areacoveredwith lesions/spots/discoloration
3:1.1-10%areacovered withlesions/spots/discoloration
5:10.1-25%areacoveredwithlesions/spots/discoloration
7:25.1-50%areacoveredwithlesions/spots/discoloration
9:Morethan50%areacoveredwith lesions/spots/discoloration

C. Viraldiseases:Yellowmosaic/Indian budblight/Greenorsoybeanmosaic

RatingDescription

0 Nosymptomsonanyplant
1 Yellowmottleornecroticmottleinupto1%plants
3Yellowmottleornecroticmottleintraceson1.1-10%plants
5 Necrotic mottle/mild mottle/ Mild symptoms; 10.1-25% plants; no reduction in plant growth; noyieldloss.
7 Yellow mottle symptoms not covering the whole leaf lamina on 25.1-50% plants; reduction inleafandplantgrowth.
9 Yellow mottle symptoms on more than 50% plants; severe reduction in leaf and plant growth aswellas podformation anddeathof plant.

Scaleforclassifyingreactionofviraldiseasesunderfieldconditions.

a. The percent disease incidence (percentage of number of infected plants over totalnumber of plants in a given accession) and disease severity (number of leaves havingsymptom over total number of leaves in a single plant and averaged from 10 suchplants).
b. Based on the disease severity, symptom severity grades, designated with numericalvalues of 0-4 and a scale of response value (0-1) corresponding to such grades, thecoefficientof infection(CI) willbecalculatedby multiplying the percentdiseaseincidence to the response value assigned for each

severity grade following standardmethodology

Symptoms	**Severity grade**	**Response value**D:\mcab\Downloads\YMV.rtf - page9[b]	**Coefficientof infection (CI)**D:\mcab\Downloads\YMV.rtf - page9[a]	**Diseasereaction**
Symptomsabsent	0	0	0-4	Highlyresistant
Verymildsymptomsupto25% leaves	1	0.25	5-9	Resistant
Appearanceofsymptomsin 26-50%leaves	2	0.50	10-19	Moderately resistant
Appearanceofsymptomsin 51-75%leaves	3	0.75	20-39	Moderately susceptible
Severediseaseinfectionin symptoms(>75%leaves)	4	1.00	40-69	Susceptible
			70-100	Highly susceptible

[a]CI¼ Percent diseaseincidence(anyvalue between 0 and 100)_Responsevalue.

[b] Response value is based on disease severity which is calculated on the basis of numberof leaves showing symptoms in a singleplant, not based on the types of symptoms orareacovered bythe symptoms.

(Singh, A.K. and Singh K.P., 2000, Screening for disease incidence of YVMV in Okratreatedwithgammaraysand EMS.*Veg. Sci*.,27:72-75).

CalculationofPercentDiseaseIndex(PDI)

Theaboveratingscales or gradesareutilized forthecalculationofPDIusingthefollowingformulaof wheeler.

Percentdiseaseindex (PDI)=(Sumofindividual rating*100)/(No.ofleaves(plants)examinedMaximum diseaseratingxmaximum grade)

Statisticalanalysis will beperformafter convertingthe PDIvalues byarcsineorangulartransformations,if, required.

On the basis of PDI, the entry/variety can be classified as follows:InfectiveIndexResistant category

0=Highlyresistant (AR)

0.01– 11.11 =Resistant (HR)

11.12– 33.33 =Moderatelyresistant (MR)

33.34– 55.55 =Moderatelysusceptible (MS)

55.56–77.77 =Susceptible(S)

77.78– 100.00 =Highlysusceptible (HS)

D. TECHNICAL PROGRAMME OF ENTOMOLOGY For KHARIF 2023

A list of major insect-pests occurring at different centers' is given below and entomologists should report data of different experiments against these insect pests:

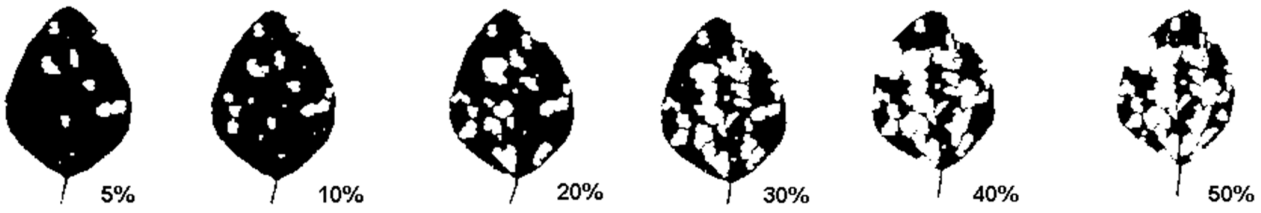
Zone	Centre	Major insect-pests
NEHZ	Imphal	Bihar hairy caterpillar, leaf webber, tobacco caterpillar, aphid and stem fly
NPZ	Pantnagar	Defoliators, girdle beetle, white fly and aphid
	Ludhiana	White fly
	Delhi	white fly/YMV and stem fly
CZ	Kota	Girdle beetle and defoliators
	Parbhani	Stem fly, girdle beetle and defoliators
	Amrawati	Stem fly, girdle beetle and defoliators
	Indore	Stem fly, girdle beetle and defoliators
SZ	Dharwad	Pod borers and defoliators
	Bidar	Pod borers and defoliators

ENT 1. Seasonal incidence of insect-pests and their bio-control agents

i) **Fixed plot survey**: At research station. Any insect susceptible soybean variety should be planted in at least 100 sq m area, to record seasonal incidence of both major and minor insect-pests and report it SMW wise with dates.
ii) **Production oriented survey**: At farmers' fields. Information on previous crop and farmers practices adopted should be recorded.

Centres : Pantnagar, Parbhani, Kota, Amrawati, Dharwad, Imphal and Delhi.
Sampling/observation procedures: Observations should be recorded at 7 days intervals starting from 7 days after germination (DAG) following a uniform procedure as described below for different insect pests:

i) **Leaf damage**: Calculate leaf damage in 5 randomly selected plants on the basis of visual observations at flowering and at peak incidence of larvae.
Example: Leaf damage in a plant having 10 leaves will be calculated as follows -
3 leaves with 10 percent damage (3 x 10) = 30
5 leaves with 30 percent damage (5 x 30) = 150
2 leaves with 50 percent damage (2 x 50) = 100
Average damage = (30+150+100)/10 leaves = **28% Leaf damage**



Defoliation	Resistance level
< 25 %	Least Susceptible
25-50 %	Moderately Susceptible
50-75 %	Susceptible
> 75 %	Highly Susceptible

ii) **Defoliators and Bugs** : No. of larvae (**Spp. wise**) and bugs/m. Observations should be recorded at three places and mean should be reported in Nos. per meter. Dominant defoliators should be reported separately. Calculate the extent of defoliation as above.

iii) **Leaf miner** : No. of larvae/plant in 10 plants. No. of leaflets and damaged leaflets be recorded and presented in percentage.

iv) **Stem fly**: Seedling mortality - total number of plants and number of plants succumbed to stem fly infestation / m at 3 places per plot on 7-10 DAG. Express seedling mortality in per cent and give the mean. Stem tunnelling - Plant height and length of stem tunnelled in 10 plants at physiological maturity. Express stem tunnelling in per cent.

v) **Whitefly, Aphids, Leaf hoppers and Mites**: No. of insects (nymphs and adults) on 3 leaves/plant (upper, middle and lower leaf) in 10 plants each.

vi) **Girdle beetle** : Mark 1 meter area atleast at **3-5** places, depending upon the plot size and record number of total plants and girdled plants and present the data in per cent plant infestation. Label all the infested plants with date, in earmarked area and record number of plants showing typical 'cut-off' symptoms. Calculate percent damage out of total plants per meter (in earmarked area).

vii) **Bio-control agents** : Collect 20 lepidopteran larvae from untreated soybean field at the interval of 10 days from their appearance. Put them in petri-dishes and report mortality (%) due to different bio-control agents (e.g. parasitoids and insect pathogens). Incidence of predators should also be recorded.

Note: Incidence of minor insects should also be mentioned. Variety used for this trial, date of sowing, date of germination and dates of observation should be indicated in the report. Meteorological data (on SMW basis) should be essentially appended.

IMPORTANT:

1. Submission of Weekly pest-status report

Besides fixed plot survey and production oriented survey, the weekly pest status should also be recorded by keeping close liaison with Department of Agriculture officials and the farmers of the region. As per the instructions of ADG (PP), ICAR the **weekly pest status report** should be invariably E-mailed to PI (Entomology), ICAR-IISR, Indore (lokesharsnagpur@gmail.com) in following format:

Name of AICRPS Centre: **Date**:

Crop	Crop stage	Location	Major Insect-pests		Major Plant diseases		Other pests (Nema-todes, Rats etc)	Data collected by	Data checked by	Pest Advisories
			Name	Status (Low, Medium, Severe)	Name	Status (Low, Medium, Severe)				

ENT 2. Field screening of AVT-I & II entries for resistance to major insect-pests

Centres **:** Parbhani, Kota, Amrawati, Dharwad, Imphal, Bidar, Pantnagar, Ludhiana and Delhi.

Treatments **:** Test entries of all zoneswith respective zonal checks, as per the technical programme of Plant Breeding. All entries should be grown in two sets, one with complete plant protection measures and other with no plant protection measures. All AVT test entries should be in alphabetical order followed by checks followed by entries found highly resistant, resistant, R-HY and S-HY (T) in previous years in alphabetical order.

Replications **:** Two

Design **:** RBD

Plot size **:** 2 rows of 3 m length each

Observations **:** Incidence of major insect-pests be recorded only from unprotected set of entries, at their peak incidence. Grain yield (kg/plot) should be recorded from both treated and untreated sets of entries for analysis by **Maximin-Minimax method**. ***For defoliators, entries should be rated based on defoliation* ALSO *as per the procedure given in Ent. 1.***

Data analysis:

Categorize the entries as per AICRP method to identify resistant sources against specific insect-pests. Replace mean (X) with 26 % for stem fly. Entries with traces of insect population or very less damage need not be categorized. Categorize the entries into resistant groups against prevailing insect pest-complex according to the **maximin-minimax method** (*Odulaja, A. and S. Nokoe.1993. A maximin-minimax approach for classifying crop varieties into resistant groups based on yield potential and loss. Intl J. Pest Mgmt., 39:64-67*)

IMPORTANT*:*

1. **Entries categorized as highly resistant (HR) / resistant (R) during last two seasons against the major pests of the centre/zone must be included in AVT trial of 2021 and be reported with separate identity.**
2. **In case of non availability of any entry, concerned breeder should be requested timely to send the seed.**

ENT 3: Status of AVT-II entries for antixenosis and antibiosis against *S. litura*

Centres: Pantnagar and Indore

Test Entries: AVT-II entries of **ALL ZONES**. **All concerned breeders are requested to send atleast 200 g of their AVT-II entries directly to Entomologists of above TWO centres.**

Sow susceptible variety JS 335 in about 100 sq m area so that its leaves can be used for rearing of larvae for lab studies.

Objective: To assess the effect of selected soybean genotypes on the food consumption and its utilization by *Spodoptera litura* larvae and antixenosis response exerted by genotypes. Rationale of this study is that when larvae are exposed to resistant genotypes, their feeding capacity is adversely affected, which is ultimately reflected in their growth and development. Three utilization indices [Waldbauer (1968); Jacob and Chippendale (1971); Brewer and King (1978)] will be used as the indicators of response of *Spodoptera litura* larvae exposed to soybean genotypes : (i) the **A**pproximate **D**igestibility (AD) is the measure of approximate percentage of food consumed that is utilized by the larvae; (ii) the **E**fficiency of **C**onversion **I**ndex (ECI) is an overall measure of ability of larvae to utilize the ingested food for their growth; (iii) the **E**fficiency of **C**onversion of **D**igested food (ECD) is the percentage of

digested food that contributes to weight gain of the larvae. These three indices will be calculated as follows:
AD = [(Fi – Wf) / Fi] x 100 ; **ECI** = (Wg / Fi) x 100 ; **ECD** = [Wg / (Fi – Wf)] x 100
where, Fi is weight of food ingested, Wf is weight of frass, and Wg is weight gain by larvae.

Antixenosis response exerted by the genotypes on defoliating larvae will be assessed by calculating the **Preference Index** (Kogan and Goeden, 1970).
Preference Index, **C** = 2A / M+A, where, A = Dry weight of leaves of test genotypes eaten by larvae and M = Dry weight of leaves of susceptible check eaten by larvae.

Methodology

Test Insect: *Spodoptera litura* larvae. Culture maintenance should be initiated well in advance so that sufficient larvae are available for the study. Pupae or egg masses of *S. litura* can be obtained on payment basis by sending a request to the Director, National Bureau of Agricultural Insect Resources (formerly PDBC), Pox Bag No. 2491, H.A. Farm Post Bellary Road, Bengaluru, Karnataka 560024. Price list is available at Bureau's web site http://www.nbair.res.in. E-mail: **nbaii.icar@gmail.com** / **nbair@icar.gov.in**.

Working conditions: Preferably 27 $\pm$ 1 ^{0} C, 80 $\pm$ 5 % RH
Replications: Three
Dry weight of leaves: Take fresh weight of 10 leaflets/genotype. Oven dry at 50 ^{0} C for 15 minutes and weigh. Use this relation between fresh and dry weight of leaves for calculating **Fi** (i.e. food ingested).
Dry weight of larvae: Take fresh weight of twenty 3rd instar *S. litura* larvae. Oven dry at 50 ^{0} C for 15 minutes and weigh. Use this relation between fresh and dry weight of larvae for calculating **Wg** (i.e. weight gain by larvae).
Dry weight of frass: Collect frass from each individual petri plate. Oven dry at 50 ^{0} C for 15 minutes and weigh. Use the frass dry weight for calculating **Wf**.

Antibiosis Studies:
Release FIVE 3rd instar, pre-weighed larvae in petri plates and provide pre-weighed leaves of soybean genotypes. After every 24 hr, remove the left over leaves and frass from the petri plates, oven dry them at 50 ^{0} C for 15 minutes and weigh. Record the larval weight daily. Record the larval mortality, if any. Continue this process up to pupation. Record larval duration in days. Observe the pupae and report if there is any deformity. Record pupal duration in days. Place the pupae (genotype and replication wise separately) in oviposition jars, observe adult emergence and report deformities in adults, if any.

Antixenosis Studies:
Place one pre weighed leaf (or a portion of leaf) of all the genotypes in circular manner in a petri plate having thin thermocol sheet at the base. Fix all the leaves with pin to ensure that they do not touch each other and are not displaced. Release TEN 3rd instar *S. litura* larvae at the centre of petri plate. After 8 hrs, remove the left over leaves of all the genotypes, oven dry at 50 ^{0} C for 15 minutes and weigh. Calculate the weight of leaves eaten by larvae for all the genotypes. Use the fresh and dry weight relationship as described above. Maintain 5 replications in the experiment. Calculate the **Preference Index (C)** and classify the genotypes as follows:

C value	Antixenosis response
0.10 to 0.25	Extreme antixenosis
0.26 to 0.50	Strong antixenosis
0.51 to 0.75	Moderate antixenosis
0.76 to 0.99	Slight antixenosis
1.00 or > 1.00	Preferred host

References:

Brewer F D and E G King. 1978. Effects of parasitization by a tachinid, *Lixophaga diatraeae*, on the growth and food consumption of sugarcane borer larvae. *Ann. Entomol. Soc. Am*., **71**: 19-22.

Jacob D and Chippendale G M. 1971. Growth and Development of the southwestern corn borer, *Diatraea grandiosella* on a meridic diet. *Ann. Entomol. Soc. Am*., **64**: 485-488.

Kogan, M and Goeden, RD. 19 70. The host plant range of *Lema trilineata daturaphila* (Coleoptera: Chrysomelidae). Ann. Entom. Soc. Amer., **63**(4):1175-1180.

Waldbauer G P. 1968. The consumption and utilization of food by insects. *Adv. Insect Physiol*., **5**: 229-288.

ENT 4. Field screening of IVT entries for resistance to major insect-pests (ongoing activity)

Centres **:** Parbhani, Kota, Amravati, Pantnagar, Ludhiana, Delhi, Dharwad, Imphal and Bidar

Treatment **:** Test entries as per breeding programme with respective checks

Replications **:** Two

Design **:** RBD

Plot size **:** 3 rows of 3 m length each

Observations **:** On major insects as mentioned above + Grain yield (kg/ha). ***For defoliators, entries should be rated based on defoliation ALSO in a separate column as per the procedure given in Ent. 1.***

NOTE*: PI (Plant Breeding), IISR, Indore will arrange to send 200 g seed of each IVT entry to each entomologist / centre separately.*

AICRPS method of Categorization:

HR = values < mean – CD at 1%.

R = values between mean – CD at 1% & mean – CD at 5%.

MR = values between mean – CD at 5% & mean

LR = values between mean & mean + CD at 5%

S = values between mean + CD at 5% and mean + CD at 1%

HS = values > mean + CD at 1%.

NOTE: Centres must retain all IVT entries for further use in AVT next year.

ENT 5: Evaluation of germplasm lines at hot spots for resistance against major insect-pests

Hot spots	Major insect-pests
Imphal	Bihar Hairy Caterpillar, leaf webber, Aphids
Ludhiana	White fly/YMV
Kota	Defoliators, girdle beetle
Dharwad	Defoliators, pod borers
Indore	Stem fly, girdle beetle, defoliators

No. of lines : 50. List Given Below
Plot size **:** Single row of 3 m length (Non-replicated)
Observations **:** On insects as specified above at peak incidence / infestation and **grain yield**. Date of observation and crop age should be mentioned in the report. Screening procedure should be same as in case of IVT and AVT entries.

NOTE: One row of susceptible check variety (preferably JS 335) should be planted after every 5
germplasm lines.

NOTE: Centres must retain all germplasm lines for further use.

S.NO.	Accession
1	IC 0218945
2	IC 0421898
3	EC 39494
4	IC 0501833
5	EC 113779
6	EC 113396
7	IC 469833
8	IC 0096297
9	IC 0567505
10	EC 103154
11	IC 172624
12	IC 0129008
13	IC 129009
14	EC 528624
15	IC 21757
16	IC 02128917
17	IC 0501788

S.NO.	Accession
18	IC 0263334
19	IC 0501673
20	IC 0501931
21	IC 0341347
22	IC 0574366
23	IC 0024996
24	IC 0118437
25	IC 0281647
26	EC 0251843
27	EC 37656
28	IC 16832
29	EC 0057039
30	IC 0262123
31	EC 39512
32	EC 251396
33	EC 0241870
34	IC 0548636

S.NO.	Accession
35	EC 0287458
36	IC 13053
37	IC 0128934
38	IC 0032730
39	EC 39570
40	EC 39730
41	IC 49857
42	EC 0291396
43	EC 81822
44	IC 243779
45	EC 24154
46	IC 0501852
47	IC 0117395
48	EC 93718
49	IC 207
50	EC 0232051

ENT 6. Management of major defoliators of soybean through intercropping with *suva*, *Anethum graveolens*

Centers: Pantnagar, Parbhani, Indore and Dharwad.
Treatments details: Intercropping of suva, *Anethum graveolens* with soybean in different rows combinations as given below:
Variety : JS 335
Treatment :five (5)
Replications : four (4)
Design : RBD with fivOe treatments and tree replications
Row length : 5m
Sowing : Sowing of soybean and suva must be done simultaneously.
Treatments details: Intercropping of suva, *Anethum graveolens* with soybean in different rows combinations as given below:

1. Sole Soybean (18 rows)
2. Soybean + Suva (15 soybean: 1suva rows combinations)
3. Soybean + Suva (18 soybean: 1 suva rows combinations)

4. Soybean + Suva (15 soybean: 2 suva rows combinations))
5. Soybean + Suva (18 soybean: 2 suva rows combinations)

Observations: 1. **Defoliators population**: Number of larvae per meter crop row at three random points per plot.

2. Number of eggs laying on suva and soybean species wise

3. Number of larva on suva and soybean species wise and present them in percent form like 5% *Spodoptera*, 50% semiloopers species etc.

Instructions to Soybean Entomologists for uniformity in conduct of trials and reporting of data

1. **Weather data** of entire crop season should be supplied with trial data.
2. **Survey**: Mention variety name, DOS, DOG and dates of observations. Data on major and minor insects should be submitted in the **format** given in Summary Tables of Experiments. In case of defoliators, larval population andextent of defoliation (%) at flowering and at peak incidence should be given. Observations on BCAs, both in field as well as under lab conditions should be reported. Associate with Agronomists for Field surveys and report insect situation in the region.
3. **Screening** : While reporting screening data of AVT entries, sort the test entries in alphabetical order followed by zonal checks as given in Technical Programme. Previous years' resistant entries should also be sorted alphabetically **but** should appear after zonal checks. **Use all zonal checks** also and indicate them with (C). Transformed values and the resistance categories may be given in the **same column** below the original values. In case of defoliators, larval population andextent of defoliation (%) should be reported.
4. Seeds of all IVT entries should be **retained**, so that they can be used next year if some of them get promoted to AVT or found resistant to insect(s).
5. **Summary** : A brief summary of results may be given for each trial. Please try to analyze the results critically and give your valuable interpretations. In case of unexpected results, please try to find out the possible reasons.
6. **For lab experiment (ENT. 3) on "**Status of AVT-IIentries for antixenosis and antibiosisagainst*S. litura"***:** Take timely action for procurement of *Spodoptera litura* pupae or egg masses from NBAIR, Bangalore (if required).

E. TECHNICAL PROGRAMME OF MICROBIOLOGY FOR 2023

MB 1/23:

Isolation and functional characterization of selected rhizobia for N-fixing abilities in soybean

Centre: Pantnagar, Delhi, Indore, Ludhiana, Dharwad, and Jorhat

Isolation: soybean rhizobia should be recovered from root nodules of soybean varieties which are currently in seed chain. The rhizobial isolation and characterization will be carried out by adopting standard methods **(Annexure 1).**

MB 2/21:

Response of N-fixing rhizobiaandP solubilizingbacteriawith RDF/farmers practice and with reduction of fertilization on latest release variety of soybean of a zone (Ludhiana, Delhi, Pantnagar, Indore, Sehore, Raipur and Dharwad)

Treatments-

T1=RDF (100% recommended dose of NPK fertilizers in the zone; example for central zone the recommended dose of NPK is 25 Kg N/ha, 60 Kg P/ha and 40 Kg/ha K)
T2=75% of recommended N and 100% of recommended P and K.
T3=75% of recommended P and 100% of recommended N and K.
T4=75% of recommended N&P and 100% of recommended K.
T5= 75% of recommended N and 100% of recommended P and K+*Bradyrhizobium daqingense*
T6=75% of recommended N and 100% of recommended P and K +Commercial/local rhizobial strain available in the zone/market
T7=75% of recommended P and 100% of recommended N and K+ *Bacillus aryabhataii*
T8=75% of recommended N & P and 100% of recommended K+ *B. daqingense*+*Bacillus aryabhataii*
T9=75% of recommended N & P and 100% of recommended K+*Bacillus aryabhataii* RDF+ Commercial/local rhizobial strain available in the zone/market

Treatments and design: 9 (RBD with 3 replications); Plot size: 3.6 × 5
Parameters:

- At Flowering/R2 stage-Nodules per plant, nodule dry weight, Leghaemoglobin, chlorophyll content
- At harvest: Grain yield, cost benefit ratio, savings of NPK inputs

***Cultures of *B. daqingense* and *Bacillus aryabhataii* will be supplied by the Indore centre**

MB 3/23:

Evaluation of promising consortia for conferring drought tolerance in soybean under pot conditions (Ludhiana, Delhi, Pantnagar, Indore, Sehore, Raipur and Dharwad)

This trial would be conducted in unsterilized soil in 10 Kg plastic black gusseted/pots.

Following treatments will be tested-
Treatments: 10 (5×2)
Inoculations: 05

1. ICAR-IISR, Indore microbial Consortia
2. ICAR-DGR endophyte formulation
3. ICAR-CRIDA drought tolerant microbial consortium
4. ICAR-NBAIM Archaea formulation/consortium
5. Un-inoculated control

Stress level: 02

1. No moisture stress.
2. Stress at R5 stage for 10 days (by stopping irrigation) or until plants started showing wilting symptoms whichever is earlier.

Design: Factorial CRD (5×2); replications 6
Observations (3 replications at flowering stage and remaining 3 after stress treatment at R5 stage):
After stress (7-10 days of imposing stress treatments at R5 stage)

1. Nodule dry weight
2. Leghaemoglobin in nodules
3. Relative water content
4. Chlorophyll content in leaves
5. Shoot and root dry weight.
6. N and P uptake in roots and shoots

Note: Microbial consortia will be supplied by the respective institute. Three replications will be used at flowering stage to record nodulation parameters and remaining three will be used after stress treatment at R5 stage. The sampling will be done before irrigation (after stress treatment at R5 stage).

MB 4/13: Nodulation ability of AVT-II entries of respective centres
Centres: Pantnagar, Delhi, Indore, Sehore, Ludhiana, Raipur & Dharwad

Zone	AVT II Entries
NHZ	NRC 197 (null KTI, high oil yield), **Checks-**Palam Early Soya 1, VLS 89, VLS 99, VLS 63
NPZ	Nil
NEHZ	Nil
EZ	RSC 11-42, **Checks-** NRC 128, JS 20-116, AMS 2014-1
CZ	JS 23-09, JS 23-03 **Checks**- JS 20-34, NRC 152, NRC 138, NRC 142, JS 95-60
SZ	Nil

Experimental design and replication: As per breeder's trial (Either take samples, whole plants with intact roots and soils, from breeder trials in triplicates or procure seeds from breeders of respective zone to conduct trial separately in which case each entry should have 3 replications).

Observations:

1. Nodule number and nodule dry weight
2. Leghaemoglobin content in nodules at 50 % flowering stage
3. Grain yield per plot

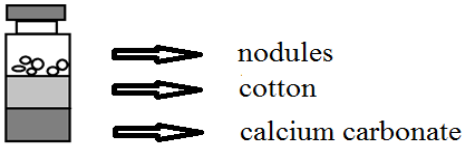
4.

Annexure 1

Isolation of soybean rhizobia

Collection of soybean root nodules

The root nodules will be collected from soybean root nodules at flowering stage of target soybean varieties. From each root sample, 2 to 3 healthy root nodules were detached gently and washed thoroughly with sterile distill water so as to remove the foreign soil particles adhered to nodules. The root nodules will be preserved in a dessicator until used for isolation. The lower most layer of the container (tube) consist of calcium carbonate which is used to absorb the extra moisture present in dessicator and on the surface of nodules, above which cotton is placed and in this system nodules are kept and stored in refrigerator until used for isolation (depicted below).



Isolation

The method used for isolation of rhizobia from root nodules will be followed given by Somasegaran and Hoben (1985). After washing, two healthy surface nodules will be sterilized with 95% alcohol for 30-40 seconds followed by immerging in 4% sodium hypochlorite for 3 to 4 minutes. Then nodules immediately washed 5 to 6 times with sterile distill water to remove trace of sodium hypochlorite. After washing, the nodules will be transferred to sterile vials containing 200µl sterile distill water. Nodules will be crushed with sterile glass rod to obtain some creamish solution of which one loop full culture will be streaked on Congored yeast extract mannitol agar media (CRYEMA Table-1) or alternatively the turbid suspension of about 50µl culture will be poured over the CRYEMA plates with the help of micropipette. Plates/petri dishes will be incubated at 28°C in dark until growth appeared on the diluted plates (target generation time where slow bradyrhizobial colonies will be appearing after 48 hours). Single unique colony will be picked up and will be re-streaked on the same media to isolate the pure colonies/culture.

To ascertain bradyrhizobial colonies, the reference cultures of *Bradyrhizobium* strains available with other centres will be used for comparison purpose.

Table 1: Composition of Yeast extract mannitol agar with Congo red (CRYEMA)

Component	g/L
Yeast extract	0.5
K_2HPO_4	0.5
Mannitol	10
NaCl	0.1
$CaCO_3$	1.0
MgSO4.7H2O	0.2
Congo red*	25ppm
Agar	20
D/W	1L
pH	7.8

**YEMA with 25ppm congo-red dye: 10ml of stock solution (dissolve 0.25 gm Congo red in 100ml of distilled water)*

Biochemical Parameters

Isolated strains will be characterized based on following parameters by following standard protocols-

- Gram staining and morphological characteristics **(**Somasegaran and Hoben, 1994; Cappucino and Sherman (1992)
- Acid and Alkali production
- Growth on glucose peptone agar
- Growth on keto-lactose agar (Keto-lactose test will be performed to check the contamination of agrobacterium in rhizobial isolates)
- Nitrate reductase test (denitrification)
- Phosphate solubilization
- Siderophore production (Schwayn and Neiland (1987)
- Indole acetic production (Gordon and Weber, 1951)

Molecular characterization

The selected isolates will be characterized based on 16S rRNA gene sequencing using universal primers

F. TECHNICAL PROGRAMME OF FOOD TECHNOLOGY 2022-23

Multi-location analysis of food grade characteristics of AVT II entries

Design: RBD Number of Rows: 3Row Length: 3m Replications: 3

Entries:

Zone	Entries
NHZ	NRC 197, Palam Early Soya 1, VLS 89, VLS 99, VLS 63, Filler1
EZ	RSC 11-42, NRC 128, JS 20-116, AMS 2014-1, Filler 2
CZ	NRC 262, JS 24-33, AMS 2022-1, JS 23-09*, JS 23-03*, JS 20-34, NRC 1 NRC 138, NRC 130, JS 95-60

Objectives:

1. To analyse soybean varieties in different zones for physical characteristics of seed

Parameter to be analysed	Instrument / Method
100 seed weight	Weighing balance
Seed colour	Lab hunter colour/ horticulture colour chart
Hilum colour	Horticulture colour chart
Seed dimension	Vernier calipars
Seed lustre	Lab hunter colour
Protein Content	

2. **To analyse soybean entries sown in different zones for cooking characteristics of seed**

Parameter to be analysed	Instrument/ method used
Cooking time	Time to cook seed in pressure cooker, cooking index- pressing between fingers
Hydration ratio	Ratio between weight of seed after absorption of water/ weight of dry seed
Hull fragility	Number of hulls removed during cooking per 10g seed
Sensory of cooked bean	Parameters: Softness/ Mouth feel, Beaniness, Overall acceptability
Milk yield	• Weigh 5g seed blanch for 2 minutes and soak in water overnight • Grind imbibed seed in pestal mortar • Add 50ml hot water and cook for one minute • Sieve through muslin cloth • Measure volume in measuring cylinder • Measure TSS
Tofu yield	• Take hot milk (80^0C) prepared and coagulate using 0.2% $MgCl_2$ • Centrifuge the curd to separate whey at 5000 rpm for 15 minutes • Weigh the curd for tofu yield • Calculation for tofu yield as Kg of tofu yield / Kg soybean • Protein content of tofu
Sensory of milk and tofu	Colour, texture/consistency, beaniness/ flavour, overall acceptability

3. To study effect of location of sowing on food grade qualities of seed Comparative analysis of data of seed samples grown in NPZ, NEHZ and CZ

F. TECHNICAL PROGRAMME OF TRANSFER OF TECHNOLOGY FOR 2023

Allotment of FLDs to different AICRPs Centres and KVKs - 2023-24

S. No.	Centres	Zone	State	Tentative No. of FLDs allotted	Varieties	Component wise						
						WP	IWM	INM	IPM	IC	FGV	Org. F.
1	ICAR-IISR Indore	Central zone	**Madhya Pradesh**	250	NRC 130, JS 20-34, JS 20-69, JS 20-116, RSC 10-52, RSC 10-46, AMS-MB-5-I8 (Suvarn Soya), NRC 127, NRC 138 , NRC 142 , MACS 1520 , RVSM 2011-35 , AMS 100-39 , JS 20-98	125	-	-	-	-	125	-
2	CoA, Sehore	Central zone	**Madhya Pradesh**	50	NRC 130, JS 20-34, JS 20-69, JS 20-116, RSC 10-52, RSC 10-46, AMS-MB-5-I8 (Suvarn Soya), NRC 127, NRC 138 , NRC 142 , MACS 1520 , RVSM 2011-35 , AMS 100-39 , JS 20-98	50	-	-	-	-	-	-
3	MAU, Parbhani	Central zone	**Maharashtra**	100	AMS-MB-5-18, KLDS 334, JS 20-34, JS 20-69, NRC 130, RSC 10-46, RSC l0-52, AMS-MB-5-I8 (Suvarn Soya), NRC 127, NRC 138 , NRC 142 , MACS 1520 , RVSM 2011-35 , AMS 100-39 , JS 20-98, MAUS 612	50	-	-	-	50	-	-
4	PDKV, Amravati	Central zone	**Maharashtra**	50	AMS-MB-5-18, KLDS 334, JS 20-34, JS 20-69, NRC 130, RSC 10-46, RSC l0-52, AMS-MB-5-I8 (Suvarn Soya), NRC 127, NRC 138 , NRC 142 , MACS 1520 , RVSM 2011-35 , AMS 100-39 , JS 20-98, MAUS 612	25	-	-	-	25	-	-
5	KVK Karda	Central zone	**Maharashtra**	100	AMS-MB-5-18, KLDS 334, JS 20-34, JS 20-69, NRC 130, RSC 10-46, RSC l0-52, AMS-MB-5-I8 (Suvarn Soya), NRC 127, JS 20-98, MAUS 612	50	-	-	-	50	-	-

6	AU, Kota	Central zone	**Rajasthan**	60	JS 20-34, RKS 45, PK 113, NRC 130, RSC 10-46, RSC l0-52, AMS-MB-5-I8 (Suvarn Soya), NRC 127, NRC 138 , NRC 142 , MACS 1520 , RVSM 2011-35 , AMS 100-39 , JS 20-98	30	-	30	-	-	-	-
7	KVK Bharuch	Central zone	**Gujrat**	25	NRC 130, JS 20-34, JS 20-69, JS 20-116, RSC 10-52, AMS-MB-5-I8 (Suvarn Soya), NRC 127, NRC 138 , NRC 142 , MACS 1520 , RVSM 2011-35 , AMS 100-39 , JS 20-98	20	-	-	-	5	-	-
8	DevgrahBaria	Central zone	**Gujrat**	30	NRC 130, JS 20-34, JS 20-69, JS 20-116, RSC 10-52, AMS-MB-5-I8 (Suvarn Soya), NRC 127, NRC 138 , NRC 142 , MACS 1520 , RVSM 2011-35 , AMS 100-39 , JS 20-98	30	-	-	-	-	-	-
9	Raipur	Eastern zone	**Chhattisgarh**	100	CG SOYA, RSC 10-52 & RSC 10-46, NRC 132, MACS 1407, MACS 1460, NRC 147, NRC 128, NRC 136, NRCSL 1, RSC 11-07, AMS 2014-l (PDKV Purva), JS 20-116	50	30	10	10	-	-	-
10	BAU, Ranchi	Eastern zone	**Jharkhand**	30	CG SOYA, RSC 10-52 & RSC 10-46, NRC 132, MACS 1407, MACS 1460, NRC 147, NRC 128, NRC 136, NRCSL 1, RSC 11-07, AMS 2014-l (PDKV Purva), JS 20-116	25	5	-	-	-	-	-
11	CAU, Imphal	North Eastern hill Zone	**Manipur**	50	MACS 1460, DSb 19, DSb 32, JS 20-116, RKS 113, MACS 1460,	45	-	-	-	-	-	5
12	Medziphema	North Eastern hill Zone	**Nagaland**	40	MACS 1460, DSb 19, DSb 32, JS 20-116, RKS 113, MACS 1460	35	-	-	-	-	-	5
13	Almora	Northern hill Zone	**Uttarakhand**	20	PS 1347, PS 1225, PS 25 & PS 26, VLS 89, PS 1556	15	-	-	-	-	-	5
14	Palampur	Northern hill Zone	**Himachal Pradesh**	30	VLS 59, VLS 63, VLS 89, VLS 89, PS 1556	25	-	-	-	-	-	5

15	Pantnagar	Northern Plain Zone	**Uttarakhand**	100	PS 1347, PS 1225, PS 25 & PS 26, NRC 128, SL 1028 , SL 1074, SL 955, SL 979	60	35	-	-	-	-	5
16	PAU, Ludhiana	Northern Plain Zone	**Punjab**	100	SL 958, SL 979, NRC 128, SL 1028 , SL 1074, SL 955,	100	-	-	-	-	-	-
17	ARI, Pune	Southern Zone	**Maharashtra**	50	AMS-MB-5-18, KLDS 334, JS 20-34, JS 20-69, MACS 1460, NRC132, NRC147, RSC 11-07, DSb 34, DSb23, KS 103, KDS 726, NRC 132 , NRC 147 , NRC 142, KDS 992 , Karune , MACSNRC 1667	25	-	-	-	25	-	-
18	KVK, Kaneri Math, Kolhapur-II	Southern Zone	**Maharashtra**	100	AMS-MB-5-18, KLDS 334, JS 20-34, JS 20-69, MACS 1460, NRC132, NRC147, RSC 11-07, DSb 34, DSb23, KS 103, KDS 726, NRC 132 , NRC 147 , NRC 142, KDS 992 , Karune , MACSNRC 1667	50	-	-	-	50	-	-
19	MPKV, Sangli	Southern Zone	**Maharashtra**	50	AMS-MB-5-18, KLDS 334, JS 20-34, JS 20-69, MACS 1460, NRC132, NRC147, RSC 11-07, DSb 34, DSb23, KS 103, KDS 726, NRC 132 , H19, NRC 142, KDS 992 , Karune , MACSNRC 1667	40	-	-	-	10	-	-
20	UAS Dharwad	Southern Zone	**Karnataka**	100	DSb 21, DSb 23, DSb 34, KSB 23, Karune, MACS 1460, NRC132, NRC147, RSC 11-07, KS 103, KDS 726, NRC 142, KDS 992 , MACSNRC 1667	60	20	10	10	-	-	-
21	Ugarkhurd Sugar	Southern Zone	**Karnataka**	50	DSb 21, DSb 23, DSb 34, KSB 23, Karune, MACS 1460, NRC132, NRC147, RSC 11-07, KS 103, KDS 726, NRC 142, KDS 992 , MACSNRC 1667	25	-	-	-	25	-	-
22	ICAR-KLE-KVK, Belagavi	Southern Zone	**Karnataka**	100	DSb 21, DSb 23, DSb 34, KSB 23, Karune, MACS 1460, NRC132, NRC147, RSC 11-07, KS 103, KDS 726, NRC 142, KDS 992 , MACSNRC 1667	50	-	-	-	50	-	-

23	Bangalore	Southern Zone	**Karnataka**	80	DSb 21, DSb 23, DSb 34, KSB 23, Karune, MACS 1460, NRC132, NRC147, RSC 11-07, KS 103, KDS 726, NRC 142, KDS 992 , MACSNRC 1667	60	20	-	-	-	-	-
24	PJTSAU, Adilabad	Southern Zone	**Telangana**	60	BASARA, KDS 726, KDS 753, MAUS 158, MACS 1188, NRC132, NRC147, RSC 11-07, DSb 34, DSb23, KS 103, NRC 142, KDS 992 , Karune , MACSNRC 1667	45	5	5	5	-	-	-
25	KVK, Begusarai	Eastern zone	**Bihar**	30	SL 958, NRC 128, NRCSL-1, MACS 1407, MACS 1460, NRC 147, NRC 136, RSC 11-07, RSC 10-46, JS 20-116	20	5	5	-	-	-	-
26	AICRPS center Morena	Central zone	**Madhya Pradesh**	50	NRC 130, JS 20-34, IS 20-69, JS 20-116, RSC 10-52, RSC 10-46, AMSMB-5-I8 (Suvarn Soya), NRC 127, NRC 138, NRC 142, MACS 1520, RVSM 2011-35, AMS 100-39, JS 20-98	50	-	-	-	-	-	-
27	Sipani farm, Mandsaur	Central zone	**Madhya Pradesh**	50	NRC 130, JS 20-34, IS 20-69, JS 20-116, RSC 10-52, RSC 10-46, AMSMB-5-I8 (Suvarn Soya), NRC 127, NRC 138, NRC 142, MACS 1520, RVSM 2011-35, AMS 100-39, JS 20-98	50	-	-	-	-	-	-
Grand total				**1855**		**1210**	**120**	**60**	**25**	**290**	**125**	**25**

Note:

- ✓ *All the centers are requested to follow the location/zone specific recommended soybean production technology capsule as given below.*
- ✓ *FLDs should be conducted in one cluster (10 FLDs) and that is to be in one village for consecutive two years.*
- ✓ *If more than 10 FLDs allotted to any centre, they may increase the number of clusters in multiples of 10 FLDs.*
- ✓ *More than 10 years old varieties should be avoided in FLDs. Preference should be given to recently released 5 years old varieties to conduct under FLDs.*
- ✓ *All centers are requested to record Geo-referencing of the FLD/Geo tagging invariable.*
- ✓ *The Pantnagar center is also requested to cover adjoining places of Uttarakhand such as Pilibhit, Varanasi (FAARD) etc of Uttar Pradesh state for conduct of FLDs to expand soybean area under nontraditional areas by providing technical support and required critical input*

Location/Zone Specific Recommended Soybean Production Technology Capsule

1. **Whole package**

Input/practices	North Hill Zone (HP, Hills of Uttarakhand)	North Plain Zone (Punjab, Haryana, Delhi, NE Plains of UP, Western Bihar)	Central Zone (MP, Raj., Guj., Bundelkhand Region of UP, Western Maharashtra)	Southern Zone (Karnataka, TN, AP, Kerala, Southern Maharashtra)	North Eastern Hill and Eastern Zone (Assam, W. Bengal, Meghalaya, Manipur, Nagaland, Eastern Bihar, Orissa, Chhatisgarh)
1. Variety	As given in allotment of FLD table in Proceeding and Technical Programme 2022-23				
2. Planting time	Last week of May to June end	15th June to 5th July	20th June to 5th July	15th June to30th June	15th June to 30th June
3. Planting geometry	45 x 5 cm	45 x 5 cm	45 x 5 cm	30 x 5 cm	45 x 5 cm
4. Plant population	0.4 million /ha	0.4 million /ha	0.4-0.6 million/ha	0.4-0.6 million/ha	0.4-0.6 million/ha
5. Depth of sowing	3 to 5 cm	3 to 5 cm	3 to 5 cm	3 to 5 cm	3 to 5 cm
6. Manure and Fertilizer (kg/ha)	10 t FYM/ha + 20:80: 20: 20 N:P_2O_5:K_2O:S kg/ha	5 t FYM/ha + 25:75:25:37.5:1.0 N:P_2O_5:K_2O:S:B kg/ha	5 t FYM/ha + 20:60: 40: 20: 1.0 N:P_2O_5:K_2O:S:B kg/ha	5 t FYM/ ha + 20:80:20: 30: 0.5 N:P_2O_5:K_2O:S:B kg/ha	5 t FYM/ha + 25:100:50: 50:2.0 N:P_2O_5:K_2O:S:B kg/ha
7. Seed rate	75kg/ha	65 kg/ha	65 kg/ha	65 kg/ha	55 kg/ha
8. In-situ moisture	-	Bed planting 67.5 cm (2 rows per bed)	Conservation furrow each after	Conservation furrow each after 3	Ridge and furrow 60 cm

conservation			6 rows	rows	
9. Bio-regulator	-	Cycocel @ 500 ppm at flower initiation	Cycocel @ 500 ppm at flower initiation	Ethrel @ 200 ppm or salicylic acid @ 50 ppm at pod initiation	Ethrel @ 200 ppm at flower and pod initiation
10. Seed treatment	Thiram 75 WP + Carbendazim 50 WP (2:1) @ 3 g/kg seed or Thiram + Carboxin @ 2 g/kg seed or *Trichoderma viride* @ 4-5 g/kg seed for the management of seed and seedling diseases.				
11. Seed inoculation	About 5 g/ kg seed *Bradyrhizobium japonicum* culture + PSB/PSM 5 g/ kg seed				

12. Weed control	Two hand weedings at 20 and 40 DAS or Pendimethalin + Imazethapyr @ 2.5-3 l/ha as pre-plant incorporation OR Diclosulum @ 26 g/ha OR Sulfentrazone @ 750 ml /ha OR Chlomozone50 EC @ 2.00 l /ha OR Pendimethalin 30 EC @ 3.25 l/ha OR Pendimethalin38.7 CS @ 1.5 – 1.75kg /ha OR Flumioxazin @ 250 ml/ha OR Metolachlor 50 EC @ 2 l/ha OR Metribuzin @ 0.75- 1 kg /ha OR Pyroxasulfone @ 150 g /ha OR Sulfentrazone + Clomazone @ 1250 ml/ha as pre-emergence OR Chlorimuron ethyl @ 36 g /ha OR Bentazone @2 l/ha as early post emergence (10-12 DAS) OR Imazethapyr @ 1 l/ha OR Quizalofop ethyl 5 EC @ 1 l/ha OR Quizalofop ethyl 10 EC @ 375-450 l/ha OR Haloxyfop ethyl @ 1-1.25 l/ha OR Quizalofop-p-tefuryl @ 1 l/ha OR Fenoxaprop-p- ethyl @ 1 l /ha OR Fluazifop-p-butyl @ 1 -2 l/ha OR Imazethapyr 70% WG + Surfactant @ 100 g /ha OR Propaquizafop 10 EC @ 0.5-0.75 l/ha OR Fluthiacet methyl @ 125 ml/ha OR Fluazifop-p-butyl + Fomesafen @ 1 l/ha OR Imazethapyr + Imazamox @ 100 g/ha OR Propaquizafop + Imazethapyer @ 2 l/ha OR Sodium Aceflourofen + ClodinafopPropargyl @ 1 l/ha as post-emergence (15 –20 DAS) in 750 to 800 liters water/ha.

13. Insect control	Blue beetle- Quinalphos 25 EC @1500 ml/ha; Stem fly & white fly- Thiamethoxam 30 FS (seed treatment) @ 10 ml/kg seed OR Lambda Cyhalothrin+ Thiomethoxam @ 1.25 ml/ kg seed; White fly- Betacyfluthrin 8.49% +Imidacloprid @ 350 ml/ha; Defoliators (Semiloopers, Tobacco caterpillar, *Helicoverpa armigera*)- Chlorantraniliprole 18.5 SC @ 150 ml/ha OR Indoxacarb15.8 EC @333 ml/ha OR Profenofos 50 EC @ 1250 ml/ha OR Quinalphos 25 EC @1500 ml/ha OR Spinetoram 11.7 SC @ 450 ml/ha OR Betacyfluthrin + Imidacloprid @350 ml/ha OR Flubendiamide 39.35 SC @150 ml/ha OR Flubendiamide 20 WG @250-300 g/ha OR Thiamethoxam + Lambda Cyhalothrin @125 ml/ha; Girdle beetle- Thiacloprid 21.7 SC @750 ml/ha OR Profenophos 50 EC @1250 ml/ha OR Betacyfluthrin +Imidacloprid @350 ml/ha OR Thiamethoxam + Lambda Cyhalothrin @125 ml/ha; Pod borer (Helicoverpa armigera, Cidia ptychora)- Profenophos 50 EC @1250 ml/ha OR Chlorantraniliprole 18.5 SC @ 150 ml/ha OR Indoxacarb 15.8 EC @333 ml/ha; Insecticide + Herbicide combinations: Stem fly- Chlorantraniliprole + Imazethapyr/ Quizalofop ethyl; Semi-loopers- Chlorantraniliprole + Imazethapyr/Quizalofop ethyl OR Indoxacarb + Imazethapyr; Tobacco caterpillar – Chloantraniliprole/Quinalphos + Imazethapyr OR Quinalphos + Quizalofop ethyl; Girdle beetle – Chlorantraniliprole/ Indoxacarb + Imazethapyr.
14. Disease control	Seed Treatment for Charcoal rot, Anthracnose and Pod Blight, Collar rot Purple seed stain, Frog eye leaf spot: Thiophanate methyl 45% + Pyraclostrobin 5% FS OR Carboxin 37.5% + Thiram 37.5% OR Thiram+Carbendazim (2:1) @ 3 g/kg seed OR Penflufen + Trifloxystrobine 38 FS @ 1 ml/kg seed. Seed treatment for YMV, YMIV: Thiamethoxam 30 FS @ 10 ml/kg seed OR Imidacloprid 48 FS @25 ml/kg seed. First spray during initiation of the disease and second after 15 days based on disease severity: Rust- Hexaconazole 5% EC @ 800 ml/ha; Anthracnose and Pod Blight- Tebuconazole + Sulphur @1kg/ha; Charcoal rot- Tebuconazole @ 625 ml/ha OR Pyraclostrobin 20% w/w WG @500 g/ha; Spray 20-25 days after sowing as preventive spray and immediately after initiation of symptom for YMV, YMIV- Thiamethoxam 25WG @ 100 g/ha.

2. FLDs component wise

S. No.	FLD components	
1.	IWM (Integrated Weed Management)	Diclosulum @ 84% WDG 22g a.i. ha^{-1} as PE fb 1 hand weeding at 40 DAS.
2.	IPM (Integrated Pest Management)	Seed treatment Thiamethoxam 30 FS @ 10ml kg^{-1} seed, Spray Chlorantraniprole 18.5%SC @150ml ha^{-1} at flowering, Yellow sticky trap and pheromone traps @ 20-25 ha^{-1} for mass trapping and Spray *Bacillus thuringiensis* @ 1.0 l ha^{-1}, Trap/border crops such as Suva (*Anethum graveolens*), Marigold (*Tagetes patula*), cowpea (*Vigna unguiculata*), Dhaincha (*Sesbania rostrate*)
3.	INM (integrated Nutrient Management)	(50% RDF + 50% Organic) As per the zonal recommendation
4.	Intercropping	Soybean + Pigeonpea 4:2, Soybean + Sugarcane, 2:1, Soybean+Maize 4:2 etc
5.	Food grade varieties	NRC 127, NRC 132, NRC 142, NRC 147, NRCMACS 1660, Karune and Hara Soya
6.	Organic farming	FYM @ 10 t ha^{-1}, rock phosphate (16% P_2O_5) @ 375 kg ha^{-1}, Seed treatment *Trichoderma viride* @ 5 g kg^{-1} seed, rhizobium culture, phosphate solubilizing micro-organism and vesicular arbuscular mycorrhizal (VAM) fungi @ 5-10 g kg^{-1} seed, Hand weeding at 20 and 40 DAS, *Pseudomonas syringae* foliar spray @ 10g per litre of water at initiation of fungal diseases, Yellow sticky trap and pheromone traps @ 20-25 ha^{-1} for mass trapping and *Bacillus thuringiensis* @ 1.0 l ha^{-1}, Trap/border crops such as Suva (*Anethum graveolens*), Marigold (*Tagetes patula*), cowpea (*Vigna unguiculata*), Dhaincha (*Sesbania rostrate*) for control of insect pests

Proceedings of Plenary Session

Chairman	**:**	**Dr Sanjeev Gupta, Assistant Director General (Oilseed & Pulses)**
Co-Chairman	**:**	**Dr Kunwalr Harendra Singh , Director, ICAR-Indian Institute of Soybean Resarch**

The plenary session started with welcome to chair and co-chair. Dr K H Singh, Director, ICAR-IISR announced the outcome of Varietal Identification Committee meeting and informed that 7 candidated varieties *viz* JS 22-12, JS 22-16, NRC 181, NRC 188, NRC 165 (CZ); PS 16-70 (NPZ) and RSC 11-35 (EZ) have been identified for release.

Dr B S Gill Presented the report of Plant Breeding and Genetic Resource Session. As per the suggestion of the house for accepting entries with two days more maturity than the best early maturing check in Early Maturity Trials of Central Zone twoIVT (early) entries viz JS 24-33, AMS 2022-1 were promoted to AVT I (Early). A committee for rezoning in AICRP on soybean would be formed by ICAR. The matter regarding rejection of trials based on low grand mean of the trials than the state average yield was discussed and apprehensions were raised about low grand mean due to susceptibility of few genotypes against the diseases which may result in low grand mean of trials. It was decided that the matter shall be further deliberated to reach at an appropriate conclusion in NPZ. The entry DS 1547 will be repeated in IVT normal maturity.

Dr Amar Singh presented the proceedings of Plant Pathology and Entomology sessions. In both of the disciplines resistant germplasm would be further evaluated in following years for confirming their resistant status over a number of years. The trial on management of insect-pest by using microbial consortia was completed and the best microbial combination (*Nomuraea rileyi* @2kg/ha and *Bacillus thuriengiensis* @1kg/ha) recommended for management of soybean defoliator pests. In Plant Pathology, three multiple disease resistant sources EC 251865 (PB (ct) and YMV), EC 333876 (BLB, YMV, and Anth) and EC 281462 (AR reaction against CR and Anth) were identified. PP4 Experiment would be renamed as National Genetic Stock Screening Nursery and resistant entries would be evaluated both in Entomologh in Pathology for 3-4 years and resistant ones registered with NBPGR. Disease surveillance and monitoring would be based on GPS Technology.

Dr Raghvendra N presented the proceedings of Agronomy Session and three recommendations of the previously concluded experiment on application of thiourea as foliar spray (@ 750 ppm/ha at 20 -25 and

50 -55 days after sowing), inclusion of maize in soybean based cropping systems and use of minimum tillage were presented.

Dr V Govinda Samy presented the proceedings of Microbiology discipline.MB 1/16 is to be revised to focus only on isolation and characterization of soybean rhizobia.MB 2 would continue for one more year to validate the response of microbial consortia. MB 3/21a would be in collaboration with agronomist and only best performing herbicides would be evaluated with microbial consortia. Microbiologists would provide microbial strains to agronomists. Plot yield would be included in MB 4/13 along with nodulating parameters. Demonstration on IISR Microbial consortia (*Bradyrhizobium daqingense+B. aryabhataii)* would be conducted through agronomists in different centres and cultures should be supplied by the IISR, Indore.

Dr G K Naidu presented the proceedings of Transfer of Technology centre. In fileld days and field visits of FLD plots KVK staff and state agriculture department would be involved and industry persons may be invited for food grade soybean technology demonstrations. In FLDs only less than 5 year old varieties are to be included. Geotagging of FLDs is compulsory and ID proof (Aadhar card, mobile number) needs to be collected from the beneficiaries of NEH and TSP beneficialries.

Dr Gyanesh Satpute presented the proceedings of Food Technology session. Only AVT II entries would now be evaluated for food grade analysis. Principal Investigator would form numerical index for food grade traits and clearly specify food grade parameters for oil, soya milk, tofu through wider consultation. All soybean varieties would be profiled for KTi and Lox 2. Starch and protein content should be included in food grade parameters. ICAR-IISR, Indore should develop strong collaboration with Centre for Excellence on Soybean Processing and Utilization (CESPU) at ICAR-CIAE, Bhopal.

Dr Sanjeev Gupta, ADG (O&P) and Kunwar Harendra Singh, Director ICAR-IISR presented the varietal identification certificates to developers and collaborators of varieties identified in 52nd annual group meeting of AICRP on soybean.

Dr Sanjay Kumar Sharma, Organizing Secretary & Director Research Services (Gwalior) presented the vote of thanks.

द. परिशिष्ट

D. APPENDICES

Proceedings of Varietal Identification Committee (VIC) Meeting held in hybrid mode on 16th May, 2023 during 53rd Annual Group Meet of AICRP on Soybean

A meeting of Varietal Identification Committee of AICRP on Soybean was held under the Chairmanship of Dr T.R. Sharma, Deputy Director General (CS), ICAR, New Delhi in hybrid mode on 16th May, 2023.

Dr. K.H. Singh, Director, ICAR-IISR, Indore was the Member Secretary of the Varietal Identification Committee. Following members were present:

1. Dr T.R.Sharma, Deputy Director General (CS), ICAR, New Delhi
2. Dr Sanjeev Gupta, ADG (O&P),ICAR, New Delhi
3. Dr D.K. Yadava, ADG (Seed), ICAR, New Delhi (Online)
4. Dr Yashvir Singh Shivay, Ex-Professor and Principal Scientist (Agronomy) ICAR-IARI New Delhi
5. Dr S. K. Sharma, Director Research Services, RVSKVV, Gwalior
8. Shri D.N. Pathak, Executive Director, SOPA, Indore (Online)
9. Shri Jagdish Kumar, Vice President (R&D), Ruchi Hi-Rich Seeds Pvt. Ltd., Indore
10. Dr Sanjay Kumar, Director, IISS Mau (Online)
11. Dr Sanjay Gupta, Principal Scientist & PI (PlantBreeding), ICAR-IISR,Indore
12. Dr. K.H. Singh, Director, ICAR-Indian Institute of Soybean Research, Indore

Varietal identification committee considered 8 proposals for identification. Following recommendations were made.

1. JS 22-12: The entry is an early maturing variety and has mean yield of 2121 kg/ha with 31% superiority over the Checks JS 20-34. It has shown resistant reactions to Charcoal Rot, YMV disease, Anthracnose, girdle beetle, stem fly and defoliators. The entry was identified for release in the states of Madhya Pradesh, Bundelkhand region of UP, Rajasthan, Gujarat and Marathwada and Vidarbh region of Maharashtra.

2. JS 22-16: The candidate variety has been identified for Central Zone states of Madhya Pradesh, Bundelkhand region of UP, Rajasthan, Gujarat and Marathwada and Vidarbh region of Maharashtra. It is an early maturing variety which out yielded (2083 kg/ha) over check varieties JS 20-34 (29%). It has moderate to high resistance to Charcoal Rot, YMV, Rhizoctonia Arial Blight, Anthracnose, stem fly, girdle beetle and defoliators.

3. NRC 181: The candidate variety was considered for its identification in Central Zone. The variety is Kunitz trypsin inhibitor (KTI) free. Based on its yield (1721 kg/ha) superiority of 8.0% over the best check JS20-34 (1594 kg/ha) and resistant reactions to YMV and target leaf spot, it was identified for release in the states of Madhya Pradesh, Bundelkhand region of UP, Rajasthan, Gujarat and Marathwada and Vidarbh region of Maharashtra.

4. NRC 165: The candidate variety NRC 165 was considered for identification in Central Zone. It is an early maturing variety. Based on its yield (1886 kg/ha) superiority of 13% over the best check JS 20-34 and resistant reaction to YMV, target leaf spot, Alternaria Leaf Spot, stem fly, girdle beetle and defoliators, the entry was recommended for release in CZ comprising the states of Madhya Pradesh, Bundelkhand region of UP, Rajasthan, Gujarat and Marathwada and Vidarbh region of Maharashtra.

5. NRC 188: It is vegetable type soybean entry with 6% higher green pod (4429 kg/ha) yield than check variety JS 95-60. It has desirable characters for vegetable soybean like

glabrous pod, high green seed weight and green pod picking days of 76 days. The entry was identified for release in the states of Madhya Pradesh, Bundelkhand region of UP, Rajasthan, Gujarat and Marathwada and Vidarbh region of Maharashtra.

6. JS 22-18: The entry is an early duration variety. It has superior yield (2088 kg/ha) to the checks JS 20-34 (29%). The entry was presented for identification for release in Central Zone. The pedigree of JS 22-18 is same as JS 22-12. Considering lower grain yield performance of the proposed entry as compared to the candidate variety JS 22-12, the entry was not identified.

7. RSC 11-35: The candidate variety is identified for Eastern zone states of Chhattisgarh, Odisha, Jharkhand and Bihar. Mean grain yield of the entry is 2424 kg/ha which is 20 % higher than the best check JS 20-116. It is highly resistant to Indian Bud Blight, which is the main disease of Eastern Zone.

8. PS 1670: The entries is identified for North Plain Zone comprising the states of Panjab, Uttar Pradesh (except Bundelkhand region of UP) and Delhi. Mean grain yield of the entry is 2372 kg/ha which is 32% higher than the best check SL 955. The entry showed moderate to high resistant reaction to YMV, Bacterial Pustule, Stem fly, girdle beetle and tolerant to defoliator.

Appendix-III

MONITORING PROFORMA-2023

Objectives Assigned to Centre:

Centre	
Date of monitoring	

1. **Weather conditions**

Location	June 2022	July 2022	Aug. 2022	Sep. 2022	Oct. 2022	Nov. 2022
Max. Temp. (°C)						
Min. Temp. (°C)						
Rainfall (mm) (Rainy Days)						
Max.R.H. (%)						
Min. R.H. (%)						
Sunshine (Hours/Day)						

2. Germplasm Activities

(a) List of Germplasm Available

Name of Germplasm	Total Number

(b) Germplasm under evaluation

Name of Germplasm	Total Number

3. Multi-location Germplasm Evaluation

Only for Palampur, Almora, Pantnagar, Raipur, Imphal, Indore, Parbhani, Pune Centres

S. No	Number of Germplasm Under Evaluation	Number of Blocks	Number of Checks / block and their name	Germplasm line with less population and name of their adjacent germplasm	Comments of team: Is the trial worth accepting, if not give reasons

4. Hybridization Programme of the Centre

(a) Hybridizations conducted in 2023

Pedigree	Hybridizations Attempted	Purpose

(b) Evaluation of F1s

Pedigree	Total Number of Plants	Number of True Plants

(b) Segregating Populations

Generations	Pedigree	Number of Selected Plants	Number of Bulks
F2			
F3			
F4			
F5			
F6			
F7			
Advanced Generations			

5. National Hybridization Programme

NHP Number	Pedigree	Generation	Comment of the team

6. Station Trials

(a) First Year of Station Trial

S. No	Entry and checks	Pedigree	Comments of monitoring team
1.			
2.			
3.			
4.			
5.			
6.			

(b) Second Year of Station Trial

S. No	Entry and checks	Pedigree	Performance of First Year Station Trial			
			Maturity (Days)	Grain Yield (Kg/ha)	% increase over best check	Comments of monitoring team
1.						
2.						
3.						

4.						
5.						
6.						

7. Evaluation of AICRPS Trials

Discipline	No. of trials allotted	No. of trials conducted	General maintenance	Specific comments of team
1. Plant breeding				
2. Agronomy				
3. Entomology				
4. Plant pathology				
5. Microbiology				
6. Food Technology				

(a) Discipline-wise evaluation

Name of discipline ……..

Trial / experiment	Crop stage	Comments of Team		
		Deviation from Technical Programme	Whether Trial is worth cosidering	Report reason for not considering the trial

8. Seed Production Programme:

Breeder seed						
Variety	Target (q)	Area sown (ha)	Date of sowing	Expected production	Crop stage	Specific comments of team

Nucleus seed						
Variety stage I /stage II	Target (q)	Area sown (ha)	Date of sowing	Expected production	Crop stage	Specific comments of team

5. Front Line Demonstrations:

	FLD allotted	Number of FLD conducted	Number of FLD visited	General condition of FLDs	Specific comments of team
Full package					

9. Manpower (For regular centres)

Manpower Sanctioned	Manpower in Position

S. No	Name of the Scientist / Technical	Designation

6. Overall Specific comments of the monitoring team about the performance of the centre

AICRPS I/c **Monitoring team members**

53rd Annual Soybean Group Meet
(AICRP on Soybean, 2023)
Venue: Auditorium, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior

Date: May 16-17, 2023

May 16, 2023 (Tuesday)		
09:00 to 10:00 hrs.	**:Registration**	
Technical session I: Plant Pathology and Entomology (Conference Room 1)		
10:00-12:00 hrs	Chairman	Dr R.K. Pandya, Professor (Pathology), RVVRSKVV, Gwalior
	Co-chairman	Dr M.L. Sharma, Professor (Entomology), RVVRSKVV, Gwalior.
	Experts	Dr Ashwani Basandrai, Plant Pathologist, CSK HPKV, Palampur, Himachal Pradesh
	Rapporteurs	Dr Amar Singh, Principal Scientist, CSKHPKVV, Palampur Dr Nilima Karam, Jr. Entomologist, CAU Imphal
10:00-10:30 hrs	Annual Progress Report Plant Pathology	Dr K P Singh, Professor & PI-Plant Pathology, G B Pant Univ of Ag & Tech Pantnagar
10:30-10:45 hrs	Technical Programme Presentation-Plant Pathology	
10:45-11:15 hrs	Annual Progress Report Entomology	Dr Lokesh Kumar Meena, Scientist & PI-Entomology, ICAR-IISR, Indore
11:15-11:30 hrs	Technical Programme Presentation - Entomology	
11:30-12:00 hrs	Session concluding remarks	Dr R.K. Pandya & Dr. M.L. Sharma
Technical Session II:Breeder Seed Production		
12:00-13:00 hrs	Chairman	Dr D K Yadava, ADG (Seed), ICAR, New Delhi
	Co-chairman	Dr Sanjay Kumar, Director, ICAR-IISS Mau
	Rapporteurs	Dr Punam Kuchlan, Scientist, ICAR-IISR, Indore
12:00-12:20 hrs	Scenario of breeder seed production at various centres	Dr Mrinal Kuchlan, Senior Scientist, Seed Technology, ICAR-IISR, Indore
12:20-12:45 hrs	Variety-wise breeder seed production programme as per DAC indent	
12:45-13:00 hrs	Session concluding remarks	Dr D K Yadava, Dr Sanjay Kumar
13:00-14:00 LUNCH		
14:00 – 15:00 hrs.	**Inaugural Function: University Auditorium**	
Chairman		Dr T.R. Sharma, Deputy Director General (Crop Science), ICAR, New Delhi
Chief Guest		Dr Arvind Shukla, Vice chancellor, RVSKVV, Gwalior
Rapporteur		Dr Gyanesh Satpute & Dr Shivkumar M.
Welcome		Dr S.K. Sharma, Director Research Services, RVSKVV, Gwalior
Introductory remarks		Dr Sanjeev Gupta, Assistant Director General (Oilseed & Pulses), ICAR, New Delhi
R&D activities on Soybean in India and Project Coordinator's report		Dr K.H. Singh, Director, ICAR-IISR, Indore
Release of publications and distribution of certificates		All dignitaries
Address by Chief Guest		Dr Arvind Shukla, Vice chancellor, RVSKVV, Gwalior
Chairman's remarks		Dr T.R. Sharma, Deputy Director General (Crop Science), ICAR, New Delhi
Vote of thanks		Dr Sanjay Gupta, Principal Scientist & Scientist In-charge, AICRP Soybean, ICAR-IISR, Indore

Session III: Programme Review and Technical Programme Formulation Committee		
15:00-17:00 hrs	**Plant Breeding and Genetic Resources**	
	Chairman	Dr T. R. Sharma, Deputy Director General, (CS), ICAR, New Delhi
	Co-chairman	Dr Sanjeev Gupta, ADG (O&P), ICAR, New Delhi
	Rapporteurs	Dr B S Gill, Principal Scientist, PAU, Ludhiana Dr Shivakumar M, Senior Scientist, ICAR-IISR, Indore
15:00-15:45 hrs	Annual Progress Report of Plant Breeding 2022	Dr Sanjay Gupta, PI-Plant Breeding, ICAR-IISR Indore
15:45-16:15 hrs	Technical Programme Presentation	
16:15-16.45 hrs	Session concluding remarks	Dr Sanjeev Gupta, ADG (O&P), ICAR, New Delhi Dr T R Sharma, DDG (CS), ICAR, New Delhi
17.00-18:00 hrs	**Varietal / Technological Identification Committee Meeting**	
19:00 Onwards	**Cultural Programme & Dinner**	
17th May 2023 (Wednesday):		
Technical Session IV: Agronomy		
09:30-11:15	**Agronomy**	
	Chairman	Dr. Pratap Singh, Director Research, Agriculture University, Kota (Rajasthan)
	Expert	Dr Yashvir Shivay, Principal Scientist, ICAR-IARI New Delhi
	Rapporteurs	Dr Raghvendra Nargund, Scientist, ICAR-IISR, Indore
09:30-10.15	Annual Progress Report Agronomy	Dr R. K. Verma, PI-Agronomy, ICAR-IISR, Indore
10.15-11.00	Technical Programme Presentation - Agronomy	
11.00-11.15	Session concluding remarks	Dr. Pratap Singh
11.15-11.30	**Break**	
11.30-12.45	**Technical Session V: Food Technology**	
	Chairman	Dr Sanjeev Gupta, Assistant Director General (O&P), ICAR, New Delhi
	Rapporteurs	Dr G K Satpute, Principal Scientist, ICAR-IISR Indore
11:30-12:00	Results of Food Technology Experiments	Dr L Sophia Devi, Jr Food Technologist, CAU, Imphal
12:00-12:30	Technical Programme Presentation	
12:30-12:45	Session concluding remarks	Dr Sanjeev Gupta
12:45 to 13:45 LUNCH		
13:45-14:45	**Microbiology**	
	Chairman	Dr A.K. Saxena, Former Director, ICAR-NBAIM, Mau
	Co-chairman	Dr Swarna Lakshmi, PS, IARI, New Delhi
	Experts	Dr Ashwani Basandrai, Plant Pathologist, CSKHPKV, Palampur, Himachal Pradesh
	Rapporteurs	Dr P. Jones Nirmalnath, Principal Scientist (Microbiology), UAS, Dharwad Dr. V Govinda Samy, Principal Scientist, ICAR-IARI New Delhi.
13:45-14:15	Annual Progress Report Microbiology	Dr M.P. Sharma, PS& PI-Microbiology, ICAR-IISR, Indore
14:15-14:30	Technical Programme & Presentation of Microbiology	
14:30-14:45	Session concluding remarks	Dr. Swarana Lakshmi Dr. A.K. Saxena
14:45-16:00	**Transfer of Technology**	
	Chairman	Dr Sanjeev Gupta, ADG (O&P), ICAR, New Delhi
	Co-chairman	Dr R K Mathur, Director, ICAR-IIOR, Hyderabad
	Expert	Dr S K Jha, Principal Scientist, ICAR, New Delhi

	Rapporteurs	Dr G K Naidu, Associate Professor, UAS, Dharwad Dr R K Verma, Scientist, ICAR-IISR Indore
14:45-15:30	Annual Progress Report FLD	Dr Raghvendra Madar, Scientist & Nodal Officer, FLD, ICAR-IISR, Indore
	Allotment of FLDs	All concerned centres
15:30-15.45	Tribal Sub Plan Activities	Dr Sanjay Gupta, Principal Scientist & Nodal Officer, ICAR-IISR, Indore
15.45-16.00	Session concluding remarks	Dr Sanjeev Gupta, Dr R K Mathur
16.00-16.45	**General body Meeting, Society for Soybean Research& Development**	
16.45-18.15	**Plenary Session**	
	Chairman	Dr Sanjeev Gupta, ADG (O&P), ICAR, New Delhi
	Chief Guest	Vice-chancellor, RVSKVV, Gwalior
	Convener	Dr K. H. Singh, Director, ICAR- IISR, Indore
16.45-16.55	Welcome and Remarks	Dr K H Singh, Director, ICAR-IISR Indore
16.55-18.00	Presentation of summary recommendations and highlights of deliberations	Rapporteurs of different sessions.
	Plant Breeding & Genetic Resources	Dr B S Gill, Principal Scientist, PAU, Ludhiana
	Plant Pathology and Entomology	Dr Amar Singh, Principal Scientist, CSKHPKVV, Palampur
	Breeder Seed Production	Dr Punam Kuchlan, Principal Scientist, ICAR-IISR Indore
	Agronomy	Dr. Raghvandra N, Scientist, ICAR- IISR, Indore
	Microbiology	Dr. V Govinda Samy, Principal Scientist, ICAR-IARI New Delhi.
	Transfer of Technology	Dr G K Naidu, Associate Professor, UAS, Dharwad
	Food Technology	Dr G K Satpute, Principal Scientist, ICAR-IISR Indore
18.00-18.15	Remarks by Chairman	Dr Sanjeev Gupta, ADG (O&P), ICAR New Delhi
18.15-18.30	Remarks by Chief Guest	Dr Arvind Shukla, Vice Chancellor, RVSKVV, Gwalior
18.30-18.40	Vote of thanks	Dr S K Sharma, Director Research Services, RVSKVV, Gwalior

Appendix-VII

INSTRUCTIONS FOR DOING ON-LINE DATA-ENTRY OF AICRPS PLANT BREEDING TRAILS DATA*

1. On the desktop click the Internet explorer icon.
2. In the internet explorer type http://www.nrcsoya.nic.in and open this website.
3. In the home page of the official website, click on the hyperlink "AICRPS Data entry" available at the bottom.
4. Enter the username and the password as informed to you.
5. Now select the trail, character and start entering the final data for each and save every time by clicking the save button provided on the screen at the bottom.
6. Using the 5^{th} – step, repeat the data- entry for all the trials and characters and save it every time.
7. At last, view the data-entered and recheck it.

***** In case of any difficulty/clarification please feel free to contact Mrs. Savita Kolhe, Scientist (Computer Application) at e-mail savitasoham@gmail.com or savita_kolhe@rediffmail.com