July
2021

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ICAR

राअस्ट्रैप्रसं
NIASM

Project Coordinator

.... a monthly update

ICAR-National Institute of Abiotic Stress Management
Baramati, Pune, Maharashtra 413115

Project Coordinator

.... a monthly update

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From Director's Desk

Greetings from ICAR-NIASM…

The current issue on Project Coordinator highlights the progress made under all the ICAR-NIASM projects during July, 2021 and targets for August, 2021. We made progress in research and development efforts particularly in 1) developing web-scrapping scripts for geo-tagged soil fertility datasets from open data sources, 2) assessing canopy temperature dynamics in soybean genotypes under water stress, 3) field evaluation of different accessions of foxtail millet, finger millet, pigeon pea, ground nut and soybean, 4) standardization of DNA extraction process from different plant tissues representing local wild as well as cultivated plants, 5) recording of comparative status of hematological status in different breeds of goat for the month, 6) measurement of the real time post-harvest quality parameters of okra, 7) recording of real time growth parameters in sugarcane, and 8) method standardization for in vitro study of root architecture for chickpea genotypes.

The Institute organized its 9th Research Advisory Committee meeting on July 03, 2021 where the achievements of the Institute during the past year, progress and targets of all the projects, were presented followed by inviting suggestions from the resource persons for further improvement in the research programme. I sincerely hope that this issue will help the scientists and the farm personnel of NIASM and other research Institutes for better coordination among project staff while implementing the planned activities. I thank Dr. Aliza Pradhan and her team for their dedication and sincerity in bringing out this publication and wish that the issue would be received well by readers across all domains.

(Himanshu Pathak)

Contents

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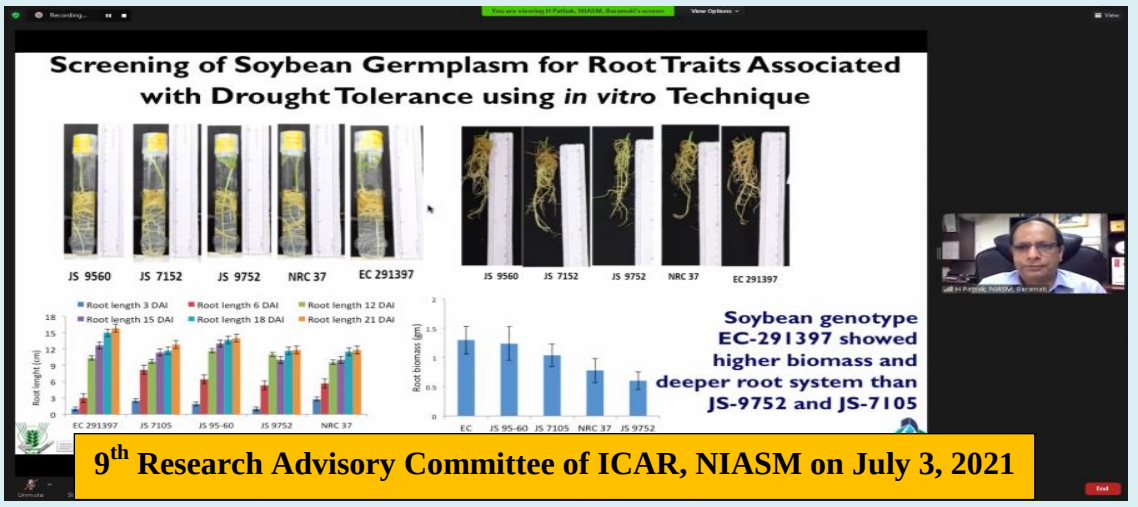


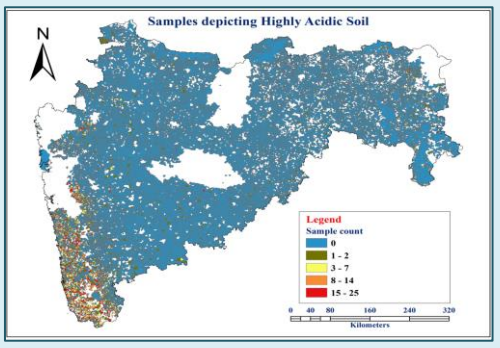
9th Research Advisory Committee of ICAR, NIASM on July 3, 2021

Visit of Hon'ble Shri. Sharad Pawar to ICAR, NIASM on July 10, 2021

UP 1. Abiotic Stress Information System (ASIS)

Geo-spatial digital maps of multiple abiotic stresses, management options and future scenarios

PI: Bhaskar B Gaikwad; **Co-PI(s):** Amresh Choudhary, Ram N Singh, Dhananjay D Nangare, Nitin P Kurade, Sachinkumar S Pawar, Mukeshkumar P Bhendarkar, Sunil V Potekar and Pravin H More



Outputs

- Extraction and arrangement of village level soil nutrient status datasets for all states of India.
- Village level soil fertility status maps for state of Maharashtra and Madhya Pradesh.

Targets for next month

- Develop webscrapping scripts for geo-tagged soil fertility datasets from open data sources.
- Creating spatial maps of soil fertility nutrient status for India.

UP 2. Germplasm Conservation and Management (GCM)

Genetic garden and gene bank for abiotic stress tolerant plants, animals and fisheries for food security and sustainability

PI: Boraiah K M; **Co-PI(s):** Ajay K Singh, Basavaraj P S, Mahesh Kumar, Satish Kumar, Rajkumar, N Karthikeyan, Paritosh Kumar, Sanjeev K Kochewad, Mukesh Kumar P Bhendarkar, Harisha C B, Pratapsingh Khapte, Jagadish Rane, Neeraj Kulakshetran, Bhojaraja Naik, Gurumurthy S, Pravin B Taware, Aniket More, Rushikesh Gophane and Lalit Kumar Aher

Outputs

- Top dressing of urea in foxtail millet (118 accessions) and finger millet (77 accessions).
- Sowing of germplasm/promising varieties of groundnut (174 accessions), finger millet (30) and soybean (30) for multiplication and maintenance.
- Sowing of different varieties of groundnut, pigeon pea, cow pea, soybean, finger millet, sorghum, fenugreek and coriander in crop cafeteria for demonstration purpose.

Targets for next month

- Recording of agro-morphological and physiological traits of sown crops.
- Identification of drought responsive genes using GenBank database for gene expression profiling study in promising, wild-relative/land races of brinjal.
- Primer designing for gene expression profiling in wild-relative/land races of brinjal.

Field view of foxtail millet accessions

UP 3. Model Green Farm (MGF)

Environment-friendly, economically viable, state-of-the-art model farm for abiotic stressed regions

PI: Dhananjay D Nangare; **Co-PI(s):** Himanshu Pathak, Goraksha C Wackchaure, Bhaskar B Gaikwad, Vanita Salunkhe, Rajkumar, Paritosh Kumar, Aliza Pradhan, Amresh Chaudhary, Mukesh kumar P Bhendarkar, Sangram B Chavan, Vijaysinha D Kakade, Pratapsingh S Khapte, Pravin B Taware, Rushikesh Gophane, Noshin Shaikh, Santosh Pawar and Avinash V Nirmale

Outputs

- Measurement of the post-harvest parameters for Sapota.
- Recording of physiological parameters in guava planted with different planting techniques and filling mixtures.
- Correlation study among weather, soil and plant growth parameters in dragon fruit.
- Collection of soil samples from pomegranate orchard.
- Technology data repository for grape, dragon fruit, guava & sapota.
- Survey of dragon fruit orchards and collection of samples for diseases occurred at farmer's field.

Targets for next month

- Water budgeting of whole NIASM farm.
- Fruit quality analysis in guava and dragon fruit orchard.
- Recording of observation for time requirement for different reproductive growth stages in dragon fruit.
- Growth, physiological observations and post-harvest analysis in Sapota.
- Planting of sandal wood and lemon grass in tamarind orchards.
- Water budgeting of NIASM farm.
- Analysis of soil samples in pomegranate orchard.

UP 4. Climate-smart IFS (CIFS)

Climate resilient integrated farming system in semi-arid region

PI: Sanjiv A Kochewad; **Co-PI(s):** Kamlesh K Meena, Goraksha C Wackchaure, Vanita Salunkhe, Rajkumar, Mukeshkumar P Bhendarkar, Aliza Pradhan, Amresh Chaudhary, N Subash, Laxman R Meena, Pravin B Taware and Patwaru Chahande

Intercultural operations in mungbean

Outputs

- Sowing of *kharif* crops.
- Establishment of vermicompost unit.
- Weeding and intercultural operations.

Targets next month

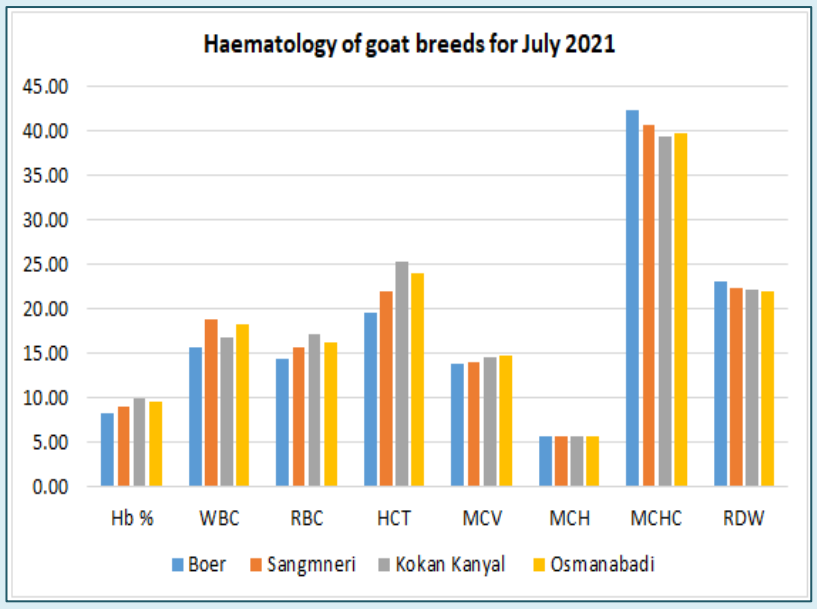
- Preparation of Dashparni ark for insect pest management.
- Purchase of native poultry birds.

Vermicompost unit in CIFS

FP 1. Atmospheric Stress Management

Adaptation and mitigation of atmospheric stress in crops, livestock, poultry and fishes for sustainable productivity and profitability

PI: Nitin P Kurade; **Co-PI(s):** Sachinkumar S Pawar, Sanjiv A Kochewad, Bhaskar B Gaikwad, Rajkumar, Mukeshkumar P Bhendarkar, Ram N Singh, Dhananjay D Nangre, Avinash V Nirmale and Sunil V Potekar



Outputs

- Recording of comparative status of growth, physiological and haematological parameters in different breeds of goat for July.
- Sequence retrieval & primer designing of HSP70 polymorphic regions in goat.
- Amplification of HSP-70 polymorphic region in Vanaraja poultry birds.
- Experiment on salinity stress levels in GIFT tilapia.
- Procurement of set up for mass culturing of black soldier fly.
- Procurement of microcontrollers and sensors and initiation of its programming.

Targets for next month

- Evaluation of stress parameters and parasitic prevalence in different breeds of goat.
- Heat stress study and amplification of HSP polymorphic region.
- Preparation for IPM of fall army worm in maize.
- Biochemical impact of salinity stress in GIFT tilapia.
- Programming of sensors and carrying out trial checks.

FP 2. Bio-saline Agriculture

Exploitation of halophytic plant and associated microbiome for amelioration of saline agricultural land of arid & semiarid regions

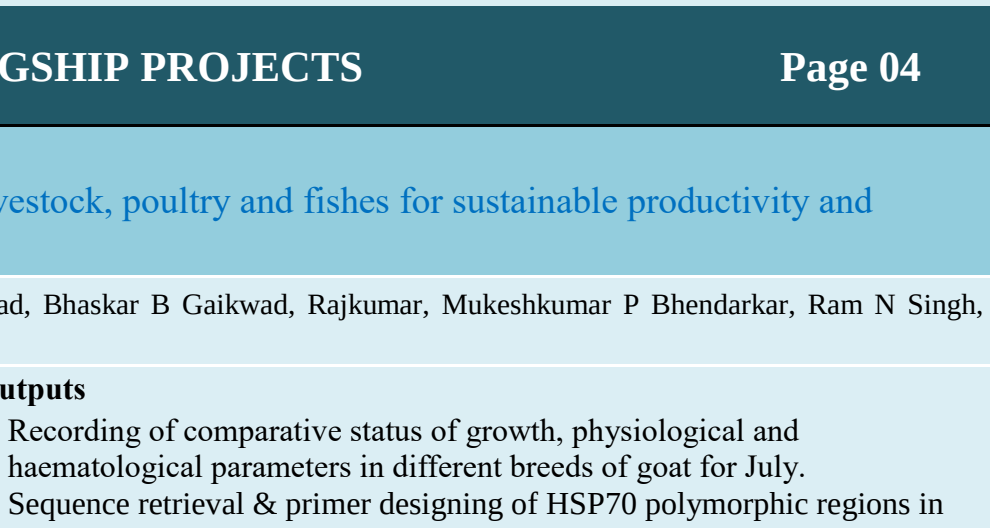
PI: Satish Kumar; **Co-PI(s):** Ajay K Singh, Vanita Salunkhe, Sanjiv A Kochewad, Mahesh Kumar, Paritosh Kumar, Neeraj Kumar, Amresh Chaudhary and Himanshu Pathak

Outputs

- Standardization of DNA extraction process from different plant tissues representing local wild as well as cultivated plants.
- A field-layout has been proposed for development of simulated saline plots at the ICAR-NIASM experimental farm.

Targets for next month

- To determine quantitative siderophore production by the halotolerant bacterial strains.
- To conduct a survey for sampling of halophytic plants from the coastal region in Konkan area.



Standardization of DNA extraction from different wild and crop plant tissues and the field layout proposed for development of simulated saline plots at ICAR-NIASM.

FP 3. Technology targeting and policy

Targeting prospective technologies for abiotic stress resilience in rainfed and dryland regions

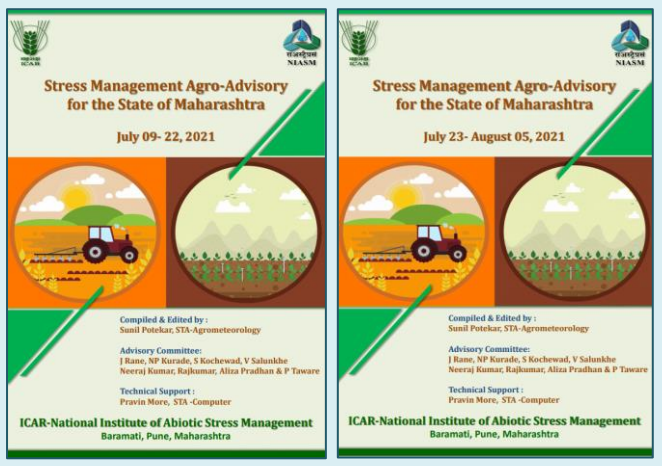
PI: Dhananjay D Nangare, **Co-PI(s):** Sachinkumar S Pawar, Sanjiv A Kochewad, Bhaskar B Gaikwad, Boraiha K M, Kartikeyan N, Rajkumar, Mukeshkumar P Bhendarkar, K Ravi Kumar and Himanshu Pathak

Outputs

- Preparation of the draft of questionnaire for survey of farmers regarding facing abiotic stress in crops and livestock.
- Review of research work, literature, and secondary data on indigenous technical knowledge resources available for compilation specifically on Abiotic stress management.
- Publication of two fortnightly agro advisories on institute website for stakeholders.
- Collection of information for success stories under TSP.

Targets for next month

- Preparation of online survey data collection format for the project.
- Coordination of extension activities and visits of stakeholders.
- Collection of information on ITKs related to abiotic stress management.
- Writing of review paper /book chapter on abiotic Stress Management and role of extension and policy.

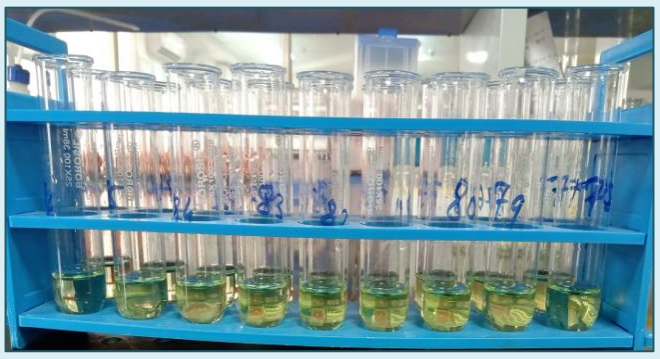


Agro-advisory of ICAR,NIASM

B) School of Water Stress Management (SWSM)

1. Mitigating water stress effects in vegetable and orchard crops

PI: Goraksha C Wakchaure; **Co-PI(s):** Dhananjay D Nangare, Satish Kumar, Aliza Pradhan, K M Boraiah, Pratap Singh Khapte and Jagadish Rane



Biochemical analysis of sapota

Custard apple field view

Outputs

- Measurement of real time post-harvest quality parameters during storage to study the interactive effects of sulphur sources and water stress.
- Analysis of two years (2018 and 2019) weather and bulb yields data for the field trials on onion responses to bio-regulators for alleviating water logging stress.
- Biochemical analysis of the sapota fruits.
- Finalized the treatment and layout for field trial on responses of different cultivar of custard apple to bio-regulators during fruiting season.
- Analysis of six years field data on dragon fruits to study the interactive effects soil filling mixture on yield and quality of dragon fruits.
- Lecture on "भारत में ड्रैगन फ्रूट की खेती - बाधाएं और संभावनाएं" in dragon fruit webinar series 27-29 July 2021 organised by the Krishibodh, Pune.

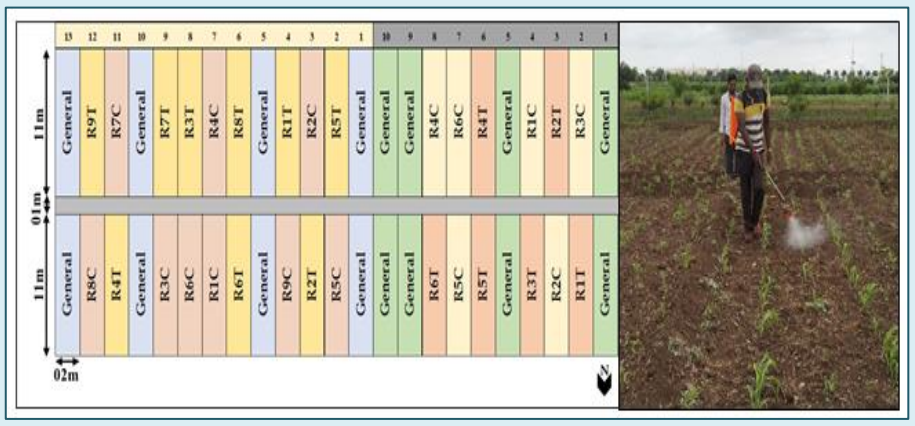
Targets for next month

- Measurement of onions responses to sulphur and water stress levels during storage.
- Measurement of PS-II under fruit imitation stages of custard apple.
- Measurement of yield and yield attributes of dragon fruits

EXTERNALLY-AIDED PROJECTS

EAP 1. Evaluation of halotolerant rhizobium and PGPB based biomolecules for alleviation of drought and salt stress (Funded by: AMAAS, NBAIM, Mau)

PI: Satish Kumar; **Co-PI:** Goraksha C Wakchaure



Overview of the experimental plan to be implemented for evaluation of the performance of newly developed bioformulation under field conditions.

Outputs

- Presentation of silent achievements of the project during 2017-2021 in final review meeting organized by the nodal center for Application of Microorganisms in Agriculture and Allied Sectors – NBAIM, Mau
- Following the expert-recommendations in the review meeting, a field trial has been planned for further evaluation of the newly developed bio-formulation under field conditions.

Targets for next month

- To prepare needful quantity of bio-formulation for field treatment.
- To conduct the treatments on experimental crops as per schedule.
- To monitor the initial (pre-treatment) and post treatment crop status in terms of biomass, canopy temperature, and aerial growth.

EAP 2. Conservation agriculture for enhancing resource-use efficiency, environmental quality and productivity of sugarcane cropping system (Funded by: CA Platform ICAR)

PI: Goraksha C Wakchaure **Co-PI(s):** Aliza Pradhan, Amresh Chaudhary, Paritosh Kumar and Himanshu Pathak

Outputs

- Harvesting and measurement of yield attributes of the groundnut as intercrop in sugarcane cropping system.
- Monitoring and measurement of real time soil-water-plant parameters for sugarcane trials under CA.
- Publication of technical bulletin on Conservation Agriculture practices in sugarcane.

Targets for next month

- Measurement of real time soil-water-plant parameters for sugarcane trials under CA.

Technical bulletin on CRP-CA

EAP 3. Genomics strategies for improvement of yield and seed composition traits under drought stress conditions in soybean (Funded by: ICAR-NASF)

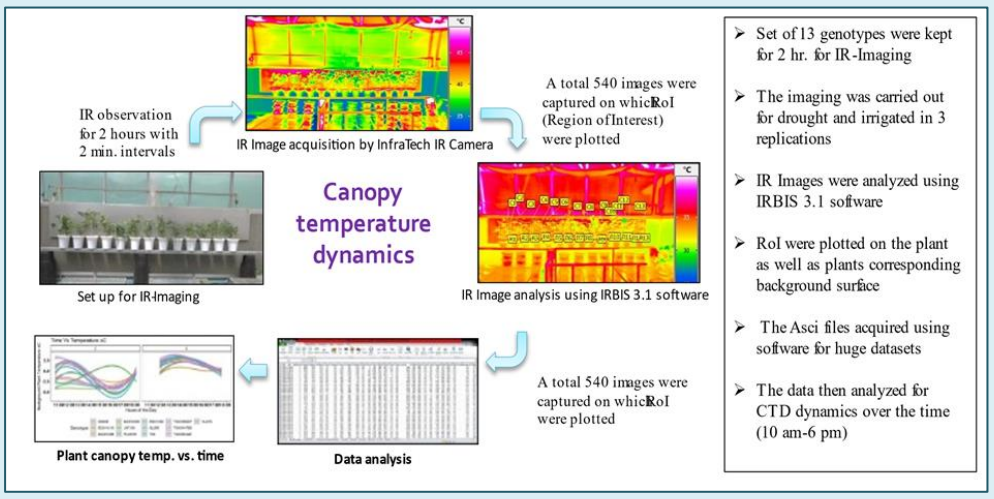
PI: Ajay Kumar Singh; **Co-PI(s):** Mahesh Kumar, Jagadish Rane

Outputs

- Grouping of soybean genotypes as per their similarity trend in the canopy temperature dynamics.
- Correlating the CT dynamics trend of these groups with PS-II efficiency and relative water content.
- Genotypes RSC-1052, PLSO-79, EC-251388 showed efficient PS-II efficiency and higher relative water content.

Targets for next month

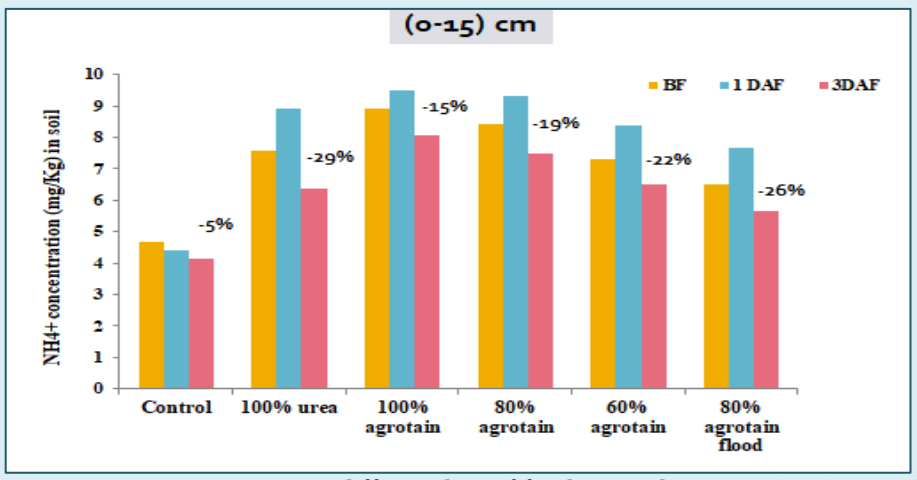
- Evaluation of 150 soybean genotypes for traits associated with water stress tolerance.
- Root system architecture study in 100 soybean genotypes under *in vitro* condition.
- Evaluation of stomatal movement/stomatal conductance in soybean genotypes.



Assigned group	Soybean Genotypes
1	JS7105
2	EC241310, DS205
3	RSC1052, PLSO79, EC251388
4	EC572160, VLS75, TGX-5392-D-7, TGX-81478-D, TGX-854429, SL295
5	T-49

EAP 4. N-(n-butyl) Thiophosphoric Triamide (NBPT) as a urease inhibitor for improving nitrogen use efficiency in sugarcane cropping systems in India (Funded by: CIMMYT)

PI: Aliza Pradhan **Co-PI(s):** Amresh Chaudhary, Jagadish Rane, Pravin B Taware and Himanshu Pathak



Ammonium concentration at different days of fertilizer application at (0-15) cm soil depth

Outputs

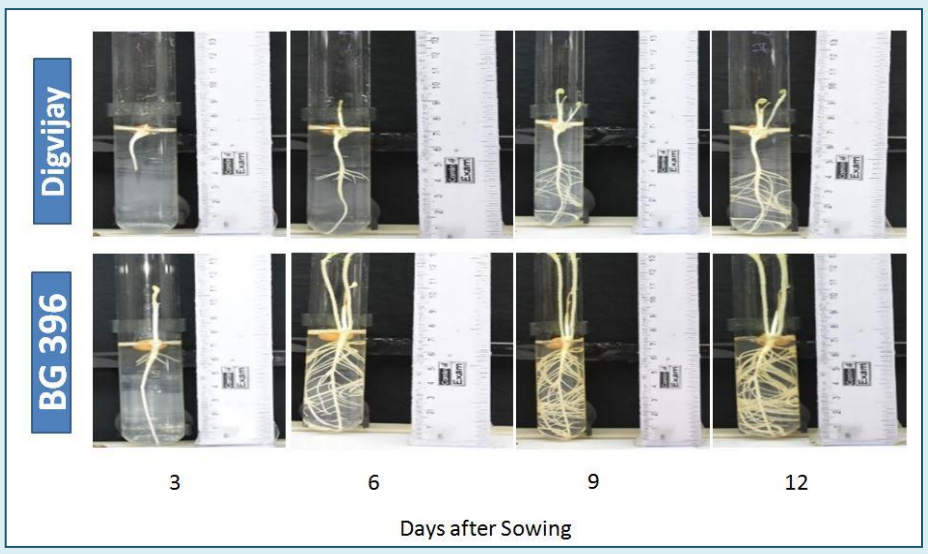
- After three days after fertilization, highest loss (29%) of nitrogen as ammonia was observed in 100% neem coated urea applied plots while the minimum loss (15%) was under the treatments having 100% Agrotain for (0-15) cm soil depth.

Targets for next month

- Analysis of collected soil samples at 5, 7 and 10 days after fertilizer application for ammonium and nitrate concentration in soil.

EAP 5. Phenotyping of pulses for enhanced tolerance to drought and heat (Funded by ICAR-NICRA)

PI: Jagadish Rane; **Co-PI:** Mahesh Kumar



Outputs

- Standardized method for in vitro study of root architecture for chickpea genotypes.
- Significant difference was observed in root growth related parameters in chickpea genotypes.

Targets for next month

- Study the response of chickpea genotypes in response of soil moisture stress.

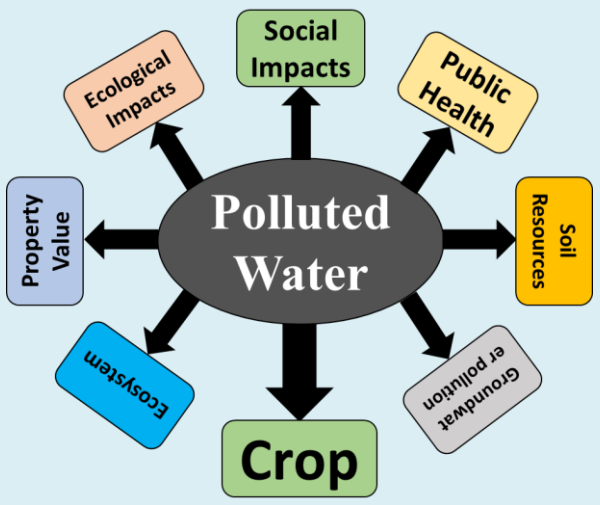
Impacts of Water Pollution on Agriculture

Ganesh S Masal, YP-I, ICAR-NIASM

Water is an essential and valuable resource of the nature. It is a prime national asset vital for domestic, industrial and agriculture usage, later being intricately linked to food, nutrition and environmental security of the nation. Samuel Taylor Coleridge (1772-1834) in his novel '*Rime of the Ancient Mariner*' observes that "*Water, water everywhere and all the boards did shrink; water, water everywhere, nor any drop to drink"* reminding us that though there is sufficient water on this planet but one may die out of thirst because most of the water is not usable (Pathak et al., 2015). Most human activities whether domestic, agricultural or industrial have an impact on water making more and more of it unusable or polluted.

India with 2.4% of the world's total area has 16% of the world's population; but has only 4% of the total available fresh water. The annual precipitation including snowfall, which is the main source of water in the country, is estimated to be of the order of 4000 km^3. Rainfall in India is mainly dependent on the south-west monsoon between June to September, and the north-east monsoon between October and November. Out of 140 Mha net sown area, only 43 Mha is fully irrigated, 23 Mha is partially irrigated, whereas 74 Mha is unirrigated. Drought is one of the recurring features of Indian agriculture, especially in the rainfed areas. India has made significant progress in conserving, storing and enhancing water use efficiency. Pressurized, low cost and demand-driven micro-irrigation methods are promoted with substantial success. However, water pollution remains a big challenge affecting the quality and quantity of fresh water availability in the country.

- **Water Pollution:** Water pollution is contamination of natural water bodies like rivers, lakes, oceans and groundwater due to deposition and inflow of pollutants by natural and anthropogenic processes. Water is considered to be polluted when harmful substance often chemicals or microorganisms enter and contaminate a natural water body such as stream, river, lake, ocean, etc., and degrade water quality and rendering it toxic to human as well as the environment. Water pollution could be either surface water pollution or ground water pollution. Surface water i.e., water sources which are found on the surface of earth such as rivers, lakes and lagoons is polluted with disposal of wastes and pollutants. This is easily visible form of water pollution. Ground water i.e., water stored under earth's surface could be polluted due to recycling of industrial wastes without proper treatment and leaching of toxic chemicals (fertilizers and pesticides) below soil surface from agriculture fields. Ground water pollution is of more concern as it contaminates drinking water and at the same time it is not easily visible.
- **Causes of water pollution:** Owing to its nature a "universal solvent," water is able to dissolve more substances than any other liquid on earth, and hence, is highly vulnerable to pollution. Toxic substances such as pesticides, insecticides, fertilizers, etc. from farms, domestic waste from towns, and highly toxic effluents from industries readily get mixed with water, causing severe water pollution. The major causes of water pollution are increased use of chemical fertilizers and pesticides in agriculture, rapid development of industries and mines, urbanization, increased use of water, particularly ground water, thermal discharge, and social and religious customs.
- **Impact of water pollution**: Globally, agriculture accounts for 70 percent of water withdrawals and also plays a significant role in water pollution. Farms routinely discharge a large quantity of different agrochemicals, organic matter, agrochemical-residues, and saline drainage into natural water bodies. Being an essential component, water is a critical determinant of agricultural productivity; however, most of the times, use of polluted water for irrigation purposes can be threateningly damaging to the agricultural systems. For instance, industrial effluents-contaminated water often contains different types of heavy metals which are highly toxic to aquaculture, agricultural crop growth, and human health as well. Additionally, the user - farmer is also exposed to all the contaminants from polluted water and is likely to experience severe health hazards diarrhoea, bronchitis, skin diseases, eye irritation, etc. The contaminants from polluted water enter the soil, the biomass, and finally into the food-chain and induce large-scale damages.
- **Impact on crop:** Polluted water – particularly domestic wastewater is mainly used in agriculture due to presence of high concentrations of organic nutrients, which could provide many of the nutrients necessary for crop growth along with the moisture. Many crops have been reported for higher yields when irrigated with domestic wastewater, further a reduction in chemical fertilizer inputs is also possible in such cases as the nutrients from wastewater fulfill the nutritional requirements of the crop. However, the trend of fertilizer reduction and higher crop yield may not be applicable as a routine, typically due to the crop-specific nutritional requirements and varying responses to nitrogen delivered via wastewater. In some crops, if the nitrogen dose exceeds that for recommended dose, then it may stimulate vegetative growth, and exhibit delayed ripening and maturity under extreme circumstances causing yield losses. Therefore, it is essential to determine the quantity of nutrients, and absence of toxic substances in wastewater prior to use for irrigation.



- **Remediation of water pollution**: There are many methods and strategies to control water pollution from point and non-point sources. To control water pollution from point sources, it is essential to treat wastewater from sources before its discharge into any water body. For remediation of water pollution from agricultural sources, following points may be considered.

  1. Optimum use of fertilizers and pesticides to reduce their leaching and runoff into water bodies
  2. Storage of run-off from manures in the basin to prevent the leaching of nutrient-rich water and the same can be used in agriculture.
  3. Separate drainage systems for sewage and rainwater to prevent overflow of sewage.

References

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"Access to food is the birth right of every individual on this planet".

-Norman Borlaug