June
2022

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ICAR

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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 June, 2022 and targets for July, 2022. We made progress in research and development efforts particularly in 1) developing an interactive web based framework (beta version) of atomspheric information system of ASIS, 2) multiplication of different stress tolerant crop germplasms, 3) recording of physical and chemical parameters of sapota, guava and grapes 4) sunburn and canopy management in dragon fruit, 5) recording of comparative hematological status in different breeds of goat for the month, 6) molecular characterization of stem canker (*Neoscytalidium dimidiatum*) pathogen in dragon fruit,7) harvest of sugarcane with measurement of cane and trash yield and other yield attributes as well as soil sample collection for chemical and biological analysis, 8) basic soil characterization of plots under various orchards,
9) measurement of yield and its attributes for okra and eggplants, 11) study of drought adaptive traits of soybean genotypes, 12) establishment of ratoon eggplant experiment and 13) acclimatization study of cold water fish Mahaseer in fisheries wet laboratory.

Besides the research activities, some important events and extension activities were organized during the month of June. The institute inaugurated short term course on "Abiotic stresses in agriculture: an introduction and hands-on training for skill development (1 June to 10 July, 2022)" for students, young professionals and researchers across different agricultural disciplines including agricultural engineering. Besides several other important activities such as 12th Institute Research Council (IRC) meeting, ICAR-University-NAAS stakeholder interface meeting, farmers' awareness campaign of efficient and balanced use of fertilizers, International Yoga Day, awareness programme on protecting rights in areas of farm innovations, breeding and protection of varieties were organized at the institute.

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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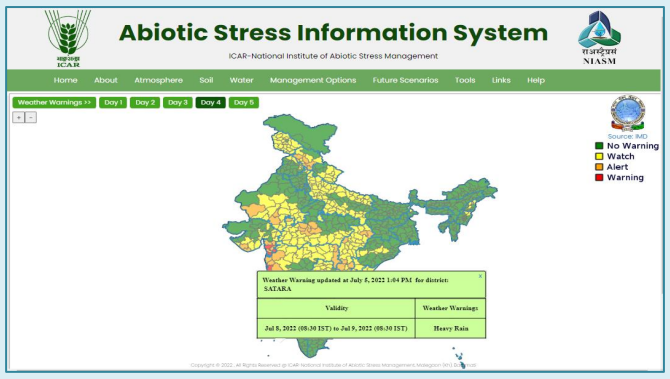
UP 1. Abiotic Stress Information System (ASIS)

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

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



Abiotic Stress Information System for India*
(* Enlarged view& additional figures on page 08)

Outputs

- Development of interactive web based framework (beta version) of atmospheric information system of ASIS developed utilizing IMD API services.
- Geo-spatial maps for UAV application specific annual and monthly available hours.

Targets for next month

- Add compiled and processed data layers on ASIS webserver.
- Add interactive functions (filtering/search/expression builder) and visualization tools to ASIS.

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

- Sowing of germplasm/accessions of crops for multiplication maintenance.
- Sowing of abiotic stress tolerant varieties of kharif crops.

Targets for next month

- Calendar of operations (hoeing and weeding) in genetic garden plots.

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 Wakchaure, 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, Rajagopal V, Hanamant M Halli, Pravin B Taware, Rushikesh Gophane, Noshin Shaikh, Santosh Pawar and Avinash V Nirmale

Outputs

- Irrigation scheduling as per deficit irrigation treatments in pomegranate; molecular characterization of stem canker (*Neoscytalidium dimidiatum*) pathogen in dragon fruit; analysis of fruit quality parameters (phenols, flavonoids, total antioxidants, proline, MSI and physical parameters) of sapota planted with different planting techniques and filling mixtures.
- Use of shade nets with different colour and shade intensity in dragon fruit, completely reduced sunburn damage, 50% reduction of disease incidence, early flowering and emergence of new sprouts.
- Completion of basic soil characterization of all fruit orchard crop plots.

Sun burn management in dragon fruit

Targets for next month

- Post-harvest fruit quality parameter analysis of pomegranate.
- Irrigation scheduling in pomegranate as per deficit irrigation treatments.
- Sunburn and canopy management experiment in dragon fruit; observations to be recorded on plant growth, flowering and fruiting.
- Planting of dragon fruit (red pulp): installation of RCC poles and plates and planting of dragon fruit cuttings.
- Evaluation of antifungal potential of essential oils (EOs) against *Neoscytalidium dimidiatum.*
- Gravel disintegration studies with quantification of falling crop residues under different trees.

UP 4. Climate-smart IFS (CIFS)

Climate resilient integrated farming system in semi-arid region

PI: Sanjiv A Kochewad; **Co-PI(s):** Goraksha C Wakchaure, Vanita Salunkhe, Rajkumar, Mukeshkumar P Bhendarkar, Aliza Pradhan, Vijaysinha D Kakade, Sangram B Chavan, Rajagopal V, N Subash, Laxman R Meena, Pravin B Taware and Patwaru Chahande

Outputs

- Sowing of black gram, green gram and pearl millet as kharif season crop.
- Harvesting of mango; pruning of *mrig bahar* in pomegranate.
- Visit of IRC experts to CIFS unit.
- Management and quantification of drumstick in silvi-pasture system.

Targets next month

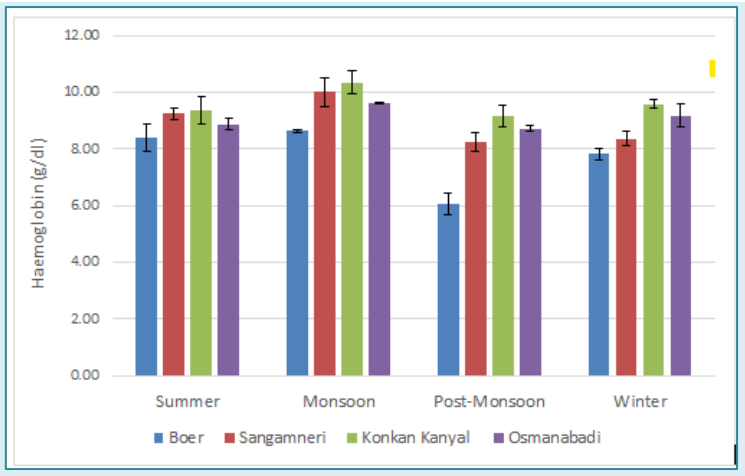
- Sowing of sorghum and pigeon pea; planting of sugarcane as control cropping system plot; transplanting of brinjal seedlings in multilayer plot.

Visit of IRC experts to 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, Bhaskar B Gaikwad, Gopalakrishnan B, Rajkumar, Dhananjay D Nangre, Avinash V Nirmale, Sanjiv A Kochewad



Seasonal variation of haemoglobin in different breeds of goat during 2021-22

Outputs

- Recording of comparative status of growth, feed & water intake, physiological and haematological parameters in four breeds of goat for June, 2022.
- Continuation of mass culturing of BSF as novel protein for poultry& fish.
- Assessment of thermal stress in poultry and goat.
- Adaptation and rearing of cold water fish Mahaseer in fisheries wet laboratory.
- Standardization of Azolla and Duckweed production.
- Seasonal variation of haemoglobin in different breeds of goat during 2021-22.

Targets for next month

- Evaluation of stress parameters & parasitic prevalence in goat breeds; survey of goat farmers and haematological analysis of field and experimental goats;
- Evaluation of breeding unit of BSF & mass culturing.

FP 2. New Crops

Augmenting farm income in water scarce regions with alternative crops

PI: Jagadish Rane ;**Co-PI(s):** Ajay K Singh, Dhananjay D Nangre, Goraksha C Wackchaure, Mahesh Kumar, Satish Kumar, Karthikeyan N, Boraiah K M, Sanjiv A Kochewad, Aliza Pradhan, Amresh Chaudhary, Ram N Singh, Basavraj P

Outputs

- Preparatory tillage and layout of experimental design for kharif 2022-23.
- Arrangement of quality seeds and other inputs such as fertilizers and bio-fertilizers.
- Data analysis and reporting of performance of quinoa under multiple abiotic stresses.

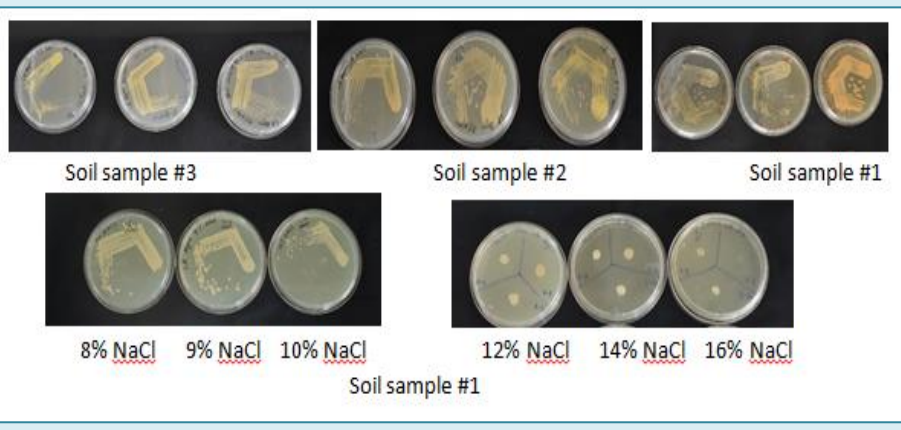
Targets for next month

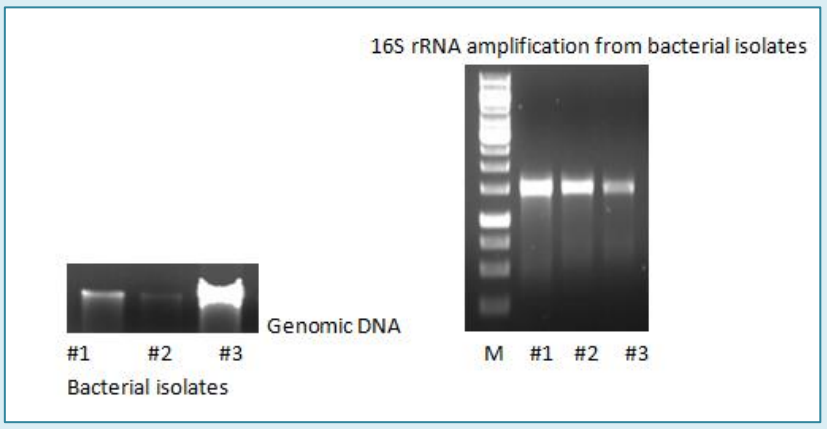
- Sowing and other calendar of operations; review of literature of alternative crops for abiotic stress management.

FP 3. Bio-saline Agriculture

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

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





Outputs

- Isolation of bacterial samples from rhizosphere of halophytes and characterization for colony characteristics.
- PCR amplification of the 16S rRNA for genetic diversity study of bacterial isolates.

Targets for next month

- Isolation and characterization of microbiome associated with halophytes; salinity & water stress response in halophytes.
- Isolation & characterization of microbiome associated with halophytes; shoot and root anatomical studies of halophytes.

FP 4. 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

- Organization of training as well as distribution of inputs to beneficiaries under TSP and SCSP program.
- Co-ordination of visit of farmers, state departments, students and FPO's (313 visitors) to ATIC/museum, research fields of ICAR, NIASM.

Targets for next month

- Field survey and data collection of farmers regarding bio-physical and socio-economic constraints.
- Procurement and distribution of critical inputs to farmers under TSP and SCSP program.

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, Pratap Singh Khapte, Aliza Pradhan, K M Boraiah, and Jagadish Rane

Outputs

- Measurement of the physiological (RWC, NDVI, PS-II, CATD) and biochemical (protein, DPPH) parameters for leaf and fruits of sapota growing under different treatments (planting methods, soil depths and soil filling mixtures).
- Real time soil-water-plant growth parameters for evaluating interactive effects of wild rootstocks grafting and DI levels.
- Initiation of second trials to study the effects of growth regulators and soil filling mixtures on yield and post-harvest quality of dragon fruit.
- Short term course on abiotic stresses in agriculture: an introduction and hands-on training for skill development for students and young researchers (1 June to 10th July, 2022).

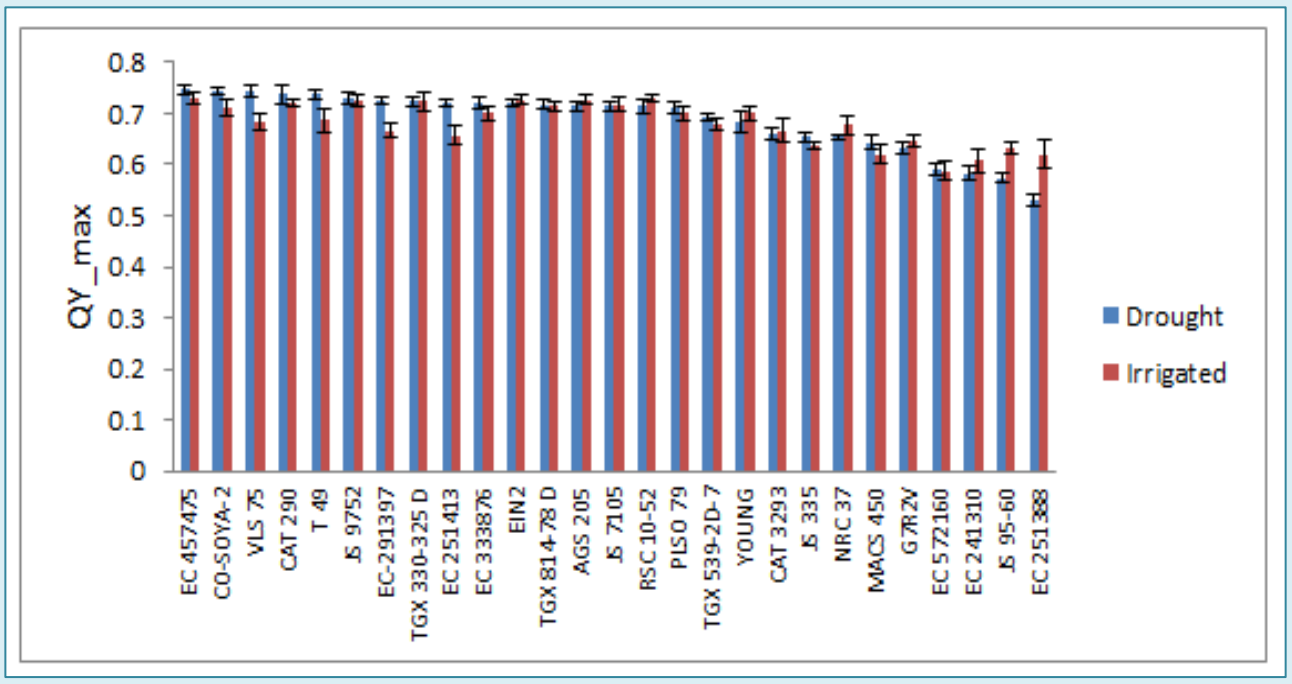
Measurement of physiological & biochemical parameters of sapota

Targets for next month

- Measurement of antioxidant properties of sapota; measurement of real time soil-water-plant parameters of ratoon eggplants trial.
- Completion of short term training course on abiotic stresses.
- Repetition of second trail for assessing the impact of PGRs and cultivars of custard apple.
- Assessing the impact of PGRs on bud formation, flowering and development stages of dragon fruit grown under different soil conditions.
- Measurement of yields and yield attributes and post-harvest quality assessment of ratoon eggplant crop.
- Post-harvest quality assessment of dragon fruit.

2. Genomics, genetic and molecular approaches to improve water stress tolerance in soybean and wheat

PI: Ajay Kumar Singh



Screening of soybean genotypes for root biomass

Outputs

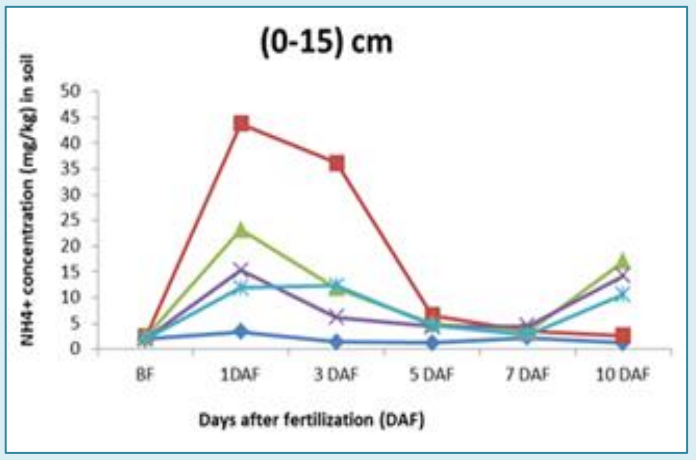
- Evaluation of twenty five soybean genotypes along with check varieties JS-7105, JS-9752, JS-335,JS-9560 and NRC-37 for PS-II efficiency.
- Soybean genotypes EC-457475 showed higher PS-II efficiency as compared to check varieties under no stress as well as drought stress conditions.

Targets for next month

- Stomatal function studies in EIN2- silenced soybean plants under well-watered and water deficit conditions.
- ABA quantification in EIN2-silenced soybean plants.

EAP 1. 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



NH4+ concentration (mg/kg) of soil in sugarcane

Outputs

- Delayed hydrolysis in Agrotain treated urea plots compared to urea plots.
- Maximum concentration of NH4+ -N in neem coated urea (NCU) plots just one day after fertilization followed by a decreasing trend indicates higher volatilisation loss of ammonia from NCU.
- Conc. Of NH4+ -N greater in AIU than that of NCU at 10 DAF.

Targets for next month

- Recording of NDVI at every 15 days interval.
- Application of treatments at pre-growth stage followed by soil sampling as per the objectives of the experiment.
- Analysis of soil samples for ammonium, nitrate and urease enzymes under different treatments.

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

- Analysis of growth, yield and soil fertility parameters of different field trial.
- Real time morpho-physiological parameters (plant height, plant tillers, NDVI, PS-II, hyper spectral, RWC etc) of standing sugarcane crop in different field experiments.
- Analysis of sugarcane plant samples for estimating nitrogen use efficiency.
- Organization of national level campaign on "Efficient and balanced use of fertilizers (including nano-fertilizer)" on 21st June 2022.

Targets for next month

- Data analysis of growth, yield and soil fertility parameters of different field trials under CRPCA.

Organization of national level campaign on balanced use of fertilizers

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

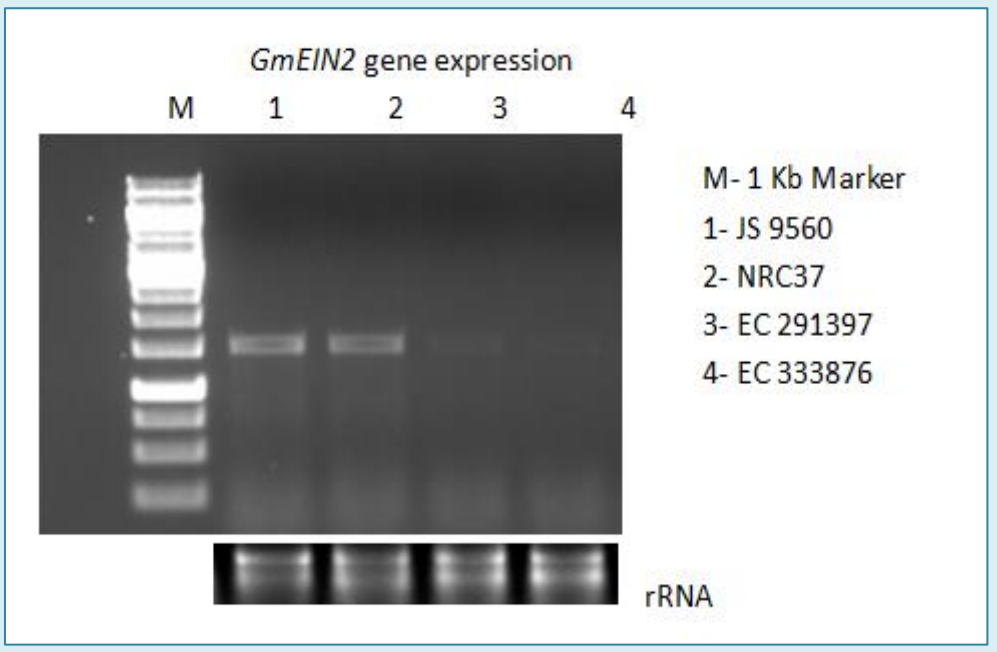
PI: Ajay K Singh; **Co-PI(s):** Mahesh Kumar and Jagadish Rane

Outputs

- Evaluation of promising soybean genotypes EC-291397 and EC-333876 along with drought susceptible check varieties JS-9560 and NRC-37for expression of GmEIN2 gene responsible for ethylene sensitivity.
- Promising soybean genotypes EC-291397 and EC-333876 exhibited lower expression of GmEIN2 gene as compared to check varieties JS-9560 and NRC-37.

Targets for next month

- Expression profiling for EIN2 gene in 15 promising soybean genotypes under no stress and water deficit conditions.
- Morphological, physiological and biochemical analyses of 20 promising soybean genotypes under no stress and water deficit conditions.



Evaluation of soybean genotypes for photosynthetic efficiency

Application of remote sensing for stress detection in plants

Debasmita Mohanty, (SRF, NASF project) & Gautam Guruprasad Jena (M Tech Student, IARI)

In recent era, global warming is one of the major concerns worldwide. As a result, the world is facing rise in temperature, frequent drought, flood and many other natural calamities which are becoming a challenge to agricultural sector. These environmental conditions are now affecting food security and sustainability and becoming a threat to global economy and ecosystem survival. In general, crops experience one or the other environmental calamities within their life cycle but lately, their magnitude and frequency has been increased manifold. To overcome this situation, it is crucial to monitor various stresses in plants. When a plant is subjected to any abiotic and biotic stress, it responds through various physiological and biochemical changes which are mediated by gene expressions. Later on it produces morphological changes which can be detected through visual observations. In recent past, there are so many artificial intelligence (AI) tools and crop modeling techniques, which have been developed for regular surveillance in crop field. However, to detect plant stress before appearance of any visual symptoms and thereby mitigate it without compromising the yield is the need of the hour.

Remote sensing approach is a rapid and non-destructive method, which can be applied to a large area and can be utilized in precision agriculture and plant phenotyping for resistance breeding purposes. Remote sensing techniques can detect the physiochemical changes in plant from a distance, through interpretation of reflectance and imagery patterns obtained from crop surface. The image acquisition and digital representation is mainly conducted through interpretation of electromagnetic radiation.

Approaches to detect stresses in plants:

1. Spectral signature of plants (Fig 1): Spectral signature represents the reflectance of plants from 350 to 2500nm range of wavelength. It can collect a large amount of data which can be used to access various morphological, physiological and biochemical changes occur in plants as an effect of stress conditions. It can also be used to detect various nutrient and water status in plants.

2. Thermal imaging: It can record the surface temperature of plants in the form of image with precision and accuracy. Leaf or canopy temperature has a significant relationship with stomatal conductance and gas exchange rate. So this technique can be implemented for early detection of pest and diseases as well as drought and heat stress.

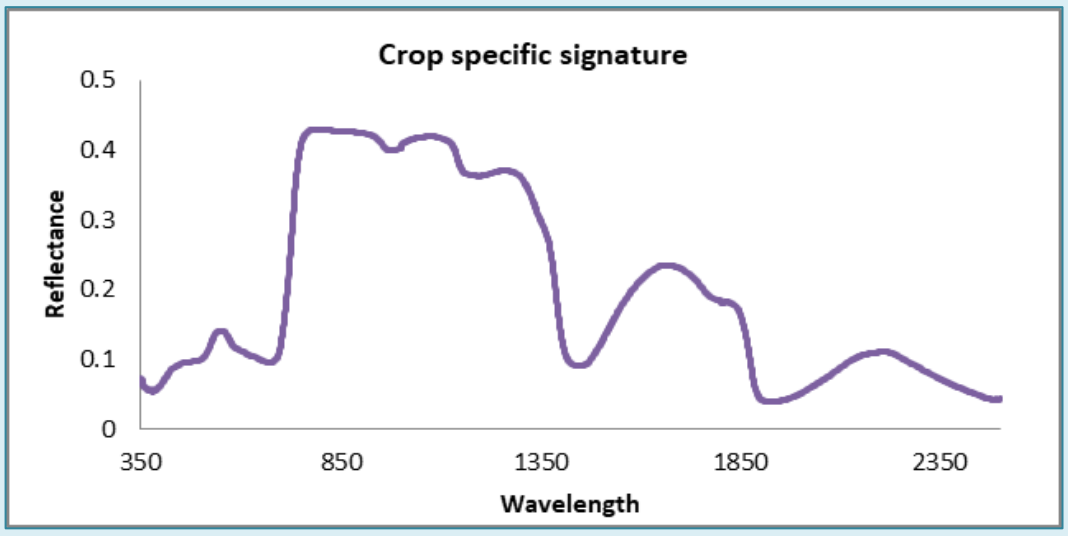


Fig.1. Crop specific signature of sugarcane crop measured by hyperspectral ASD FieldSpec 4 Hi-Res (Analytical Spectral Devices Inc., Boulder, CO, USA) spectroradiometer equipped with a contact probe.

3. Fluorescence imaging: Fluorescence imaging allows to sense the excitation of fluorescent molecules and measures the amount of energy emission. Through this technology we can measure the fluorescence of photosystem-II present in chlorophyll pigment because photosystem-II molecules are highly sensitive to any biotic or abiotic stress and it can represent plant health.

4. Visual and NIR imaging: Visual imaging can be used to observe and analyze any morphological or visible changes in plants which our eye can't detect, but through some image acquisition software we can detect and quantify these changes. NIR imaging measures the reflectance of 850 to 2500 nm range of electromagnetic spectrum, which is highly sensitive to moisture. So it can detect the moisture content of plant tissue.

Conclusion and future prospects:

Image acquisition based remote sensing tools are now quite popular in field and lab experiments. Now a days, farmers are also adapting these techniques in their fields for stress detection and early mitigation. Thanks to artificial intelligence and robotics, collection and analysis of a huge amount of data is not a challenge anymore. But this system should be more accurate in case of detecting various kinds and types of stresses so that appropriate management practices can be adapted on time. From farmers prospective, cost and compatibility of these systems are another drawback. But in our near future, we can expect modifications and variations of these systems and devices which will make them user friendly with higher accuracy and reliability.

References:

Barbedo J. G. A. (2019). A review on the use of unmanned aerial vehicles and imaging sensors for monitoring and assessing plant stresses. Drones 3:40 10.3390/drones3020040.

Buschmann C. (2007). Variability and application of the chlorophyll fluorescence emission ratio red/far-red of leaves. Photosynth. Res. 92, 261–271. 10.1007/s11120-007-9187-8.

Galieni, A., D'Ascenzo, N., Stagnari, F., Pagnani, G., Xie, Q., & Pisante, M. (2021). Past and Future of Plant Stress Detection: An Overview From Remote Sensing to Positron Emission Tomography. Frontiers in plant science, 11, 609155

"The highest education is that which does not merely gives us information but makes our life in harmony with all existence."

-Rabindranath Tagore

Abiotic Stress Information System

ICAR-National Institute of Abiotic Stress Management

Home | About | Atmosphere | Soil | Water | Management Options | Future Scenarios | Tools | Links | Help

Weather Warnings >> | Day 1 | Day 2 | Day 3 | Day 4 | Day 5

Source: IMD

No Warning
Watch
Alert
Warning

Weather Warning updated at July 5, 2022 1:04 PM for district: SATARA

Validity	Weather Warnings
Jul 8, 2022 (08:30 IST) to Jul 9, 2022 (08:30 IST)	Heavy Rain