April
2021

Project Coordinator

.... a monthly update

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

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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 April, 2021 and targets for May, 2021. Even under covid-19 pandemic situation during last month, our scientists were able to make research and development efforts regarding investigation of salt tolerance potential of newly isolated bacterial strains as well as in GIFT tilapia, screening of soybean & chick pea genotypes, installation of micro-irrigation systems in fields, data collection and analysis of *rabi* sown crops, communications for inter institutional collaboration, distribution of inputs to SC beneficiaries. Covid-19 precautionary measures and appropriate guidelines were followed while conducting the research and developmental activities. The institute also organized 11th Pre-Institute Research Council (Pre-IRC) meeting from April 08-13, 2021 in hybrid mode where presentations on research achievement by scientists and technical staff were made followed by detailed discussions for further improvement.

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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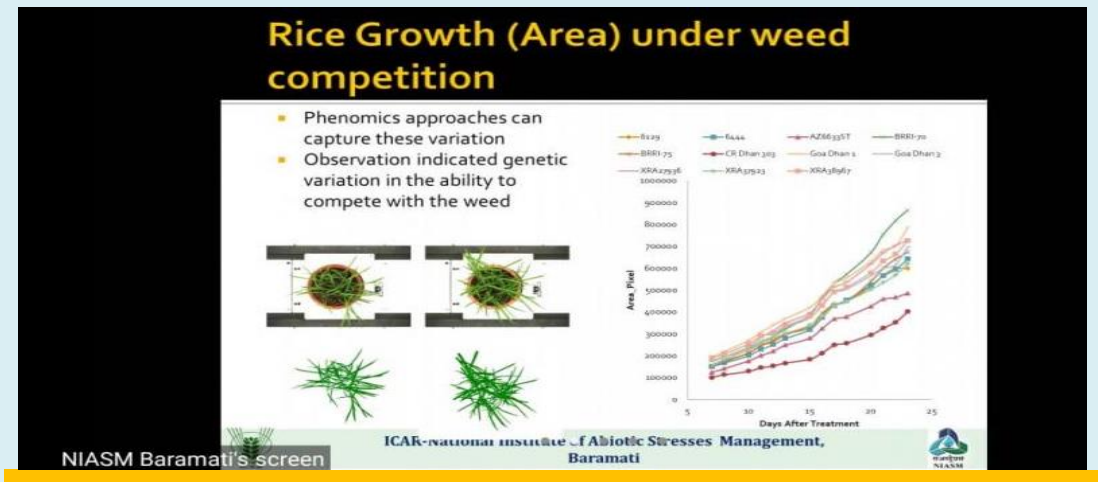
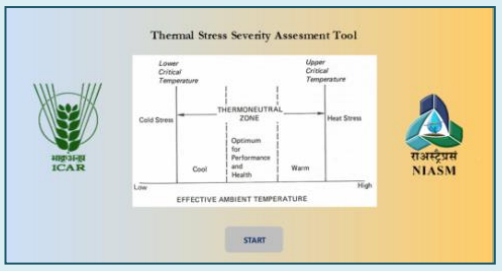


Glimpses of presentations made during 11th Pre-IRC meeting during April 08-13, 2021

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, Pravin H More



Thermal stress severity assessment tool

Outputs

- Spreadsheet model "Thermal Stress Severity Assessment Tool For Livestock" with management options based on forecasted values and 10 year historic data of the selected geo location.
- The Thermal Severity was assessed based on five days forecasted values of selected geo-location.

Targets for next month

- Web app for Suggest management options based on Forecasted values.

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, Pravin B Taware, Aniket More, Rushikesh Gophane, Lalitkumar Aher

Outputs

- Communication with ICAR-IISS, Mau for collaboration and seed materials wild species of finger millet and rice germplasm was done.
- Established communication with UAS, Dharawd , UAS, Raichur, RARS, Tirupati and ARS, Kadiri for drought tolerant groundnut varieties.
- Documentation of 510 accessions of pigeon pea, groundnut, finger millet and foxtail millet received from ICRISAT, Hyderabad: Testing the seed viability, germination and purity (based on seed color).
- Finalization & upload of technical bulletin on "Abiotic stress tolerant crop varieties, livestock breeds and fish species" on institute website.
- Preparation of draft copy of blue print of genetic garden.

Targets for next month

- Planting turmeric genotypes in the filed for evaluating their performance under rainfed and shallow soils.
- Crop calendar preparation for Kharif, 2021.
- Planting turmeric genotypes for evaluating salinity tolerance (pot experiment).

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, Avinash V Nirmale

Setting up of methyl eugenol para-pheromone in mango

Outputs

- Setting up of methyl eugenol para-pheromone traps in mango orchard for monitoring and management of fruit flies.
- Compilation of information on recommendations for fruit crops and future research study.
- DNA extraction of *Colletotrichum spp*. & its *in vitro* pathogenicity study in dragon fruit.
- Collection and compilation of the information on crop details, irrigation system, no. of irrigations required in order to calculate water budgeting in north and south farm.

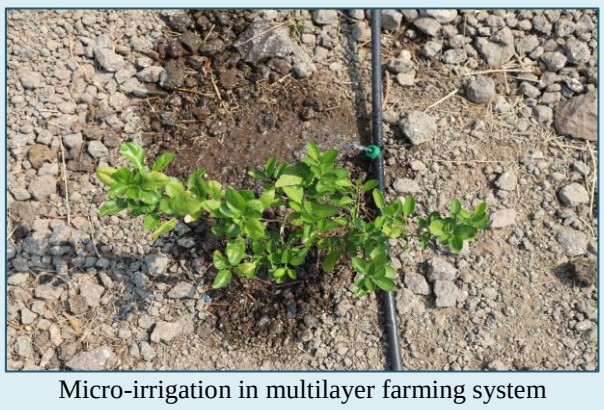
Targets for next month

- Recording of yield of Sapota under different treatments.
- PCR studies & sequencing of dragon fruit pathogens.
- Collect and compile the initial information of each fruit crops/plots in the north block.

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, Patwaru Chahande



Micro-irrigation in multilayer farming system

Outputs

- Completion of laying of micro-irrigation system in individual plots.
- Sowing of fodder maize crop completed.
- Completion of transplantation of brinjal crop in multilayer farming system.

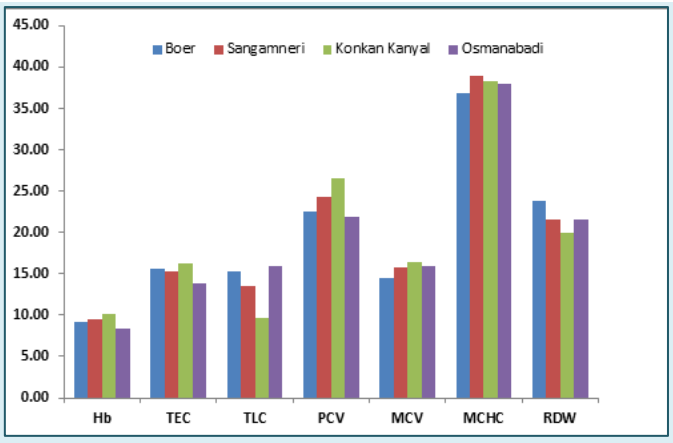
Targets next month

- Land preparation for upcoming *kharif* season.
- Summer management of field and horticultural crops and livestock.
- Cultivation of cucurbits in multilayer farming system.

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, Sunil V Potekar



Haematological parameters in different breeds of goat in April

Outputs

- Recording of comparative status of growth, physio-haematological parameters and reproduction in different breeds of goat for April.
- Recording of various parameters (growth and biochemical) of GIFT tilapia in different salinity levels.
- Recording of growth rate (length weight relationship) in different salinity levels in GIFT tilapia.
- Collection of black soldier fly larvae for its mass multiplication.

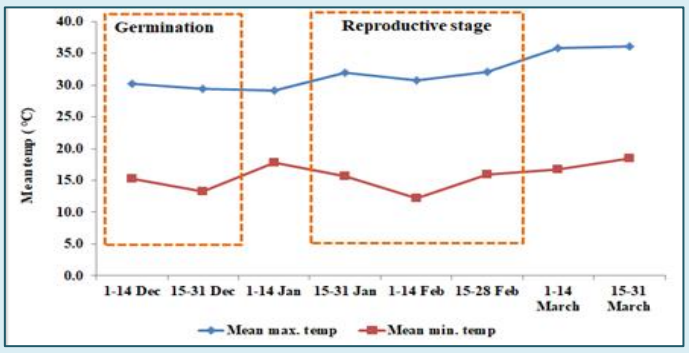
Targets for next month

- Evaluation of stress parameters in different breeds of goat.
- Amplification of Heat Shock Protein polymorphic region for poultry.
- Survey on fall armyworm in maize and collection of black soldier fly larvae.
- Impact of salinity stress in GIFT Tilapia; development of live fish feed culture unit.

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 S, Harisha C B



Mean maximum and minimum temperature during quinoa growth

Outputs

- Sowing on second fortnight of Dec (15 Dec) had better morphological and yield attributes (plant population, panicle height & weight, no. of panicles per plant, seed & biomass yield).
- Low night temperature played a fundamental role on germination and physiology of quinoa.

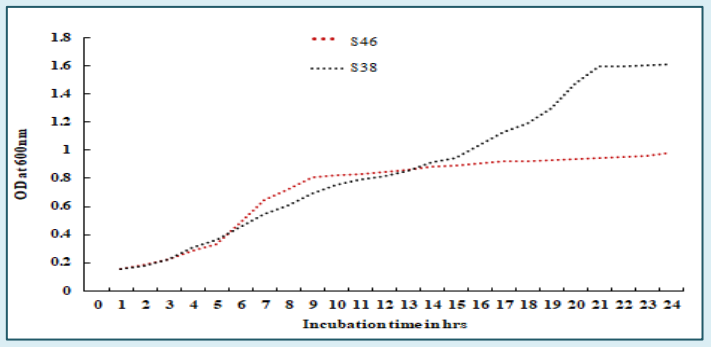
Targets for next month

- Preparation for germination test of quinoa under different salinity stress.
- Preparation of book chapter on abiotic stress management in new crops.

FP 3. 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, Aliza Pradhan, Amresh Chaudhary, Himanshu Pathak



Growth curve of the two halotolerant bacteria from marine habitat at NaCl concentration of 8% (w/v)

Outputs

- Analysis of growth curve of candidate halotolerant bacterial strains under high NaCl regime.
- Conduction of study to establish the molecular basis of nitrogen fixation among the N2 bacteria using colony PCR approach.

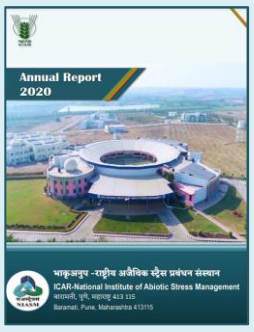
Targets for next month

- To resolve the biochemicals extracted from rhizosphere of *Cullen plicata* using HPLC.

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, Himanshu Pathak



Agro advisory & Annual report of the institute

Outputs

- Distribution of inputs (sewing machine, flour mill, utensils, bicycle etc) to SC beneficiaries.
- Publication of annual report and two fortnightly agro advisories on institute website for stakeholders.
- Rearing of fish in different small ponds.

Targets for next month

- Preparation of questionnaire for data collection on abiotic stress management of crops.
- Development of ATIC ; coordination of extension activities.
- Preparation of action plan under agro tourism.

B) School of Water Stress Management (SWSM)

1. Mitigating water stress effects in vegetable and orchard crops

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

Onion bulbs produced under different sulphur and water stress treatments under LSS

Outputs

- Measurement of the bulb yields and yield attributes of harvested onion (cv. Bhima Kiran) for investigating impact of sulphur sources and water stress using line source sprinkler system.
- Measurement of fruit yield and quality attributes of fresh okra fruit for assessing the impact of plant growth regulators for alleviating the water stress.

Targets for next month

- Physico-chemical analysis of harvested onion for evaluating impact of sulphur sources and water stress.

EAP 1. Genomics strategies for improvement of yield and seed composition traits under drought stress conditions in soybean (Funded by: ICAR-NASF)

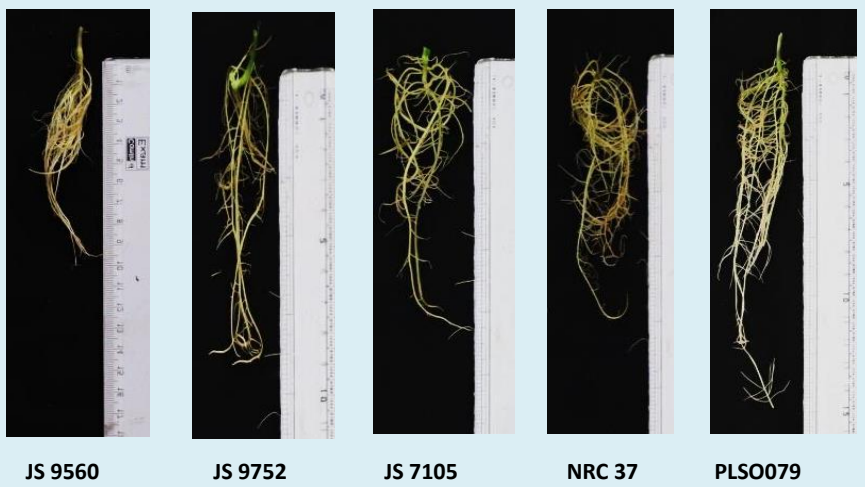
PI: Ajay Kumar Singh; **Co-PI(s):** Mahesh Kumar, Jagadish Rane

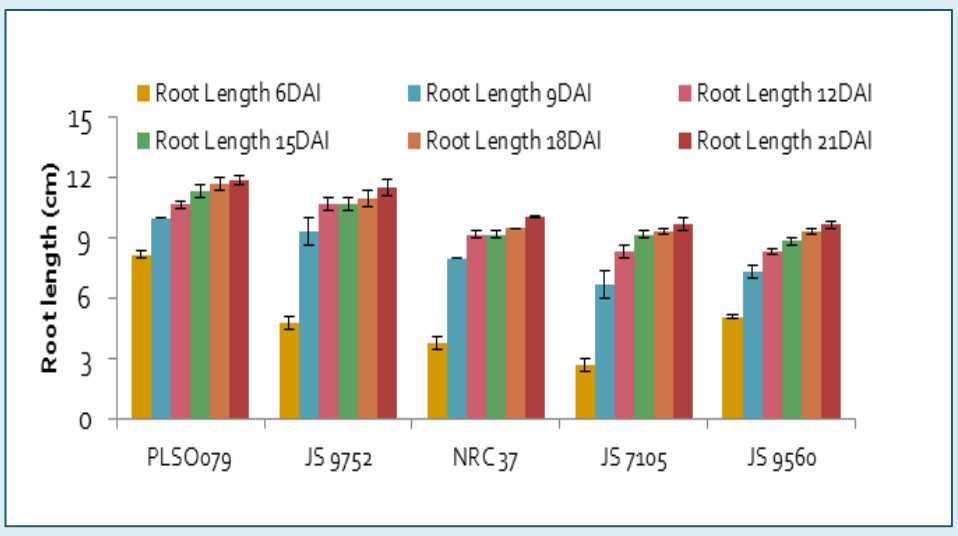
Outputs

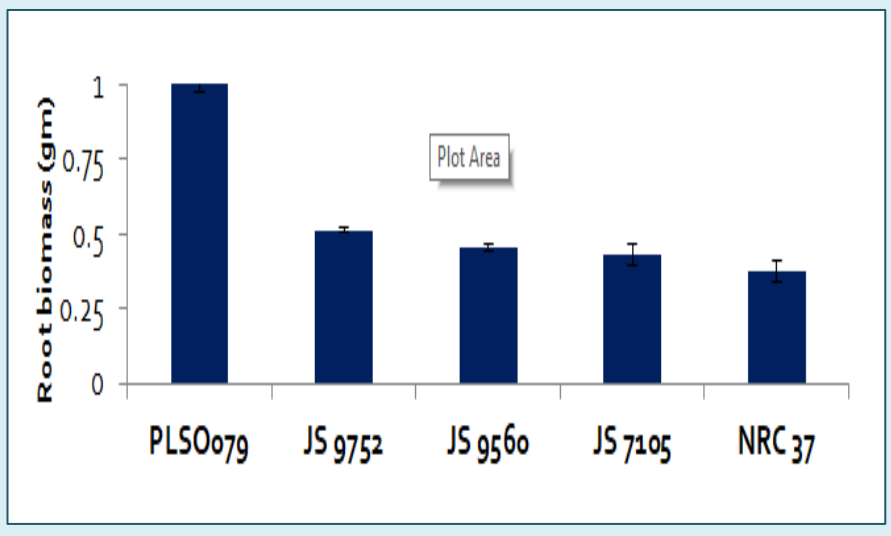
- Genotype PLSO-079 showed higher biomass and deeper root system as compared to check varieties i.e. JS-9752 (drought tolerant), JS-7152 (drought tolerant), JS-9560 (drought susceptible) and NRC-37 (drought susceptible).

Targets for next month

- Evaluation of 15 promising soybean genotypes for drought adaptive traits and genes under greenhouse conditions.
- Root system architecture study in 25 soybean genotypes.
- RNAi constructs designing for silencing 1-Amino Cyclopropane Carboxylate Synthase (ACS) gene in soybean and Farnesyltransferase gene in wheat.







Genetic variability in Root System Architecture (RSA) in soybean genotypes

EAP 2. Phenotyping of pulses for enhanced tolerance to drought and heat (Funded by ICAR-NICRA)

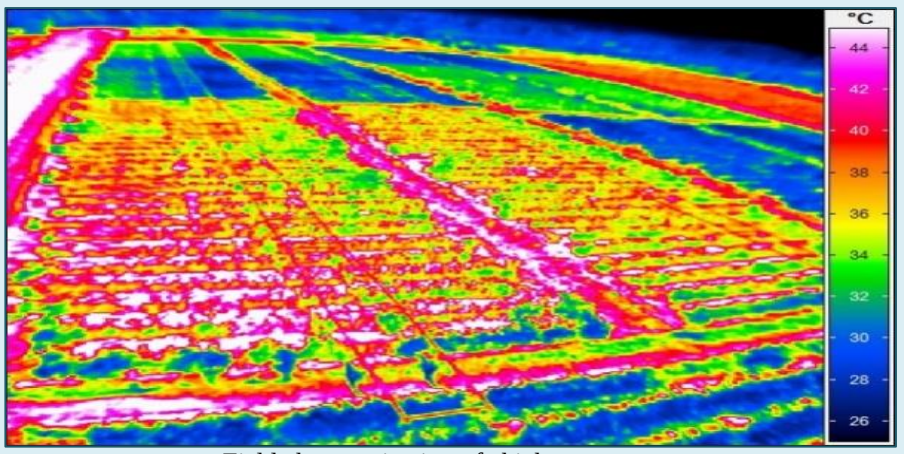
PI: Jagadish Rane; **Co-PI:** Mahesh Kumar,

Outputs

- Completion of field characterization of chickpea genotypes under two environments.
- Higher Biomass accumulation was observed in D31, D15, D24, and D29 under normal whereas D31, D30, D22 and ICE 14886 under water stress condition.
- Initiation of experiment for phenotyping mung bean genotype in field conditions.

Targets for next month

- Phenotypic evaluation of mung bean genotype in field conditions for moisture stress tolerance traits.



Field characterization of chickpea genotypes

EAP 3. Evaluation of halotolerant rhizobium and PGPB based biomolecules for alleviation of drought and salt stress (Funded by: AMAAS, NBAIM, Mau)

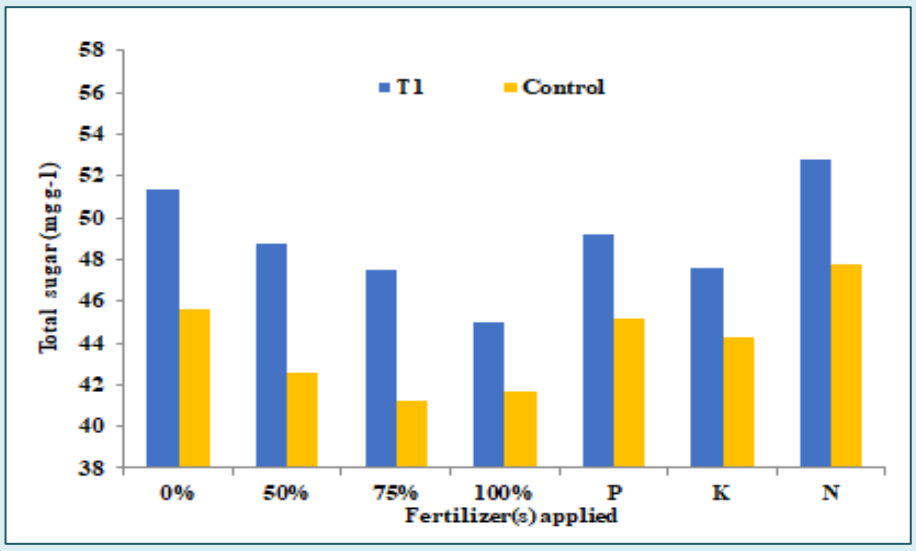
PI: Satish Kumar; **Co-PI:** Goraksha C Wackchaure

Outputs

- Evaluation of the effect of ACC deaminase producing bacterial strain on biochemical status of wheat seedlings in terms of accumulation of soluble sugars, proteins and phenolic compounds.
- Determination of the influence of different growth regulators and a newly developed bio-formulation on root volume of spinach.

Targets for next month

- To develop a HPLC method for resolution of multiple phenolic compounds from the newly developed bio-formulation to generate a HPLC-signature of the product.



Variations in total sugar content in wheat plants under the influence of microbial consortium (T1) and varying exogenous NPK conditions

EAP 4. 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, Himanshu Pathak


Experimental plot of groundnut as intercrop in fresh sugarcane crop

Outputs

- Collection of real time data of soil-water-crop parameters viz., plant height, number of tillers, NDVI, length of internodes and chlorophyll index in tillage system and planting geometry field trials of sugarcane.
- Completion of combined pooled analysis of yield data collected during last three years from field experiments.
- Monitoring and recording of data in recently established sugarcane- groundnut field trials for optimizing planting geometry, micro irrigation and residue management practices.

Targets for next month

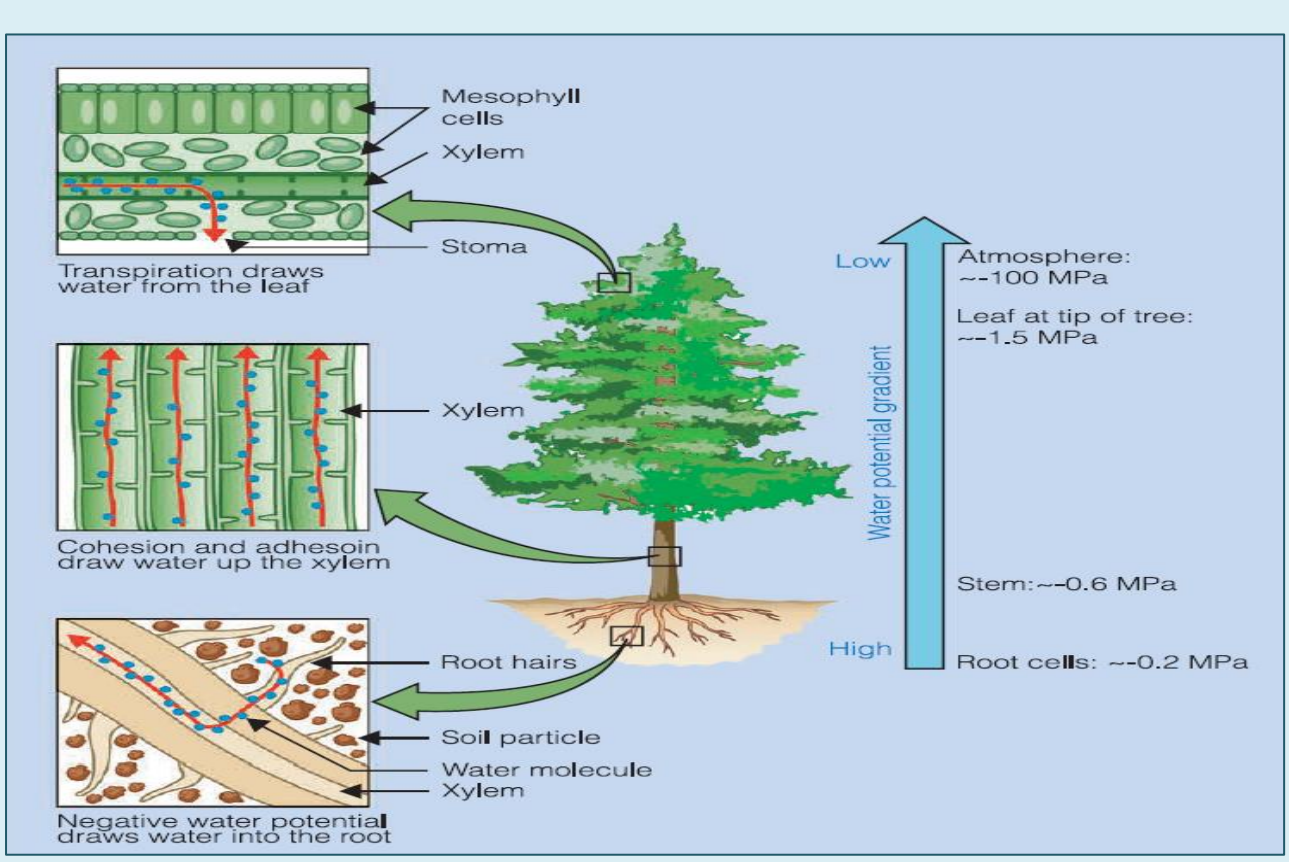
- Measurement of real data time of soil-water-crop parameters in various field trials on conservation agriculture for sugarcane.
- Preparation of draft of technical bulletin on conservation agriculture in sugarcane.

Measuring the Water Demand for Precision Irrigation Techniques

Pravin B. Taware , Sr. Technical Officer (Farm)

Crop cultivation under arid conditions, high drain soils demand more water resources for irrigation. This ecological and economic problem of excessive water uses in agriculture may be alleviated by application of precision irrigation techniques. Precision irrigation implies precise spatial and temporal control of water supply based on the actual water demand.

The measurement techniques used for irrigation scheduling are usually grouped into three categories (Jones, 2007). The first category is soil-based irrigation scheduling, relying exclusively on either measurement or estimation of soil-water status. The second are plant-based irrigation techniques, determining the water demand based on measured plant's water status, and the third category contains combined techniques, combining both soil-water and plant-water status measurements. Soil-based irrigation scheduling techniques aim to calculate the amount of water which needs to be supplied in order to compensate for given soil-water deficit. The least accurate is the model-based estimation of the soil water balance. It estimates the total amount of available soil-water from a mathematical model accounting for the water drainage, evapotranspiration and meteorological data (precipitation, air temperature, humidity, wind, and insolation). More accurate soil-based irrigation scheduling is obtained by direct measurement of physical quantities describing the soil-water status: soil water potential or water content. The soil water potential is usually measured using tensiometers and psychrometers, and water content measurement are made by using gravimetric sensors, capacitive time-domain reflectometry and neutron probes. Similarly, Oletic and Bilas 2020 provided an overview of state-of-the-art in measurements of common plant-hydraulic quantities, open challenges and research opportunities. They focused on novel, emerging methods showing potential for field application, but are still on their way from botanists' laboratories into the vineyards and crop fields. These techniques include; measuring xylem water potential, thermal sensors of xylem sap flow, electromagnetic sensing of stem water content and ultrasonic detection of xylem embolism. El-Naggar 2020 compared real-time, sensor based and soil water balance scheduling on a trial under a variable-rate center pivot irrigation system. The soil-water balance scheduling used the FAO56-ET model to calculate daily soil-water deficits and to determine crop water requirements using climate data from local climate station. The sensor-based scheduling system used a wireless soil moisture sensing network to trigger irrigation when soil water deficit reached a critical value in a web-based user interface. The sensor-based scheduling technique delivered 27-45% less water and irrigation water efficiency was greater. In short, actual measurement of water demand, proper scheduling and judicious application are important components of precision irrigation.



Plant's water transport system (Oletic and Bilas 2020)

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"Earth provides enough to satisfy every man's need, but not every man's greed".

-Mahatma Gandhi