



## Abiotic Stress Management News

भाकृअनुप- राष्ट्रीय अजैविक स्ट्रेस प्रबंधन संस्थान

ICAR- National Institute of Abiotic Stress Management

मालेगाँव खुर्द, बारामती – 413 115, पुणे, महाराष्ट्र, भारत

Malegaon Kh, Baramati- 413 115, Pune, Maharashtra, India



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#### Workshops/Seminar/Symposia/Conference/ Training attended

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#### Editorial Committee

Dr Ajay Kumar Singh  
Dr Mahesh Kumar  
Dr Neeraj Kumar  
Dr Paritosh Kumar

#### Technical Assistance

Mr. Pravin More  
Mr. Madhukar Gubbala

### From the Director's Desk.....

Greetings from ICAR-NIASM.

Plants are sessile organisms with ability to survive at extreme environmental conditions that affect their development. Adverse environmental factors can limit crop production as much as 70%. Abiotic stresses like extreme ambient temperatures, freezing, drought and salinity cause major losses to crop productivity worldwide by adversely affecting plant growth, metabolism and thus productivity.



Dealing with the abiotic stresses is a tedious task due to their convolution, uncertainty and differential temporal and spatial effects. Being a tropical country, India is more challenged with multitude of several abiotic stresses. Thus, understanding abiotic stress responses in plants, animals and fishes and enhancing stress resilience to maintain the efficiency of agro-ecosystems on long-term basis are the extremely demanding areas in agricultural research. This requires improvement in the tolerance of plants and animals to environmental stresses and adoption of practices that minimize their magnitude.

Development and promotion of strategies to minimize the impact of abiotic stresses are fundamental for sustaining agriculture. The strategies should include both the improved agronomic management and breeding novel genotypes with improved capacity for adaptation to stress environments. The major challenge is to enable accelerated adaptation and mitigation without threatening the sensitive agro-ecosystems that support livelihood of inhabitants striving to cope with abiotic stresses. The multi-thronged strategies are required to accomplish this task based upon the analysis of current and future situations and development and use of newer technologies. Impact of such technologies will be increasingly visible if they are customized for specific agro-ecosystem that may vary across the location.

To accomplish this, ICAR-NIASM, Baramati has taken lead to carry out research for delivering technologies for the benefit of farming community through basic and strategic research in crops, livestock and fisheries. It has joined hands for research and academic activities by signing the MoU with Dr BSKKV, Dapoli; PDKV, Akola; University of Agricultural Sciences, Dharwad; VNMKV, Parbhani and University of Horticultural Sciences, Bagalkot. Many important events such as Constitution Day, World Soil Day, 71<sup>st</sup> Republic Day, 12<sup>th</sup> Foundation Day and International Women's Day were celebrated. Institute has also made efforts on human resource development by conducting workshops and training programmes.

I thank the Editorial Board Members for their sincere efforts in bringing out the Newsletter. I place on record my thanks to all the staff members for their contributions for this issue of the Newsletter.

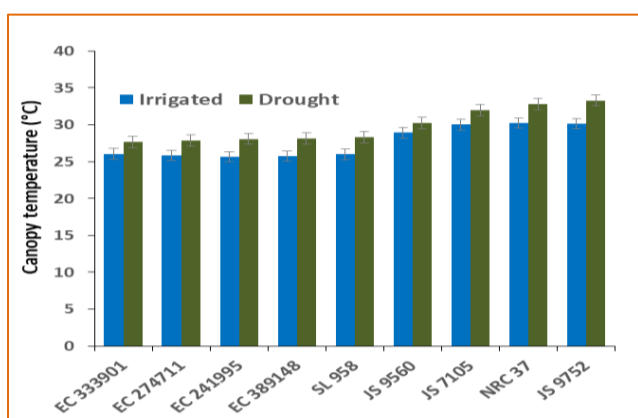
Date: March 31, 2020

(Himanshu Pathak)

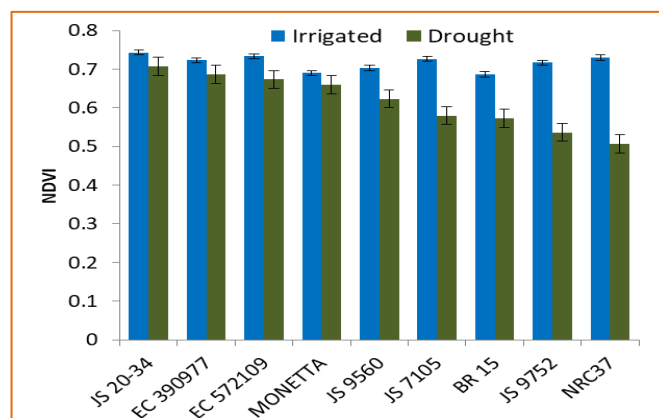
## Evaluation of soybean germplasm for traits associated with adaptation to drought stress

(Ajay Kumar Singh, Senior Scientist)

A total number of 153 soybean genotypes along with check varieties i.e., JS-9560 (drought susceptible), NRC-37 (drought susceptible), JS-9752 (drought tolerant), JS-7105 (drought tolerant), were evaluated under greenhouse conditions for traits associated with drought. Drought stress was imposed by withholding watering for 48 hour at flowering stage (R1) stage. Soybean genotypes along with check varieties were evaluated for NDVI (Normalized Difference Vegetation Index), canopy temperature using IR camera, relative water content and chlorophyll fluorescence (Fv/Fm) for quantum efficiency of photosystem II. Genotypes EC-333901, EC-241995, SL-958, EC-274711, and EC-381148 exhibited cooler canopy under non-stress and also under drought stress condition compared to check varieties JS-9752 and NRC-37. The NDVI was recorded at drought stress condition. Soybean genotypes EC-39077, EC-572109, JS-2034 and Monetta exhibited higher NDVI compared to local check varieties JS-9752, JS-9560, JS-7105 and NRC-37.

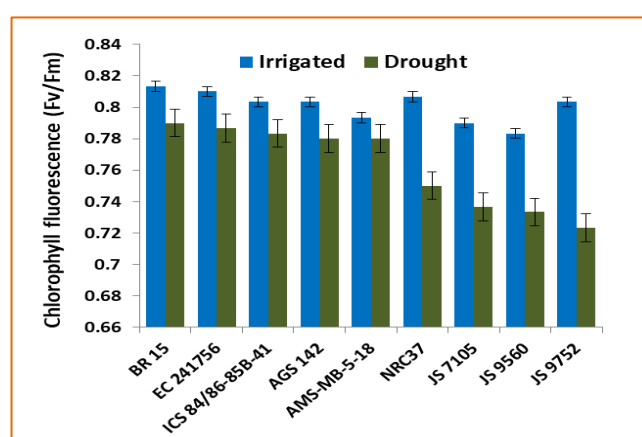


Genetic variability in canopy temperature under drought and irrigated conditions in soybean genotypes.



Genetic variability in NDVI under drought and irrigated conditions in soybean genotypes.

Chlorophyll fluorescence was measured in excised leaves of soybean plants. Chlorophyll fluorescence variation can be used as a valuable index for evaluation of plants tolerance to environmental stresses like drought and water stagnation stresses. Photosystem II photochemical capacity was calculated from the ratio of variable fluorescence to maximum chlorophyll fluorescence (Fv/Fm). The chlorophyll fluorescence of soybean genotypes against check genotype was measured under well-watered and also under drought stress conditions. Genotypes BR-15, AGS-142, AMS-MB-5-18, ICS84/86-858-41 and EC-241756 showed higher Fv/Fm compared to check varieties JS-9752, JS-9560, JS-7105 and NRC-37.

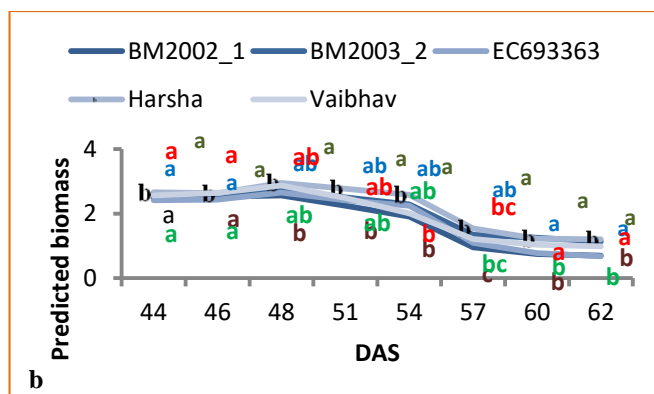
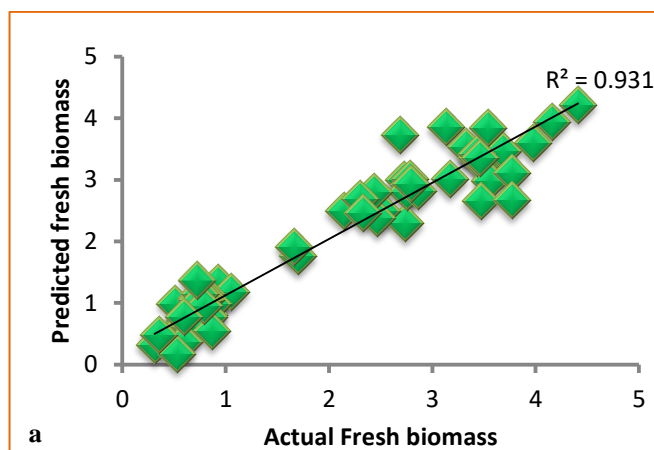


Genetic variability in chlorophyll fluorescence (Fv/Fm) under drought and irrigated conditions in soybean genotypes.

## Optimisation of high-throughput phenotyping method to screen mungbean (*Vigna radiata* L.) genotypes for drought tolerance

(Jagadish Rane, Principal Scientist)

High-throughput phenotyping technology allows the quantitative large scale estimation of plant responses to environmental stimuli in a non-destructive and rapid way as compared to many of the traditional destructive and time consuming methods. The Plant Phenomics facility was used to differentiate the phenotypic responses of 12 mungbean genotypes to short-term drought (11 days; 46 days after sowing (DAS) to 57 DAS). The moisture content of the soil was reduced to 32% of field capacity at 57 DAS which was monitored by using automatic weighing facility in the system. Images acquired from 42 DAS to 63 DAS in different spectral ranges (Visible and Near Infra-Red) were later processed and features were extracted using LemnaTech software. Results revealed that the mungbean genotypes Harsha and EC-693357 performed better than the locally adapted cultivar Vaibhav. Plant biomass is one of the main parameter for growth analysis and yield prediction in different environmental condition. The biomass taken in a destructive manner at 62 DAS was significantly correlated with the image parameters derived from images captured before harvesting the plants. Step-wise regression analysis revealed that parameters in addition to image areas such as Boundary Point Count, Circumference and Centre of Mass of images captured from top and side views can contribute in prediction of biomass of mungbean. It was concluded that it is necessary to consider other key image parameters in addition to area for predicting biomass and the rate of growth calculated based on these digital parameters/indices can serve as surrogate trait for differentiating the growth responses of the mungbean genotypes to drought.



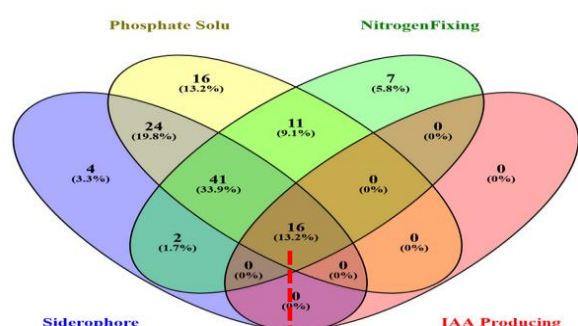
Correlation between predicted biomass and actual fresh biomass (a) and biomass curve of selected genotypes plotted from predicted biomass (b).

## Bio-prospecting xerophytes for novel bio-inoculants and bio-regulators aimed at enhancing drought stress tolerance in field crops

(Satish Kumar, Scientist)

Six accessions of *Opuntia* sp. were explored for isolations of endophytes with Plant Growth Promoting Activity (PGPA). Using different culture conditions, more than 250 endophytes have been isolated from phylloclade of six *Opuntia* accessions. The qualitative screening assays for siderophore production (Blue Agar CAS Assay) were performed and a total of 86 isolates were found positive for siderophore producing activity. The endophytic isolates were also screened for isolates phosphate solubilisation (Pikovskaya (PVK) agar assay) and for their ability to grow in nitrogen free media (Jensen's Medium). A total of 97 and 71 isolates exhibited phosphate

solubilizing activity and grew well in nitrogen free medium. Isolates were also evaluated for their IAA producing activity and 16 isolates were found positive for IAA producing activity. We found 16 microbial isolates which were positive for all four PGPA traits screened. These sixteen isolates could be potential microbes and are being identified using 16S rRNA gene sequencing and will be subsequently tested for their IAA production abilities using more precise techniques as HPLC and LC-MS.



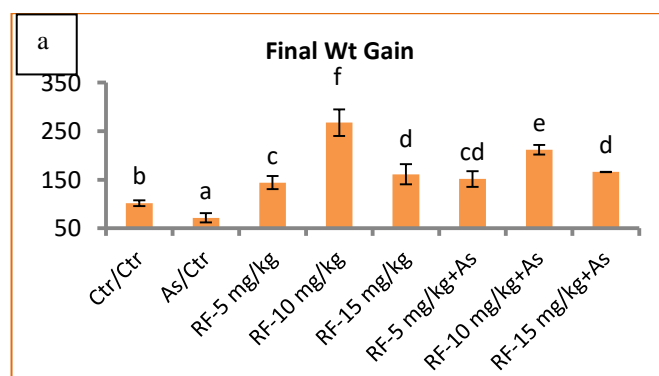
| Sixteen isolates showing all four PGPA traits (Qualitative Assay) |             |    |              |
|---|-------------|----|--------------|
| 1   | Cac-4-NA-44 | 9  | Cac-6-NA-81  |
| 2   | Cac-4-NA-54 | 10 | Cac-6-NA-82  |
| 3   | Cac-5-NA-57 | 11 | Cac-6-NA-84  |
| 4   | Cac-6-NA-70 | 12 | Cac-1-LB-94  |
| 5   | Cac-6-NA-72 | 13 | Cac-1-LB-95  |
| 6   | Cac-6-NA-73 | 14 | Cac-3-LB-120 |
| 7   | Cac-6-NA-74 | 15 | Cac-5-LB-148 |
| 8   | Cac-6-NA-79 | 16 | Cac-6-LB-155 |

### Dietary riboflavin potentiates immunity and antioxidative status in fish with response to arsenic and high temperature

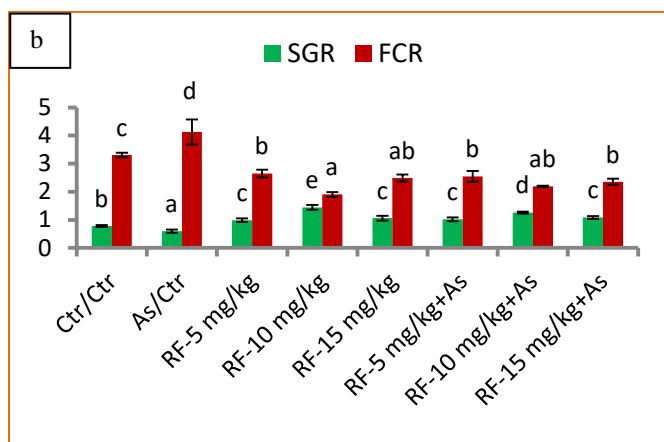
(Neeraj Kumar, Scientist)

Role of dietary Riboflavin (RF, Vitamin B-2) on mitigation of abiotic stresses as arsenic and high temperature on *Pangasianodon hypophthalmus* was studied. Fishes were fed with four diets containing different level of RF @ 5, 10 and 15 mg kg<sup>-1</sup> diet and treated under arsenic (As, 1/10th of LC50, 2.7 mg L<sup>-1</sup>) and temperature (34°C) for 90 days. The growth index as final

weight gain percentage, feed conversion efficiency ratio, FER, protein efficiency ratio, PER and specific growth rate, SGR were significantly (p<0.01) enhanced with application of RF @ 10 mg kg<sup>-1</sup> diet and drastically reduced the growth index with treated group of arsenic and temperature with control fed group. The anti-oxidative status (catalase, CAT, superoxide dismutase, SOD, glutathione-s-transferase, GST and glutathione peroxidase, GPx) has been noticeably (p<0.01) improved with application of dietary RF @ 10 mg kg<sup>-1</sup> diet. Dietary RF has been noticeably improved (p<0.01) the immunological status as total protein, albumin, globulin, A:G ratio, NBT, myeloperoxidase, total immunoglobulin of the fish treated with or without As and high temperature. The biochemical stress markers as blood glucose and HSP 70 was drastically (p<0.01) reduced with dietary application of RF @ 10 mg/kg diet, however, the level of glucose and HSP 70 were elevated with arsenic and high temperature treatment group and fed with control diet. The bacterial infection *Aeromonas hydrophilla* was inducted to fishes to observe the immunological status of fishes fed with dietary RF. The protective role of dietary RF was witnessed in the histopathological study of liver and gill. The arsenic bioaccumulation in different fish tissues was also determined. However, the present study proved that application of dietary RF have potential role in overall development of fish against the multiple stressors.







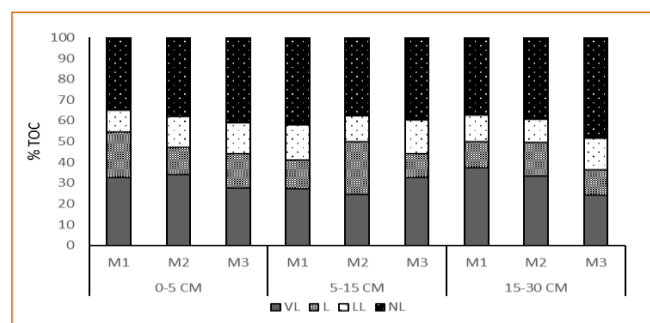
Impact of dietary riboflavinon (a) final weight gain %, (a) FCR and SGR of *P. hypophthalmus* reared under arsenic and high temperature for 90 days (b).

### Effect of tillage, residue and nutrient management practices of ratoon crop in sugarcane on different pools of soil organic carbon

(Amresh Chaudhary, Scientist)

A field experiment on sugarcane (*Saccharum officinarum*) in a clayed lithic Ustrothrent soil of NIASM, Baramati to study the effect of these treatments on dynamics of soil organic carbon under different treatments of tillage, residue management and nutrient management in ratoon crops with SORF machine. The soil samples were collected from three soil depths i.e., 0-5 cm; 5-15 cm and 15-30 cm. The results revealed that total soil organic carbon (TOC) was found higher in 0-5 cm soil depth which decreases along with soil depth in all the treatment of tillage. The highest TOC% was found in M3 plots (1.02) and lowest in M1 (0.86%) which indicates 20% higher carbon content in M3 as compared to M1. Similarly, for second and third depths, it was 10.58% and 5.8% higher in M3 as compared to M1 plots. Total soil organic carbon was always higher in plots having residue retained on surface (T1) as compared to residue burning (T2) (Table 1). Among the nutrient management plots, The TOC content was observed highest in N3 plots in 0-5 and 5-15 cm soil depths whereas the SOC content becomes non-significant in 15-30 cm of soil depth among different treatments of nutrient management in sub-sub plots. The percentage of labile pools (VL+L) decreases with

depth and the recalcitrant pool (LL+NL) increases with depth from surface to sub-surface. This shows that the tillage and residue management has great impact on soil carbon sequestration by increasing the recalcitrant pool of C in conservation tillage systems (M2 and M3) as compared with conventional system (M1) (Table 1).



Distribution of different pools of SOC under three tillage practices at three soil depths.

**Table 1:** Total soil organic carbon in different treatments across the soil depth.

| Treatments  | TOC %             |                   |                    |
|---|-------------------|-------------------|--------------------|
|   | 0-5 cm            | 5-15 cm           | 15-30 cm           |
| Tillage (T)   |                   |                   |                    |
| M1 (laser land levelling (LLL) + conventional tillage (CT) + 10% of recommended dose of fertilizers applied as basal and remaining 90% dose of fertilizers through fertigation) | 0.86 <sup>C</sup> | 0.85 <sup>B</sup> | 0.85 <sup>AB</sup> |
| M2 (LLL+RT+10% of RDF as basal, 40 % through band placement and remaining 50% through fertigation)  | 1.00 <sup>B</sup> | 0.92 <sup>A</sup> | 0.82 <sup>B</sup>  |
| M3 (LLL + RT + 10% of RDF as basal, 40% through band placement and remaining 50% through fertigation)   | 1.02 <sup>A</sup> | 0.94 <sup>A</sup> | 0.90 <sup>A</sup>  |
| General Mean  | 0.96              | 0.92              | 0.85               |
| Residue Management (RM)   |                   |                   |                    |
| T1 (Mulching with sugarcane trash)  | 1.05 <sup>A</sup> | 0.98 <sup>A</sup> | 0.88 <sup>A</sup>  |
| T2 (Residue burning)  | 0.87 <sup>B</sup> | 0.83 <sup>B</sup> | 0.84 <sup>B</sup>  |
| Nutrient treatment (NT)   |                   |                   |                    |
| N1 SORF with placement of 25% through SORF and 75 % through fertigation   | 0.95 <sup>B</sup> | 0.90 <sup>A</sup> | 0.88               |
| N2 SORF with placement of 50% through SORF and 50 % through fertigation   | 0.92 <sup>C</sup> | 0.85 <sup>B</sup> | 0.83               |
| N3 SORF with placement of 50% through SORF and 50 % through fertigation   | 1.01 <sup>A</sup> | 0.96 <sup>A</sup> | 0.86               |

## Quantifying thermal tolerance and genetic polymorphism in fishes from Bhima and Krishna rivers in Maharashtra

(Manoj P Brahmane, Principal Scientist)

Diurnal temperatures are going to change with rise in atmospheric temperature. As temperature is a major abiotic stress factor having ability to influence the other physico-chemical properties of water it is important to analyse the response in fish with higher rise in the maximum diurnal temperature during day time. Live fishes were brought from the Bhima river. Tilapia fishery dominates Bhima river. *Oreochromis mossambicus* larvae (5 dph) subjected to diurnal water temperature exhibited increased growth. The fishes were exposed to three average diurnal water temperature regimes during day time (OT-DT), (1) 25.4-28.1°C, (2) 26.1-30.3°C, (3) 26.1-37.2°C for a period of 90 day. The fishes experiencing 26.1-37.2°C temperature regime were daily exposed to faster rise in temperature for 3 hours from 1400 to 1700 hrs from 29.6 to 37.2°C, respectively- a rise in 7.6°C. It is observed that the total weight of fishes (n=50) experiencing 25.4-28.1°C was 119.4 g, fishes experiencing 26.1-30.3°C thermal regime accumulated biomass of 125.6 g and the fishes which experienced higher thermal regime of 26.1-37.2°C exhibited a total biomass of 144.8 g (Table 2). Similarly gene expression induced by different diurnal thermal regimes were analyzed, *MyoD* and *MyoG* expression increased in the fishes exposed to the 26.1-37.2°C regime. These results suggest that the experiencing higher diurnal temperature induce faster growth in fishes leading to accumulation of higher muscle mass.

**Table 2:** Thermal regime and accumulated biomass

| Thermal regime | OT-DT 25-28°C | OT-DT 26-30°C | OT-DT 26-37°C |
|----------------|---------------|---------------|---------------|
| Biomass        | 119.43 g      | 125.61 g      | 144.84 g      |

## Effect of multiple salinity levels on growth response and survival of Nile tilapia (*Oreochromis niloticus*)

(MP Bhendarkar, Scientist)

The experiments were carried out at fisheries wet lab in rectangular aquarium tanks having dimension 2x1x1 feet to investigate the effect of different salinity levels on survival of Nile tilapia (*Oreochromis niloticus*). Experimental designs were prepared with variable salinity levels maintain such as 15 ppt, 10 ppt, 05 ppt, freshwater (control) and saline water (control). Fish of an average initial weight  $10 \pm 2.0$  g were randomly assigned to each aquarium tank at the rate of 3 fishes per tank. Fish were fed with 28% protein diet @ 8% of its wet body weight on daily basis. No survival was recorded in the 15 ppt and saline water control.

## Analysis of long-term rainfall data in scarcity zone Baramati

(R N Singh, Scientist)

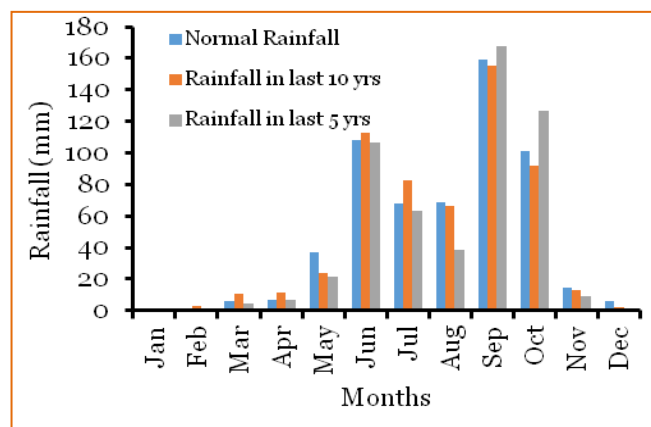
Baramati lies in arid to semi-arid region of western Maharashtra where water is the main limiting factor affecting crop productivity. The daily long term rainfall data of 34 years (1986-2019) of Baramati was processed and analyzed. It is evident from the monthly mean cumulative rainfall during different months that monthly rainfall had unimodal peak. September received maximum rainfall of 158.8 mm and January received the minimum amount (0.6 mm). However, September of 2008 received the highest rainfall (377 mm) during 1986-2019. The standard deviation of monthly mean cumulative rainfall varied between 2.6 mm/month (January) and 107.3 mm/month (September) and the coefficient of variation varied from 67.1% (June) to 446.9% (February) (Table 3).

**Table 3:** Monthly mean, highest and lowest rainfall (mm) along with SD and CV at Baramati

| Months    | Mean  | Highest | Lowest | SD    | CV    |
|-----------|-------|---------|--------|-------|-------|
|           |       |         | t      |       |       |
| January   | 0.6   | 13.0    | 0.0    | 2.6   | 398.8 |
| February  | 0.9   | 24.0    | 0.0    | 4.2   | 446.9 |
| March     | 5.9   | 80.0    | 0.0    | 14.8  | 251.4 |
| April     | 7.1   | 54.0    | 0.0    | 13.2  | 185.3 |
| May       | 37.0  | 204.0   | 0.0    | 45.6  | 123.2 |
| June      | 108.1 | 314.0   | 13.0   | 72.5  | 67.1  |
| July      | 67.9  | 162.6   | 6.0    | 46.0  | 67.7  |
| August    | 68.6  | 277.0   | 5.0    | 63.1  | 91.9  |
| September | 158.8 | 377.0   | 14.0   | 107.3 | 67.5  |
| October   | 101.0 | 332.4   | 0.0    | 93.6  | 92.7  |
| November  | 14.2  | 97.0    | 0.0    | 21.4  | 150.8 |
| December  | 5.7   | 75.0    | 0.0    | 16.3  | 287.6 |

Long Period Average (LPA) for the last 34 years at Baramati is only 576.0 mm which is distributed in monsoon, pre-monsoon and post monsoon seasons. It is observed that during the decade mean annual rainfall, monsoon, pre-monsoon and post monsoon season rainfall was almost equal to normal rainfall of the region. Amount of rainfall was less in monsoon season and pre monsoon season during last 5 years, compared to normal. However, it was recorded higher than normal in post monsoon season. It indicates there is slight shifting of rainfall spells towards the end of monsoon season.

Long-term monthly mean cumulative rainfall varied between 0.6 mm (January) and 158.8 (September). During last ten years and five years average monthly cumulative rainfall remained highest in September i.e. 155.5 mm and 167.6 mm, respectively while lowest was recorded in January i.e., 0.0 mm in both the cases.



Monthly rainfall at Baramati (1986-2019)

The results revealed that monthly distribution of rainfall occurs for five months from June to October and it is mostly due to monsoon and post monsoon. The crops development depends on monsoon rainfall during July-August. The *Rabi* season crops are grown with the residual soil moisture of monsoon and post-monsoon rainfall received in October with assured supply of irrigation water. Rainfall which occurs due to western disturbance after monsoon season saves one or two irrigations during this season.

### Waste water treatment synergizing with integrated approach of constructed wetland and aquaponics

(Paritosh Kumar, Scientist)

NIASM septic tank waste water is treated through a pilot scale constructed wetland system. The system comprised of two parallel units (i) Horizontal Sub-Surface Flow Based Constructed Wetland System (HSSF-CWs) and (ii) Vertical Sub-Surface Flow Based Constructed Wetland System (VSSF-CWs) constituted with different growing cum filtration media. Treated waters from these systems along with wetland plants grown systems were passed through 25 Watt UV sterilization unit and collected separately and used for growing aquaponics.

## Pollutant Removal Efficiency

Microbial population of these wetland +UV treated waters were considerably reduced within the safe limit recommended by WHO for total coliform (1000/100 ml), faecal coliform (100/100 ml) and *Escherichia coli* (100/100ml) and their BOD was also reduced below 30 mg/l. However, among different filling media Gravel + charcoal and gravel based system has performed the best and their treatment was found consistent every month. Apart from microbial, other physico-chemical parameters were found within safe limit.

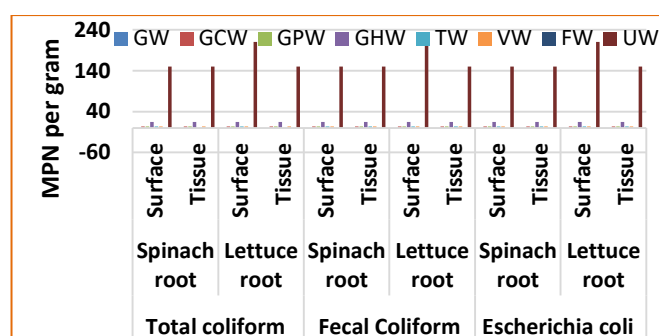
## Flower Harvesting

In the crop season December 2019 to March 2020 yellow and orange flowering cultivar of marigold were grown in both HSSF-CWs and VSSF-CWs applied with septic tank wastewater spiked with multi metal mixture viz. Fe, Mn, Zn, Cu, Cr, Cd, Pb and Ni of 1.0 ppm concentration and evaluated their performance under water logging, microbial + heavy metal stress. Till now, about 5.12 kg and 0.78 kg of orange flower and 4.14 kg and 0.60 kg yellow flower were harvested from horizontal (HSSF-CWs) and vertical systems (VSSF-CWs). Flower yield in horizontal system was observed higher compared to vertical system. However, among different treatments (growing media) average marigold flower yield was found the highest in Gravel + charcoal and Gravel + coco peat based systems which was up to 1.3 kg orange and 1.07 kg yellow flower.

## Food Quality of Harvested Crop from Aquaponics System

Spinach, Pangasius fish, lettuce has been grown in aquaponics system and about 4.32 kg spinach and 1.38 kg lettuce leaf were harvested. However, among different treatments maximum spinach leaf was harvested from Gravel treated

water (GW; 937 g) followed by untreated water (UW; 735g) while lettuce leaf from UW (401 g) followed by Gravel + charcoal (GCW; 237 g) and GW (228 g) treated water. Total coliform, faecal coliform and *Escherichia coli* content on the surface and inside tissue of spinach leaf grown in untreated water (UW) was found 3.6 MPN/g each, on the surface and inside tissue of lettuce leaf 15 and 7.4 MPN/g each and in fish muscle 150, 43 and 75 MPN/g was observed. While in other treatments their content was found below detection limit and thus safe for consumption. However, in spinach and lettuce root the microbial content is presented below.



Total coliform, fecal coliform and *E. coli* content in spinach and lettuce root grown in treated waters of GW: Gravel, GCW: Gravel+Charcoal, GPW: Gravel+Coco peat, GHW: Gravel+Rice hull, TW: Typha, VW: Vacha, UW: Untreated water and FW: Fresh water under aquaponics system

## New Initiatives

First issue of 'Farm Coordinator', the in-house Newsletter, has been started on the eve of foundation day. It has been compiled and edited by the institute farm committee. This will be published online every month with the purpose to improve the coordination among NIASM staff for implementing the planned activities.

The invocation song of NIASM was launched on the Foundation Day. The song (यहाँ खोज खोज पर तनाव मुक्ति का नारा है। अजैविक स्ट्रेस प्रबंधन संस्थान हमारा है।) was written by Dr Pravin B Taware, Senior Technical Officer. The song narrates the importance, mandate and responsibilities of ICAR-NIASM.



## Major events

### MoU for collaborative research on abiotic stress management between ICAR-NIASM and Dr BSKKV, Dapoli

ICAR-National Institute of Abiotic Stress Management, Baramati, Pune signed MoU with Dr Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli (MS) on October 11, 2019 in presence of Hon'ble Vice-Chancellor, Dr Sanjay D Sawant to promote research on abiotic stress in Crop Science, Animal and Husbandry Science and Fisheries Science. The both Institutes also collaborate for Master and PhD students' research.



MoU between ICAR-NIASM and Dr BSKKV, Dapoli for collaborative research

### MoU for collaborative research on abiotic stress management between ICAR-NIASM and PDKV, Akola

ICAR-National Institute of Abiotic Stress Management, Baramati, Pune signed MoU with Punjabrao Deshmukh Krishi Vidyapeeth, Akola for abiotic stress management research and PG studies including pulse, millets, cotton and citrus on 23<sup>rd</sup> October, 2019 at Akola in presence of Dr Bhale Honb'le Vice-Chancellor of Punjabrao Deshmukh Krishi Vidyapeeth, Director of Research, Dean, Registrar and Heads of the Departments. Dr Jagadish Rane, Director (A), ICAR-NIASM, Baramati delivered a talk on "NIASM a potential partner for research and education. He discussed common areas of interest for collaboration involving faculty from relevant departments and PG students.



Signing of MoU for collaborative research between ICAR-NIASM and PDKV, Akola

### Workshop on advances in soil and water analysis

(Paritosh Kumar, Amresh Chaudhary and R N Singh)

A Workshop on “Advances in soil and water analysis” was organized in the Institute during November 4-6, 2019. A 28 candidates from different parts of Maharashtra attended the Workshop. Dr Narendra Pratap Singh (Ex. Director, ICAR-NIASM) was the Chief Guest in the inauguration ceremony. Various lectures and practical sessions were conducted viz. lecture on Advances in soil chemical analysis, Analysis of soil physical Parameters, Water quality: challenges and opportunities for addressing abiotic stresses in present scenario of climate change, Advances in assessment of soil biological diversity, How to conduct field experiments on water stress and water productivity, Soft skills for data analysis and visualization, Advanced instrumentation facility for detection of micronutrients and heavy metals in soil and water. Practical sessions of the workshop were conducted on “Assessment on soil quality indicators” in which soil sampling, sample preparation in the lab (like air drying, crushing, sieving, extract preparation, etc.) and analysis of soil health parameters viz. soil bulk and particle density, pH, EC, NPK analysis etc. were covered. During practical session of “Analysis of water quality” water sampling method (from pond, tap and bore well, well), sample preparation in the lab (for microbial, nutrient and metal analysis) and

analysis of water quality parameters like pH, Electrical conductivity (EC), Oxidation reduction potential (ORP), temperature, Dissolved oxygen (DO), salinity, turbidity, TDS, alkalinity (Carbonate & Bicarbonate), hardness (Calcium + Magnesium ion), chloride, sodium, potassium, micronutrients and metal analysis, total coliform, faecal coliform and *Escherichia coli* etc. were covered. During workshop working of Atomic Absorption Spectrophotometer (AAS), Inductively Coupled Plasma Mass Spectroscopy (ICP-MS), Flame photometer (FES), UV/VIS-spectrophotometer have also demonstrated and also given hands on training to the participants.



NIASM staff and participant of workshop on advances in soil and water analysis

### **MoU for collaborative research on abiotic stress management between ICAR-NIASM and University of Agricultural Sciences, Dharwad**

The Institute is exploring options for abiotic stress management. UAS, Dharwad signed the MoU with ICAR-NIASM to carry out collaborative research in the area of abiotic stress management. This MoU will provide opportunities for scientists and post graduate students of UAS Dharwad to make best use of the state of the art facilities for research at ICAR-NIASM by involving different disciplines with an aim to provide the best combination of options for areas prone to abiotic stresses such as drought, extreme

temperature, waterlogging, salinity etc. The meeting for MoU was chaired by Dr MB Chetti, Hon'ble Vice-Chancellor of UAS, Dharwad. While briefing about the genesis of ICAR-NIASM, Hon'ble Vice-Chancellor highlighted that the state of the art facilities for abiotic stress research will be useful for complementing the present research going on at the University and the staff and student should make best use of this opportunity. The MoU was signed by Dr Jagadish Rane, Director (A) of NIASM and Dr VR Kiresur, Registrar, UAS Dharwad. Scientists of both ICAR-NIASM and UAS-Dharwad were present on this occasion.



Signing of MoU between ICAR-NIASM and UAS, Dharwad for collaborative research on abiotic stress management

### **Celebration of Constitution Day**

Meeting-cum-Gosthi with institute staff was held on fundamental duties of Indian citizens of article 51-A of the Indian Constitution during the second fortnight of December, 2019 at ICAR-NIASM, Baramati. The meeting/Gosthi was graced by the presence of the Director of the institute. The institute staffs were made aware of fundamental duties of Indian citizen. Discussion cum Gosthi was initiated to discuss on the fundamental duties. All the staff including scientists, technical and administrative staff, RAs, SRFs, JRFs and YPs actively took part in the event.





Dr Jagadish Rane, Director (A) addressing NIASM staff during celebration of Constitution Day

### Interaction meeting with young minds under SCSP Scheme

The interaction-cum-brainstorming meeting was held on December 3, 2019 under SCSP Scheme at the Institute. The agenda of the meeting was to assess the constraint in improving livelihood and income of schedule caste community from the rural/farming background including drought prone area. The Video message of Director NIASM about SCSP scheme has been displayed during inaugural session. The total 68 students participants and teachers/representative from the seven different colleges viz. Rajendra Junior College, Khandala; SPMM College Shardanagar; TC College, Baramati; College of Agriculture Baramati; College of Pharmacy, Malegaon; Mudhoji College, Phaltan; SSCH College Phaltan. The interaction was focused on four thematic areas i.e., awareness, health safety, livelihood option and mode of implementation of the schemes by providing questionnaires.



NIASM staff and young minds during interaction meeting under SCSP scheme

### Celebration of World Soil Day

World Soil Day was organized by the Institute in collaboration with Krishi Vigyan Kendra, Baramati and Maharashtra State Agriculture Department at Sangavi Village of Baramati Tahsil. About 250 farmers of nearby villages attended and benefited from this program. The program was inaugurated by the Dr SA Syed, Head and senior scientist, KVK, Baramati. The program was attended by Dr Vanita Salunkhe, Scientist, NIASM, Mr Amresh Chaudhary, Scientist, NIASM, Dr Vivek Bhoite, Scientist, KVK, Mr Y Jagadale, Scientist, KVK and Mr Balaji Tate, SDAO, Baramati. Then, a series of lectures were given by scientists and officers of Maharashtra state agriculture department. Mr Y Jagadale delivered lectures on cultivation technologies of drumstick along with its marketing strategies under dryland agriculture. Mr Amresh Chaudhary, Scientist, NIASM delivered a lecture on importance of World Soil Day and soil health from farmers' perspective. He emphasized the theme of "Stop soil erosion and save your future". He also informed various techniques of controlling soil erosion and soil health management which farmers can easily apply in their fields.



World Soil Day celebration

### Interaction meeting with schedule caste Self Help Groups (SHG) under SCSP scheme

The interaction meeting with schedule caste Self-Help Groups (SHG) was held on December 14, 2019 at Krishi Vigyan Kendra, Baramati for active participation and stall exhibition at Bhimtadhi, Pune from December 19-22, 2019. The

total 11 SHG groups participated in the interaction meeting. The NIASM scientist Dr GC Wakchauare and Dr Neeraj Kumar interacted with self-help group groups. The discussion was made for participation in Bhimadhi, Pune for providing market platform to 11 schedule caste SHG groups under SCSP scheme.



Interaction meeting NIASM Staff with schedule caste self-help group under SCSP scheme

### **Winter School on climate smart agricultural technologies for resource conservation and increasing farmers' income**

ICAR-NIASM, Baramati organised 21 days “Winter School on Climate smart agricultural technologies for resource conservation and increasing farmer’s income” during November 19<sup>th</sup> to December 9<sup>th</sup> 2019. The program was sponsored by Indian Council of Agricultural Research, Ministry of Agriculture and Farmers Welfare, Govt. of India. Nineteen participants includes scientists, teachers and researchers from different parts of the country participated in this training programme.

The objective of this programme was sensitizing the participants with the recent advancements in climate smart agricultural technologies. Lectures related to abiotic stress management and doubling farmers’ income in abiotic stressed areas were delivered and also hands on training on use of high-end equipment related to abiotic stress assessment. The programme covered informative sessions, lectures, field visits, demo-sessions, and future perspectives

in the area of climate change; food security and climate smart agriculture; abiotic stresses and their mitigation strategies using microbial resources; live demonstration of planting methods in commercial crops such as sugarcane; application of Stubble shaving, Off-barring, Root pruning and Band placement of basal fertilisers (SORF) machine for advanced cultural practices in sugarcane; measurement of root dynamics using sophisticated imaging system; Infra-Red imaging system for canopy modelling; integrated farming system for small farmers to achieve sustainable income; animal husbandry fish farming, and pest management under abiotic stress conditions; extraction of microbial biomolecules and subsequent analysis through HPLC; water and soil management technologies; novel microbial, biotechnological and plant-phenomics approaches for enhancing crop and water productivity were delivered by the various experts/resources persons.



Dr. Jagadish Rane, Director (A) addressing participants during Winter School



Winter School organized at ICAR-NIASM, Baramati



## **Collaborative training with MANAGE on “Climate smart agriculture and abiotic stress management technologies for enhancing farmers income”**

A collaborative training program on ‘Climate Smart Agriculture and Abiotic Stress Management Technologies for Enhancing Farmers Income’ sponsored by the National Institute of Agricultural Extension Management (MANAGE), was organised during 16-20 December 2019. Total 26 extension functionaries from state agriculture development departments, state agricultural University and KVKs were participated. The training programme was inaugurated by Dr Jagadish Rane, Director (A), ICAR-NIASM, Mr Balaji Tathe, Guest of Honour and Sub-Divisional Agricultural Officer, Baramati and Mr Bhausahab Dhumal, National Coordinator MANAGE, Hyderabad. The various lectures, practical’s and fields visits majorly on climate change and abiotic stress management, water and soil management strategies for enhancing farmers income includes bio-regulators, climate smart crops, novel microbial, biotechnological and phonemics approaches, livestock and fish production technologies were delivered by the resource persons from the ICAR-NIASM. The training programme was coordinated by Dr GC Wakchaure, Sr. Scientist (AS&PE) and Dr KK Meena, Sr. Scientist (Agricultural Microbiology).



Participants of collaborative training with MANAGE

## **Model training course on “Climate Change and Abiotic Stress Management Strategies for Enhancing Crop Productivity and Farmers Income”**

Training program on ‘Climate Change and Abiotic Stress Management Strategies for Enhancing Crop Productivity and Farmers Income’ was conducted during 4-11 January 2020. This training was sponsored by Directorate of extension, Ministry of Agriculture and farmers’ welfare, New Delhi. Total 23 extension functionaries from state agriculture development departments, state agricultural university and KVKs were participated. The training programme was inaugurated by Dr Jagadish Rane, Director (A), ICAR-NIASM. The various lectures, practical’s and fields visits majorly on climate change and abiotic stress management, water and soil management strategies for enhancing farmers’ income were delivered by the resource persons from the ICAR-NIASM as well as from other institute. Training programme was coordinated by Dr GC Wakchaure, Sr. Scientist (AS&PE)



Lighting of lamp during Model training course

## **MoU for collaborative research on abiotic stress management between ICAR-NIASM and VNMKV, Parbhani for research and academic**

The ICAR-NIASM signed MoU with Vasantrao Naik Marathwada Krishi Vidyapeeth (VNMKV), Parbhani, Maharashtra on January 17,

2020. On this occasion Dr Jagadish Rane, Director (A), NIASM and Dr DP Waskar, Director of Research VNMKV, Parbhani signed the MoU in presence of Dr AS Dhawan Honb'le Vice-Chancellor VNMKV, Parbhani. This MoU will provide opportunities for scientists and post graduate students of VNMKV Parbhani to make best use of the state of the art facilities for research at ICAR-NIASM by involving different disciplines with an aim to provide the best combination of mitigation and adaptation options for areas prone to abiotic stresses such as drought, extreme temperature, waterlogging, salinity etc. Under this MoU, the scientist of the ICAR-NIASM will also participate in the academic activities intended to update Post Graduate and Ph.D students with advances in abiotic stress sciences. The meeting was attended by all the scientific staff of the institute in addition two professors from VNMKV, Parbahni. On this occasion, Dr Dhavan emphasized for collaboration to enhance stability of crop productivity through tolerance to abiotic stresses. Dr Waskar, highlighted opportunities for collaboration where experience and breeding material generated at VNMKV can be immensely useful in complementary research efforts at NIASM in the area of abiotic stress tolerance in crop plants.



Signing of MoU between ICAR-NIASM and VNMKV, Parbhani for collaborative research on abiotic stress management

### Celebration of 71<sup>st</sup> Republic Day

The Institute celebrated the 71<sup>st</sup> Republic Day on the 26<sup>th</sup> January, 2020. Scientists, Technical, Administrative, Research Fellows, Young Professionals and supporting staff filled

with a feeling of patriotism and dedication gathered in front of the main building. The celebration started with the hoisting of the National Flag by the Dr Jagadish Rane, Director (A). In his speech, the director highlighted the importance of the day and expressed his gratitude to all those who contributed to the national development. He acknowledged contribution of former Directors of the institute who extended their vision and guidance for development of the institute. While highlighting and appreciating the achievements of the institute he urged the scientific staff to work hard for getting externally funded research projects so that employment can be created for potential candidates. He requested all the staff to think over what we have given to the institute rather than what the institute has given to us. He also read the citizens duties enlisted in the constitution and requested the staff to follow the same and to give wide publicity. The sports committee utilized this opportunity to conduct various sports in the campus from 24<sup>th</sup> January, 2020 and Women Cell of NIASM organized Rangoli competition.

In the concluding function organized after flag hosting ceremony, cultural programmers were organized which provided an opportunity to institute staff and their family to show their talent.



Celebration of 71<sup>st</sup> Republic Day

### MoU for collaborative research on abiotic stress management between ICAR-NIASM and University of Horticulture Sciences, Bagalkot

ICAR-National Institute of Abiotic Stress Management signed a MoU with University of Horticultural Sciences, Bagalkot. This MoU will provide opportunities for scientists and post



graduate students of UHS, Bagalkot to make best use of the state of the art facilities for research at ICAR-NIASM by involving abiotic stress in horticulture crops. Under this MoU, the scientist of the ICAR-NIASM will also participate in the academic activities intended to update Post Graduate and PhD students with advances in abiotic stress sciences.



Signing of MoU between ICAR-NIASM and UHS, Bagalkot for collaborative research on abiotic stress management

### Celebration of 12<sup>th</sup> Foundation Day

The Institute celebrated the 12<sup>th</sup> foundation day during February 21-22, 2020. On this occasion, the students of various colleges were visited institute and get acquainted with research activities carried out at this institute. The Director, ICAR-NIASM delivered the first Foundation Day Lecture on Climate Change and Agriculture: From Problems to Solutions.

Dr SK Chaudhary, DDG (NRM) ICAR, New Delhi, Chief Guest of the function addressed the gathering on February 22, 2020. He appreciated the efforts made by the staff and Director for making institute more visible among scientific community and farmers by developing rocky area into arable land. He also appreciated the present and former Directors for creating world class laboratory and research facility at the institute. Outstanding scientific, technical, administrative staff and contractual workers were awarded along with progressive farmers for their significant contributions.



Foundation day celebration at ICAR-NIASM

### Renewal and Surveillance of ISO 9001:2015

The surveillance audit for renewal of ISO 9001: 2015 certification of institute was successfully conducted on 06 March, 2020. Mr. DP Singh, Lead Auditor, M/s Quality Consultant delivered training lecture on “ISO 9001: 2015 standards and focus on internal auditing for improvement in system” followed by audit visit to Scientific, Technical, Administration and Finance Departments of ICAR-NIASM. All the scientific, technical, administration, finance, farm and other staff actively participated during the ISO Audit.



Dr. Himanshu Pathak, Director NIASM felicitating Dr. DP Singh, Lead Auditor, M/S Quality Consultant during renewal of ISO 9001:2015

## International Women's Day celebration organized by women cell committee of the institute

International Women's Day was celebrated in the Institute on 7<sup>th</sup> March 2020. All the women employees of the institute were honoured with Memento by the Director NIASM. Director highlighted the role of women in agriculture.



International Women's day celebration

## Swachhata Pakhwada

As a part of Swachh Bharat Abhiyan 'Swachhata Pakhwada' was observed at ICAR-NIASM, Baramati on December 16-31, 2019. As per the action plan various activities were carried out to keep the campus plastic free and to create awareness among the staff, nearby villagers, schools involving students and teachers about the importance to shun the use of single use plastics and adopt cleanliness and sanitation in daily habit. All the staff of NIASM including scientists, technical, administrative, contractual staffs, research fellows and young professionals of institute participated in the activities which were carried out as per the action plan.



Swachhata Pakhwada observed at ICAR-NIASM

## Workshops/Seminar/Symposia/Conference/Training attended

### Dr Himanshu Pathak

- Attended Senior Officers' Committee Meeting of ICAR on February 18, 2020 in Krishi Bhawan, New Delhi.
- Attended the meeting of the Drought Action Network on February 28, 2020 at Thane, Maharashtra.
- Attended Senior Officers' Committee Meeting of ICAR on March 16, 2020 in Krishi Bhawan, New Delhi.

### Dr Ajay Kumar Singh

- Attended International conference on 'Plant Genetics and Genomics: Germplasm to Genome Engineering' organised by Select Bio, NASC and IRRI at NASC Complex, New Delhi during October 17-18, 2019.
- Attended meeting on NASF Expert Committee for evaluation of ongoing NASF Project organised by ICAR-NASF at NASC Complex, New Delhi on January 11, 2020.

### Dr D D Nangare

- Participated in International Workshop on 'Course Curricula development for Post Graduate Diploma in climate smart agriculture and water management' at MPKV, Rahuri during January 11-12, 2020.
- Participated in Annual convention of ISAE and International symposium on 'AI based future technologies in Agriculture' organized by Indian Society of Agricultural Engineers (ISAE) at Pune during January 7-9, 2020.

### Dr GC Wakchaure

- Participated in MoTA project meeting at Office of Commissionerate tribal development Nasik and Jahwar, Project Officer office during October 23 and November 11, 2019.



- Participated in more than 15 SCSP meeting including at Khandala and Satara, November 09, 2019
- Participated in Advanced User Training seminar on Texture Analysis organised by Scientific and Digital Systems, New Delhi at Mumbai during November 07-08, 2019.
- Attended 2<sup>nd</sup> International Conference on sustainable water management under the Aegis of National Hydrology Project (NHP) organised by Ministry of Jal Shakti, Department of Water resources, River Development and Ganga Rejuvenation at Mumbai on November 06, 2019.

#### Dr Mahesh Kumar

- Attended CAFT training programme on “Advances in data Science Using R” at IASRI New Delhi during September 21 to October 11, 2019.
- Attended international training on “E-ag for climate resilience” sponsored and organised by IRRI South Asia Regional Centre, Varanasi during 4-6 March 2020.

#### Mr Satish Kumar

- Attended workshop on ‘Statistical Methods in Microbiome Research, 2019’ held at National Centre for Cell Science, Pune during December 16-20, 2019.

#### Dr Neeraj Kumar

- Participated in MoTA project meeting at Office of Commissionerate tribal development Nasik and Jahwar, Project officer office during October 23 and November 11, 2019.
- Participated in more than 15 SCSP meeting including at Khandala and Satara, November 09, 2019.

#### Mr Amresh Chaudhary

- Attended CAFT training programme on “Advances in data Science Using R” at IASRI New Delhi, September 21 to October 11, 2019.

#### Mr RN Singh

- Attended training workshop for Scientific Staff under ICAR-HRM Programme 2019-2020 on “Advances in Simulation Modelling and Climate Change Research towards Knowledge Based Agriculture at CESCRA, IARI New Delhi during November 13 to December 03, 2019.
- Attended Collaborative training program on “Climate Smart Agriculture and Abiotic Stress Management Technologies for Enhancing Farmers’ Income” organised by MANAGE, Hyderabad and ICAR-NIASM during December 16 to 20, 2019.

#### Mr Sunil Potekar

- Participated and exhibited technologies of ICAR-NIASM at stall in State Bank of India (SBI) Chawadi Exhibition -2019 at Baramati, Maharashtra during 14-15 November 2019
- Participated and presented poster on "Rainfall Probability Analysis using Markov Chain Model for Crop Planning at Baramati, Maharashtra" at National Seminar on Agro-meteorological interventions for enhancing farmers’ income (AGMET-2020), Jan 20-22, 2020, KAU, Thrissur, Kerala.

#### Mrs Priya George

- Participated and presented poster on “Optimisation of high-throughput phenotyping method to screen mungbean (*Vigna radiata* L.) genotypes for drought tolerance.” National Conference of Plant Physiology-2019 on Plant Productivity and Stress Management, 19-21 December, 2019 KAU, Thrissur, Kerala.

#### Mr Dayanand Pandurang Kharat

- Participated in Capacity Building Programme for CJSC Members of ICAR Institutes / HQs designed and developed by ICAR-NAARM, Hyderabad. January 27-31, 2020 at ICAR-NAARM, Hyderabad.

## Publications

- Kumar N, Chandan NK, Wakchaure GC, Singh NP (2020) Synergistic effect of zinc nanoparticles and temperature on acute toxicity with response to biochemical markers and histopathological attributes in fish. Comp Biochem Physiol C Toxicol Pharmacol. 229, 108678.
- Kumar N, Krishnani KK, Singh NP (2020) Effect of zinc on growth performance and Cellular metabolic stress of fish exposed to multiple stresses. Fish Physiology and Biochemistry 46 (1), 315-329.

## Awards/Recognitions

- ICAR-National Institute of Abiotic Stress Management bagged prestigious award “BEST INSTITUTE IN AGRICULTURE” during Agriculture Innovation Congress held on February 12, 2020 at the Taj Lands End, Mumbai.
- Dr KK Meena, Senior Scientist (Agricultural Microbiology), Dr Mahesh Kumar, Scientist, (Plant Physiology), were honoured for their contribution to the institute on the occasion of 12<sup>th</sup> Foundation Day of ICAR-National Institute of Abiotic Stress Management held at ICAR-NIASM, Baramati, Pune on February 22, 2020.

- Mr Santosh Pawar, Senior Technical Assistant, Mr Patwaru Chahande, Senior Technical Assistant, Mrs Priya George, Senior Technical Assistant, Mr Dayanad Kharat, Assistant, were honoured for their contribution to the institute on the occasion of 12<sup>th</sup> Foundation Day of ICAR-National Institute of Abiotic Stress Management held at ICAR-NIASM, Baramati, Pune on February 22, 2020.

## New Joining

- Dr Vanita Navnath Salunkhe, Scientist (Plant Pathology) joined ICAR-NIASM on December 02, 2019.
- Dr. Sanjivkumar Angadrao Kochewad, Scientist (LPM) joined ICAR-NIASM on December 16, 2019.
- Dr. Boraiah KM, Scientist (Genetics & Plant Breeding) joined ICAR-NIASM on December 24, 2019.
- Mr Karthikeyan N, Scientist (Agricultural Microbiology) joined ICAR-NIASM on December 26, 2019.
- Dr Himanshu Pathak, Director, ICAR-NRRI, Cuttack joined as Director, ICAR-NIASM on February 07, 2020.

## Promotion

- Mr B K Sinha, Senior Administrative Officer promoted to Chief Administrative Officer on March 6, 2020.

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