

निदेशक की लेखनी से...

'जल भंडारण टैंक' का निर्माण पूरा करने पर मैं प्रक्षेत्र प्रबंधन टीम को बधाई देता हूँ। संस्थान के प्रायोगिक क्षेत्रों और बागानों की सिंचाई की आवश्यकताओं को पूरा करने में यह महत्वपूर्ण है। नियासम प्रक्षेत्र को 'मॉडल ग्रीन फार्म' बनाने हेतु अन्य परियोजना का भी नियोजन हो रहा है।

जलवायु परिवर्तन ने फसलों में कीट और रोग की गंभीरता को प्रभावित किया है। बागों में फल मक्खी और फल छिद्रक का प्रभाव वर्तमान की बड़ी चुनौती बनी है और यह पीड़ा आगे बढ़ सकती है। हमने अगस्त, 2020 के महीने के दौरान एक सबक सीखा है कि पोषण और पौधों की सुरक्षा के माध्यम से स्वास्थ्य प्रबंधन को प्राथमिकता देनी होगी। पिछले पखवाड़े के दौरान, जब ड्रैगन फ्रूट का फूलना, पीलापन और शुरुआती फल गिरने के मुद्दे को चर्चा में लाया था, तो बहुत से वैज्ञानिक विचार-विमर्शों का दस्तावेजीकरण किया गया था। इसी तरह, हर किसी को चर्चा मंच में विभिन्न मुद्दों और विचारों के साथ आने चाहिए ताकि अर्जैविक तनाव से प्रभावित जैविक तनाव को पर हम ध्यान आकर्षित कर सकें। अनुसंधान परियोजनाओं और फसल प्रबंधन से संबंधित विभिन्न मुद्दों को इस तरह हल करने के लिए मैं वैज्ञानिकों और तकनीकी कर्मचारियों के बीच अधिक से अधिक समन्वय की उम्मीद करता हूँ।

यह खुशी की बात है कि 'फार्म कॉर्डिनेटर' में प्रक्षेत्र की गतिविधियों, उपलब्धियों और भविष्य की योजनाओं को प्रस्तुत किया जा रहा है। इस उपयोगी समन्वय पत्र के प्रकाशन में निरन्तरता रखने हेतु डॉ. प्रवीण तावरे और टीम को मैं धन्यवाद देता हूँ।

From Director's Desk...

I congratulate the farm management team for completion of 'water storage tank'. This is the prerequisite to fulfill irrigation water requirements of experimental fields and orchards at the Institute. Numbers of other developments are being planned to make the NIASM farm a model, green farm.



Change in climate has influenced pest and disease severity in orchards and field crops. Fruit fly and fruit borer menace in orchards is a big challenge at present and may intensify in future. One lesson we learned during the month of August, 2020 that plant health management through nutrition and plant protection has to be brought on priority. During the last fortnight, when the issue of dragon fruit flowering, yellowing and early fruit drop was kept on platform for discussions, lot of scientific deliberations were documented. Likewise, everybody should come forward with various issues and ideas in discussion forum to prepare for addressing the biotic stresses as influenced by abiotic stresses. I expect more and more such coordination among the scientists and technical staff for resolving various issues related to the research projects and crop management.

It is heartening to note that the 'Farm Coordinator' continues to present the activities; achievements and future plan for the NIASM farm. I thank Dr. Pravin Taware and the team for their dedication and sincerity in bringing out this useful publication regularly.

Apurva

अगस्त / August 31, 2020

हिमांशु पाठक / Himanshu Pathak

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Weed management: Intermittent rains led to development of weeds in all the cultivated fields, open areas, road-sides and bunds. Integrated weed management practices were followed to tackle this situation. During dry spells, all the open areas were tilled with the help of tractor drawn implements like cultivator, rotavator and mulcher. Road sides and bunds were sprayed with non-selective, systemic weedicide (ammonium salt of glyphosate). Mungbean and soybean fields were sprayed initially with selective weedicide Quizalofop Ethyl 5EC to suppress narrow leaf weeds and subsequently hand weeding was carried out to remove broad leaf weeds. For weed management in orchards and medicinal garden and other plantation, inter cultivation was carried out in between rows followed by weedicide spraying or hand weeding in the rows or plant basins.

Agro-waste enrichment: The agro-wastes collected in the form of crop residues, pruned material from orchards and weeds of hand weeding were collected at one place and shredded in to small pieces with help of mulcher. The material was then dumped for decomposition by mixing with urea and single super phosphate to enhance decomposition. When the material was half decomposed it was enriched biologically by spraying *Trichoderma harzianum* suspension and remixing it. This is to be used in various orchards as a source of organic matter.

Planting and sowing works: Layout preparation & sowing in umbrella project on genetic biodiversity was carried out.



Mungbean ready for harvest



Spraying activities in field crops

Plant protection:

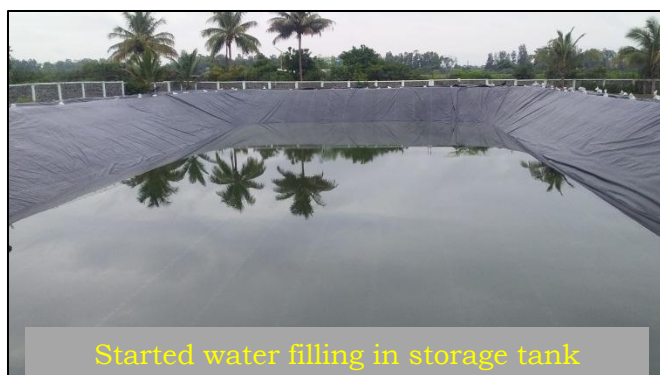
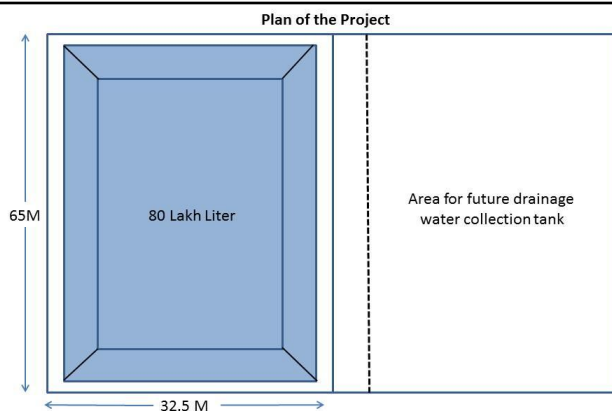
- Spraying of Lambda-cyhalothrin was carried out in Mungbean to control sucking pests and pod borer. Water soluble 19-19-19 and micronutrient mixture were mixed along with to take care of deficiencies.
- Spraying of biological control agents was preferred for disease and pest management in pomegranate, grape, dragon fruit and custard apple. *Trichoderma harzianum*, *Pseudomonas fluorescense*, *Metarhizium anisoplae* and *Beauveria bassiana* cultures were used for this purpose. The idea was that in prevailing weather conditions these agents will get established in orchards to provide biological control of diseases and pests.
- The fruit fly infestation in dragon fruit, custard apple and fruit borer in pomegranate were also important challenges during this period. Therefore, insecticides like Flubendiamide, Fipronil, Emamectin benzoate, etc. were used for early management of the pests to avoid economic losses.

Harvesting of mungbean: Mungbean sown in the field D-1,2 reached harvesting during last fortnight. Selective harvesting of matured pods was carried out manually and sundried for two days. Threshing of the produce was carried out by trampling the material under tractor wheels and grains separated by winnowing. The grains were again sundried for two days. The harvesting is to be done in two more phases.

Important achievement:

Development of 'Water Storage Tank'

In spite of pandemic due to COVID-19, the most required 'water storage tank' development work has been completed successfully. Looking in to the irrigation water requirements at campus it was planned to develop a storage tank at southern end. A proposal for converting existing pit structure in to a water storage tank was approved. The work included earth work, soil laying for cushioning and HDPE sheet lining. After receiving the office order, development work was started on 24th May 2020 with the hands of the Director. Initially bottom portion was deepened with the help of poklain breaker and material was used to prepare side wall slopes. As the bottom portion was very hard, the depth was restricted to 5.25M and bottom levelling work carried out by maintaining 1% slope towards south-west corner for cleaning purpose. Due to continuous rains, out sourced black soil supply could not be worked out. Therefore, the fine soil from campus itself was used to line the slopes and bottom of the structure. It was rolled two times with very innovative technique to make the walls firm and smooth enough for laying plastic sheet. UV-resistant HDPE geomembrane of 500-micron thickness was used for lining. After the proposed development of 'water storage tank', water filling has been started from 15th August 2020. On complete filling, subsequent loosening and fixing of sheet carefully in border trenches. Besides maintaining buffer storage of water during canal closure periods, this tank is going to serve as location for the most required secondary pumping station for on-going lift irrigation project. Further it is planned to replicate same exercise in adjoining area to develop storage tank for water collection through drainage networking.



Kharif crops harvest and rabi sowing:

Early kharif sown fields (D1, D3, D4, E5, E6) will be ready for harvest late this month. Harvesting of threshing of soybean crop in these fields will be taken care of. Some of the fields allotted for experiments during *kharif* season remained unsown due to pandemic situations and limited access. These fields (B2, B4, B5-6, C1, C3, C4) are ready for *rabi* sowing. Therefore, early *rabi* sowing will be targeted in these fields by following preparatory tillage operations as prescribed by the scientists.

Weed management and campus cleaning:

Weed management will be issue again this month because lot of seed load exists in fields and all over the open areas. Integrated weed management practices followed during August 2020 will be repeated for effective control of weeds. The opening up drive under pandemic situations for last five months is in process. Therefore, campus cleaning will be an important task ahead during this month to maintain aestheticism of campus. Cleaning operations to eradicate parthenium weeds and make the campus plastic free to be taken up again as a campaign.

Preparations for pomegranate *hast-bahar*:

Hast-bahar in pomegranate is supposed to be the safe fruiting season under oily spot risk conditions. Last year (2019-20) the stress required for *hasta bahar* could not be instigated due to delayed and heavy return monsoon. This year it has been decided to be prepared for *hast-bahar* in experimental orchards. Spraying of foliar nutrients along with agrochemicals to be continued for maturity. Bunds/ raised beds to be prepared to get rid of water stagnation. Defoliation will be activated by spraying of agrochemicals.

Preparations for forward pruning in grape:

Production phase of grape is at horizon. It is necessary to get ready for forward pruning. Field operations like soil pulverizing and fertilizer application before pruning to be completed. Spraying of fungicides, biological control agents to be done to lower down inoculum load is required. Foliar nutrition will be continued to achieve cane maturity and increase food storage. Rest period of at least 7-10 days will be imposed by water stress followed by defoliation chemically or manually. Date of pruning will be decided on the basis of prevailing weather conditions.



Turning down green manure crop



Dragon fruit field developments



Developments in experimental field



Weed management with herbicide spray



Drainage issues reported last year

Drainage issues: It had been experienced during last few seasons that campus receives two to three heavy showers of return monsoon leading to drainage issues at campus. The runoff water gets access to some experimental fields too, affecting the research. On the other hand, water escapes the campus boundaries too to enter in nearby fields. While remaining quantum gets accumulated at two to three low lying areas inside the campus where it has been planned to store for future use. Therefore, it is high time to work on drainage networking project at campus.



Experimental field of Soybean

Contd. from page 2 ...

Pomegranate maintenance: Prevailing weather conditions affected ready to harvest late *ambe bahar* fruits with fruit borer and oily spot. The affected fruits were removed and disposed. Regular spraying with biological control agents and agro-chemicals was carried to keep the pest and disease under control.

Dragon fruit maintenance: There was abundant flowering during second as well as third flush.. It was very much necessary to take care of plant nutrition, plant protection and clean cultivation for maintaining hygiene. It was taken care of by removing the



Spraying with blower in dragon fruit

Fruit fly and borer menace in orchards:

Fruit fly and fruit borer being polyphagous pests, its menace in orchards is a big challenge ahead. Especially fruit fly is very hard to control when various fruits are at nearby. It can infest guava, custard apple, dragon fruit, citrus fruits, anola, fig, etc. As the production season of these fruit crops is scattered year round, the pest can get preferred host easily for survival. Like-wise pomegranate and guava butterfly that bores the fruits also gets alternate host most of the period of year. Therefore, these are to be managed through integrated pest management. Use of pheromone traps or light traps will help in monitoring the pest incidence. Removal and disposal of damaged as well as matured fruits in time will reduce the inoculum load. Simultaneously frequent spraying of biological agents like *Metarhizium anisoplae* and *Beauveria bassiana* along with neem based or natural pesticides is required.

damaged, under nourished and ripe fruits time to time. The risk of fruit fly damage was still there; therefore integrated pest management practices like uses of pheromone traps, cultural practices and spraying were performed timely.

Foliar nutrition management: Foliar application of nutrients was preferred in sweet orange, acid lime, dragon fruit, custard apple, pomegranate and grape. The water soluble fertilizer grades like 19-19-19, 0-52-34, 0-0-50, magnesium sulphate and micronutrient mixture were used to spray at an interval of 7-10 days.

प्रक्षेत्र तकनीकी कर्मचारियों की देखरेख में फसल की खेती का संचालन किया जाता है। इसकी गुणवत्ता कृषि कर्मचारियों के ज्ञान, कौशल और दृष्टिकोण पर निर्भर करती है। अनुसंधान क्षेत्र, सुविधा, उपकरणों का इस्तेमाल और खेती के तरीकों का प्रायोगिक खेती संचालन की कुशलता को प्रभावित करता है। अनुसंधान आवश्यकताओं को समझना और समय पर तथा लागत प्रभावी तरीके से उन्हें पूरा करने की योजना बनाना प्रक्षेत्र प्रबंधन कर्मियों का प्राथमिक उद्देश्य है।

Crop cultivation operations are carried out under the supervision of farm technical staff. Its quality depends on the knowledge, skills and attitude of farm staff. The development of research fields and facilities, equipment used and farming practices adopted affect experiments and the efficiency of operations. Understanding research requirements and planning to meet them on time and in a cost-effective manner are the primary objectives of farm personnel.

Some concepts which are the bases for any agricultural experiment in obtaining valid and meaningful results are discussed.

Experimental Error

The concept of experimental error determines whether the differences observed between two treatments are real. In an experiment, all the plots receiving the same amount of nitrogen should give the same yield of crop but in reality this never happens. This difference among experimental plots treated alike, called experimental error, happens because every spot in a field is not exactly the same in terms of soil, fertility, moisture and micro-climate. Therefore, every experiment must be designed to contain a measure of experimental error, so that it can be ascertained whether the difference is real or by chance. Replication and randomization are two essential components of an experiment which reduces chance variation and bias.

Replication

In the same way, at least two plots of the same variety are needed to determine the difference among plots treated alike. Experimental error can be measured only if there are at least two plots planted to the same variety (or same treatment). Thus, to obtain a measure of experimental error, replication or repetition of treatments is necessary.

Randomization

To avoid any bias, treatments should be assigned randomly over the experimental field so that a particular treatment is not unduly favoured or handicapped.

The manner of conducting an experiment and the scientific techniques to be applied fall within a scientist's domain. However, senior farm services staff too should have an understanding of how field operations impact experimental data, which field operations can be the major source of experimental error and how such unintended errors can be avoided.

Sources of Experimental Error

Soil Heterogeneity: Variation in soil texture and depth of topsoil can alter nutrient and moisture availability to the crop. Such inherent soil variations should be tackled during land development, by ensuring that field boundaries include soil of reasonably uniform texture and depth.

Residual Fertility: Non-uniform residual soil fertility can be due to variable rate of fertilizer used, different plant densities, crop combinations and non-standard plot sizes. Experiments that leave residual variation in soil fertility should be allocated fields on a long-term basis. Fields under crop rotation alleyways should fall on the same spot every season.

Faulty Fertilizer Application: Lack of precision in fertilizer application can be a major source of error in experiments.

Non-uniform Topography: It can cause soil erosion and leave little or no topsoil at places, thereby affecting subsequent crops. It also results in uneven irrigation and drainage leading to patchy crops growth. Land levelling or terracing fields can overcome these problems.

Substandard Tillage: Substandard tillage can cause variable tilth in the field. To obtain uniform depth and tilth across fields, the equipment to be used depends on soil type and moisture.

Pest Damage: Pests can drastically reduce yield and ruin experiments. Since rain, wind and temperatures can affect the effectiveness of spraying, these must be considered before spraying a field.

Delayed & Poor Weeding : Weeds compete with crops, take up nutrients and deplete soil moisture. Delayed and poor weeding operations due to inadequate tools or soil moisture can jeopardize experimental data. It is advisable to complete at least one replication on the same day.

अर्जुन वृक्ष (*Terminalia arjuna*)



Arjuna tress at southern side of campus

अर्जुन वृक्ष भारत में होने वाला एक औषधीय वृक्ष है। इसे घवल, ककुभ तथा नदीसर्ज (नदी नालों के किनारे होने के कारण) भी कहते हैं। कहुआ तथा सादड़ी नाम से बोलचाल की भाषा में प्रख्यात यह वृक्ष एक बड़ा सदाहरित पेड़ है। लगभग 60 से 80 फीट ऊँचा होता है तथा हिमालय की तराई, शुष्क पहाड़ी क्षेत्रों में नालों के किनारे तथा बिहार, मध्य प्रदेश में काफी पाया जाता है। इसकी छाल पेड़ से उतार लेने पर फिर उग आती है। एक वृक्ष में छाल तीन साल के चक्र में मिलती है। छाल बाहर से सफेद, अन्दर से चिकनी, मोटी तथा हल्के गुलाबी रंग की होती है। लगभग 4 मिलीमीटर मोटी यह छाल वर्ष में एक बार स्वयंमेव निकलकर नीचे गिर पड़ती है। स्वाद कसैला, तीखा होता है तथा गोदने पर वृक्ष से एक प्रकार का दूध निकलता है। पत्ते अमरुद के पत्तों जैसे 7 से 20 सेमी लंबे आयताकार होते हैं या कहीं-कहीं नुकीले होते हैं। फूल वसंत में ही आते हैं, सफेद या पीले मंजरियों में लगे होते हैं। इनमें हल्की सी सुगंध भी होती है। फल लंबे अण्डाकार 5 या 7 धारियों वाले जेठ से श्रावण मास के बीच लगते हैं व शीतकाल में पकते हैं। 2 से 5 सेमी लंबे ये फल कच्ची अवस्था में हरे-पीले तथा पकने पर भूरे-लाल रंग के हो जाते हैं। फलों की गंध अरुचिकर व स्वाद कसौला होता है। फल ही अर्जुन का बीज है। अर्जुन वृक्ष का गोंद स्वच्छ सुनहरा, भूरा व पारदर्शक होता है।

अर्जुन जाति के कम से कम पन्द्रह प्रकार के वृक्ष भारत में पाए जाते हैं। औषधि जाति की पहचान करना बहुत जरूरी है। छाल एक सी दीखने पर भी उनके रासायनिक गुण व औषधीय प्रभाव सर्वथा भिन्न हैं। सही अर्जुन की छाल अन्य पेड़ों की तुलना में कहीं अधिक मोटी तथा नरम होती है। शाखा रहित यह छाल अंदर से रक्त सा रंग लिए होती है। पेड़ पर से छाल चिकनी चादर के रूप में उतर आती है। क्योंकि पेड़ का तना बहुत चौड़ा होता है। अर्जुन की छाल को सुखाकर सूखे शीतल स्थान में चूर्ण रूप में बंद रखा जाता है। होम्योपैथी में अर्जुन एक हृदयरोग संबंधी प्रचलित ख्याति प्राप्त औषधि है। अर्जुन संबंधी मतों में प्राचीन व आधुनिक विद्वानों में पर्याप्त मतभेद है। फिर भी धीरे-धीरे शोध कार्य द्वारा शास्त्रोक्त प्रतिपादन अब सिद्ध होते चले जा रहे हैं।

- अर्जुन की छाल के मुख्य घटक हैं- बीटा साइटोस्टेरोल, अर्जुनिक अम्ल, फ्रीडेलीन, टैनिनस तथा कैल्शियम कार्बोनेट, सोडियम, मैग्नीशियम, अल्युमीनियम लवण प्रमुख हैं।
- विभिन्न प्रयोगों द्वारा पाया गया है कि अर्जुन से हृदय की पेशियों को बल मिलता है, स्पन्दन गति भी कम हो जाती है। खनिज लवणों के सूक्ष्म रूप में उपस्थित होने के कारण यह एक तीव्र हृत्पेशी उत्तेजक भी है।

Arjuna is a medicinal tree originating in India. It is also called Ghaval, Kumbuk, Neer maruthu and Nadisarj (growing on the banks of river). It can grow about 60 to 80 feet high and is found in the foothills of the Himalayas, along the drains in the arid mountainous regions and quite a lot in Bihar, Madhya Pradesh. When its bark is removed from the tree, it grows again. The bark is recovered in three-year cycle. The bark is white from outside, smooth from inside, thick and light pink. About 4 mm thick, this bark comes out automatically once a year and falls down. The taste is astringent, pungent and a kind of milk comes out from the tree on tattooing. The leaves are 7 to 20 cm long rectangular like guava leaves or are pointed at some places. It flowers after spring, have a mild aroma. Fruits are long-elliptical 5 or 7 striped grow in the month of Shravan and ripen in winter. The fruits are 2 to 5 cm long, green-yellow in raw condition and turn brown-red color when ripened. The fruit is tasteless and astringent. The fruit is the seed of Arjuna. The gum of Arjuna tree is clean golden, brown and translucent.

At least fifteen types of trees of the Arjuna species are found in India. For this reason, it is very important to identify tree with medicinal properties. Even the bark resembles similar, but their chemical properties and pharmacological effects are completely different. The bark of the right Arjuna is much thicker and softer than other trees. The bark comes off as a smooth sheet from the tree. Because the trunk of the tree is very wide. The bark of Arjuna is dried and kept closed in a dry cool place. In homeopathy, Arjuna is a well-known cardiovascular medicine. There is a considerable difference between the ancient and modern scholars in Arjuna related beliefs. Nevertheless, the gradual rendering of inflammatory work is now being proven.

- The main constituents found in the bark of Arjuna are beta-cytosterol, arjunic acid, freedalene, tannins, and calcium carbonate, sodium, magnesium, and aluminum salts.
- It has been reported that the heart muscle gets strengthened by Arjuna, beat speed decreases. It is a cardiac stimulant due to presence of mineral salts in a subtle form.

प्रगति के पथ पर

अगस्त 2020 के महीने में पिछले कुछ महीनों के प्रयासों के सकारात्मक परिणामों को प्रदर्शित किया। दक्षिणी ओर में जल भंडारण टैंक 'का प्रस्तावित विकास पूरा हो गया है और इसका उपयोग भी शुरू हुआ है। यह परिसर में सिंचाई जल प्रबंधन के लिए बहुत आवश्यक सुविधा है। ड्रैगन फल में फूलों के व्यवहार, पीलेपन और शुरुआती फलों की गिरावट की जांच हेतु काफ़ी वैज्ञानिक विचार-विमर्श का अनुभव किया गया। और बरसात के मौसम के बावजूद, खरपतवार प्रबंधन कम से कम प्राथमिकता वाले क्षेत्रों में पर्याप्त किया जा सका है। हालांकि, अनुसंधान फार्म प्रबंधन को अधिक जवाबदेह, सुगम और प्रस्तुत करने योग्य बनाने के लिए बहुत कुछ किया जाना चाहिए। प्रायोगिक त्रुटियों से बचने के लिए इसे अधिक वैज्ञानिक रूप से पर्यवेक्षण किया जाना है। बदलते मौसम की स्थिति के तहत कीट और रोग प्रबंधन को अजैविक तनाव अनुसंधान के हेतु बागान तैयार करने के लिए और अधिक सटीक बनाया जाना है। ड्रैगन फ्रूट, शरीफा, अनार, अमरूद, आदि में फ्रूट फ्लाई प्रभाव से संबंधित मुद्दों को एकीकृत कीट प्रबंधन के माध्यम से समझदारी से निपटाया जाना है। रोग और कीट प्रबंधन के लिए जैविक नियंत्रण एजेंटों के प्रयोग के साथ-साथ कमियों का मुकाबला करने के लिए पर्ण पोषण को जारी रखा जाना है। अच्छे मानसून वर्षा की भविष्यवाणी के तहत अनार में हस्त बाहर की तैयारी और अंगूर में फल छाट्टाई की शुरुआत सावधानीपूर्वक करनी है। इसलिए, अब यही समय है की हम अनुसंधान प्रक्षेत्र प्रबंधन के प्रति अधिक संवेदनशील और जिम्मेदार बन जाएं।

Plan For Progress

The month of August 2020 exhibited positive outcomes of the efforts of last few months. The proposed development of 'water storage tank' at southern side has been completed and put to use. This was the most required facility for irrigation water management at campus. Lot of scientific deliberations were experienced for investigating flowering behaviour, yellowing and early fruit drop in dragon fruit. And in spite of rainy weather, weed management could be achieved at least in priority areas. However, lot is to be done ahead to make the research farm management more accountable, facilitative and presentable. It is to be supervised more scientifically to avoid experimental errors. Pest and disease management under changing weather conditions is to be made more precise to make orchards ready for abiotic stress research. The issues related to fruit fly infestation in dragon fruit, custard apple, pomegranate, guava, etc. have been tackled wisely through integrated pest management. Use of biological control agents for disease and pest management is to be continued further along with foliar nutrition to counter deficiencies if any. Preparations for 'hasta bahar' in pomegranate and 'forward pruning' in grape have to be initiated carefully under predictions of good return monsoon showers. Therefore, its time now to be more responsive and responsible towards research farm management.



Dragon fruit flowers buds



Dragon fruit flowering

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