

From Director's Desk...

It was really tough task to continue farm operations during lockdown period under the threat of COVID-19. The works were to be carried out with least manpower following all the guidelines of social distancing and personal hygiene. Institute provided masks and sanitizer for the workers and also the disinfectant for spraying around work area. During lockdown, movement was restricted; therefore preference was given to provide survival irrigation to crops at higher risk and perennial plantations at the campus. My sincere thanks to all those workers for there contributions during this period.



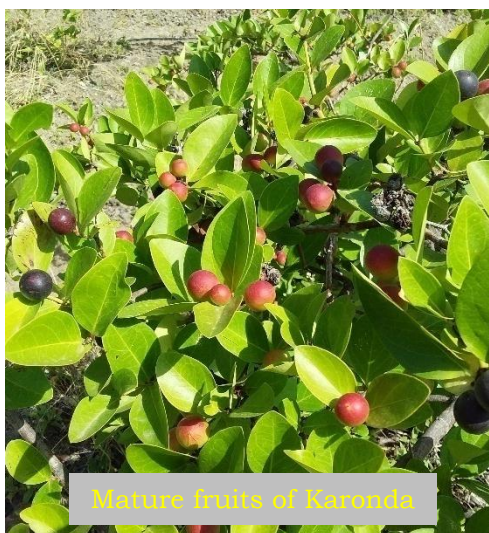
In spite of lockdown experimental field allotment for *kharif* season and several other administrative procedures were carried out through online communication and video conferencing. Field preparations, procurement and application of manure in various orchards have been started. The earth moving work through hired machinery for development of water storage tank is in progress. This is going to be an important achievement to solve water scarcity issues at campus.

Lots of deliberations and discussions were carried out during this period for improvements of the farm. Several positive steps are being taken to sort out the constraints of the farm in this abiotic stressed region. With all these, I am sure; the NIASM farm will be a Model Green Farm for abiotically stressed regions.

Himanshu

May 31, 2020

(Himanshu Pathak)



Mature fruits of Karonda

Plan For Progress

Work during COVID-19 lockdown-1 hampered a lot due to much restrictions on movements. However, the restrictions were loosened there after for agriculture related activities and at least some important works could be started. Initial preference was given to survival of the crops especially perennial ones and orchards. Thankfully things are coming to normal despite of infection threat. Therefore, every care was undertaken as per the guidelines to maintain social distance, personal hygiene and isolation of sensitive personnel from activities during this period.

Monsoon is at the door steps and lot of activities are on target. Preparatory tillage operations for *Kharif* season sowing are at full swing. This year it has been decided to make ready all the experimental fields well before the monsoon showers. This will help in timely sowing for getting benefit of subsequent rains. Simultaneously farm yard manure application in orchards was given first priority to improve soil health from nutritional, physical and biological preview. Water holding capacity of NIASM soils needs to be improved through various means, where application of manure is one.

Development of irrigation water storage facility was also on the highest priority for last three months. On completing the administrative procedures the orders for work were issued and the work initiated with great enthusiasm. This facility is supposed to resolve irrigation water scarcity issues to large extent. Therefore, looking forward for completion of this work at the earliest within a month.

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Experimental crops harvesting & threshing: Harvesting of experimental wheat (C4 & C8) and chickpea (B7) was carried out as intended by the PI's. General threshing in C4 & C7 was completed along with manual threshing for treatment blocks. While manual threshing of wheat in C8 experimental field is in progress. Maize cobs in field C3 were harvested and the straw was submitted to animal unit for fodder purpose. Harvesting of Quinoa (C7 & E6) was carried out after sampling. General maize crop was sown in E3 & E4 was sown to get rid of nutritional gradient. It was harvested and handed over to animal unit as a fodder.

Irrigation activities: Though there was no canal closure during last two months, there were some restrictions on movement. Demand for water of existing crops was fulfilled by operating lift system at Nira canal. Looking in to electrical load shading period both electrical pump and diesel engine pump were operated for lifting water. Preference was given to fulfil water requirement of orchards, landscape garden and perennial plantations through water balancing tank

General campus cleaning: During lockdown period the campus remain almost unattended for three weeks. Therefore, as work started coming to normalcy, general campus cleaning activities were initiated. Cleaning of main road sides, field bunds, orchards were taken up initially. Wherever possible the tractor drawn implements were used to turn down weeds and to increasing mechanization to tackle manpower shortage due to COVID-19 threat. Remaining spaces, rings or basins around various plantations were cleaned by hand-weeding. Weeds in roadside paver block crevices were roughed out manually. Initial focus was given to collect plastic debris too.



Fallow cultivation: After harvest of sugarcane and *rabi* crops, fields were ploughed with tractor. Selective ploughing and rotavating was carried out in field A1 & B1 as per experimental needs. Fallow cultivation is an important practice in integrated weed and pest management point of view. Due to deep ploughing during summer, weed seeds, insect pests and fungal spores are exposed to direct sunlight for irradiation, reducing inoculum load of the field. In view of preparation of layouts for experimental sowing, further cultivation by cultivator and rotavator operation have been started to bring soil to good tilth.



Repairing HDPE lining of water balancing tank: Since the inception of water balancing tank (June 2015) irrigation to north farm orchards and landscape garden was facilitated. Some more plantations could be taken up due to availability of more water. During installation and removal of pumps for repairing work some damages had occurred to the plastic lining of tank. Some seepage of water was observed from the tank. Therefore, the repairing of leakages was taken up when the water level was at lowest point. As the paper is HDPE and it was to remain under water after water filling the joints were heat sealed thoroughly.



Back pruning in Grape: Back pruning in grape was delayed by 12-15 days due to work limitations during lockdown. The pruning in Sharad seedless, Thomson seedless and Varieties block was carried on 04/05/2020, 11/05/2020 and 12/05/2020, respectively. The pruning was carried out by leaving single visible bud of the last year's growth. The cordons were cleaned by removing all the green portions, trained and tied to support wires. Looking for high temperature and low humidity after pruning, to enhance sprouting, spraying of water was carried out daily for 7-days during afternoon. Now sprouting is completed & shoots are at growing stage.



Harvesting in Orchards: Some bearing orchards viz., grape, sweet orange, karonda, amla, drumstick were in the stage of harvesting during April-May 2020. The harvested produce was sold at campus only as APMC markets were closed due to lockdown. The grape produce that could not be disposed through sale was sun-dried to prepare raisins. Drumstick pods were allowed to fully mature and dry on plant itself to get the seeds. In case of mango, though flowering was abundant, fruit set was less and also there was much fruit drop due to two thunderstorms during month of may. All other produce disposed through sale.



FYM application: Farm yard manure was procured for application in orchards. 3-4 inch deep trenches were opened in between plant rows or along the rings of the plants. Measured quantity of manure (10-20 Kg per plant) was spread uniformly in the trenches. Chemical fertilizers containing primary, secondary and micro-nutrients as per prescribed doses were mixed in the manure before closing trenches. Irrigating through drip was started immediately to avoid any stress due to root pruning and increased prevailing temperature. FYM application work is still in progress and to be continued further in remaining orchards too.



Plant Protection Measures: Sun-burning was observed in dragon fruit orchard due to increased radiation intensity. After removal of affected parts, spraying of copper oxy chloride @ 2.0 g/L was carried out to avoid complex secondary infections.

In pomegranate late *ambe bahar* was targeted therefore irrigation was started in last week of March. Increase in temperature and summer showers for two time, risk of oily spot infection, thrips and stem borer incidence was more. Therefore, prophylactic spraying of copper oxy chloride and lambda cyahalothrin was carried out. Spraying of NAA @10ppm was carried out to increase flowering and reduce fruit drop due to water scarcity.

Water Storage tank development: This work was on the highest priority list. Administrative procedures for development of water storage facility were completed till first fortnight of May. After receiving the orders for hiring machinery for same, the work have been started on May 24, 2020. This work included deepening of the existing structure, preparation of bunds with required slope (1:1), compressing and leveling activities. After finishing earthwork, black soil is to be procured for layering on the bund slopes and bottom to provide cushioning to plastic lining. HDPE plastic lining is also to be procured to lay down in pond to avoid seepage of water.

This water storage facility is going to help in resolving issues related to irrigation water scarcity at campus. The water source for this tank is the primary lift irrigation from Nira canal. Two secondary lift pumps will be installed at this tank. One for south farm irrigation another one for filling water balancing tank meant for north farm and landscape garden irrigation.



Original site for water storage tank



Development work in progress



Field layout preparation: Kharif season is at door steps. Procedure for allotment of fields for experimentation was carried out during last month. Fallow cultivation and other preparatory tillage operations were started as per experimental needs after harvest of rabi crops. During this season it has been decided that all experimental field layouts for Kharif will be prepared well in advance preferably before monsoon showers to avoid hinderance of soil moisture in layout preparation in time. However, sowing operations will be carried out only after assured monsoon or availability of canal water. Sugarcane planting is generally permitted from July, but desired layout for it will also be kept ready.



Agro-waste shredding for composting: During last two months lots of agro-wastes and weed debris have been collected as a part of campus cleaning operation. All these will be cut into small pieces with the help of tractor operated shredder machine. The shredded material will be used for preparation of compost.

Cropping system layout preparation and sowing: As per suggestions during meetings it has been decided to re-establish cropping system in B5-6 field. The layout preparation is already started. Sowing of *Kharif* crops as per treatments will be carried out along with planting of perennial grasses and missing plants of *Subabhul* will be re-planted.



Pruning & training in dragon fruit: Fruiting season of dragon fruit is to start very soon. Light pruning of plants is required prior to flowering. Main objective of pruning is to remove branches damaged due to sunburn and also to make the orchard accessible. Lower unwanted shoots growing vertically are to be removed along with upper crowded shoots. This will help to reduce risk of secondary infections from watery lesions formed during sunburn. Secondly, the sparse canopy allows good aeration through orchard which helps in reducing risk of pests especially fruit fly infestation.



Nursery plants maintenance: Last two months maintenance of potted plants could not be done effectively for the want of manpower. Therefore, most of the plants have been collected at nursery area so as to pay close attention and care. All indoor and potted ornamental plants need training, pruning and change of potting mixture or manure addition. Month of June is the best time for rejuvenating damaged plants and reshaping its aesthetic looks.

Peripheral plantation maintenance: Round for cleaning coconut tree trunks, removal and collection of dried leaves is required, removal of weeds, pulverizing soil and repairing of plant basins, pesticide use for control of *Rhinoceros* beetle infestation will be taken up.



Plant protection: Cloudy weather with some showers followed by dry spell is the prediction for month of June. This leads to complex situation from the point of plant protection.

- Main issue with pomegranate will be favorable climate for oily spot infections as well as sucking pests, copper fungicide along with antibiotic spray followed by Azadiractin spray to be planned
- In case grapes, its shoot growth stage coinciding with fruit bud differentiation. Hot and humid climate with tender shoots may lead to bacterial blight due to *Xanthomonas*. Thrips is economically important pest during this period causing inward curling of leaves resembling potassium deficiency, yellow and blue sticky traps to be fixed in vineyard
- To get rid of Phytophthora rot in Sweet orange, pasting of stems with Bordeaux paste and prophylactic spraying for control of Citrus canker will be required, multi-micronutrient spray to be done to get rid of nutrient deficiency symptoms
- Spraying of Azadiractin will be required in dragon fruit for management of fruit fly pest, pheromone traps to be installed as integrated pest management approach
- IPM for mealy bug to be implemented in custard apple.



Foundation Phase in Grape Production

Grape is a native of temperate region and well established in sub-tropical and tropical environments with certain modifications in viticulture practices. Tropical grape cultivation undergo double pruning in its annual production cycle viz., back pruning and forward pruning. Back pruning is generally carried out in April, therefore also called as April pruning. However, to avoid glut in market due to narrow harvest period, staggered pruning is practiced. Accordingly dates of both back and forward pruning are required to be adjusted depending on target market and prevailing climatic conditions.

Back pruning is aptly called as Foundation pruning, because it laid the foundation for next crop through fruit bud differentiation and food storage in vine parts to take care for produce. It is the first and most important step of production cycle and can be studied in following stages;

1. Pruning: After harvesting of last season crop at least 21-days rest period is mandatory. During this period 20 per cent dose of fertilizer is continued through fertigation. About 10-days prior to pruning, soil pulverization is carried out in orchard for root pruning (7-10%). Farm Yard Manure and first dose of fertilizers is applied at the time of pruning. The pruning is carried out by leaving only one or two buds of previous year cane on the cordon. All the green portion and dead wood to be removed to eradicate disease inoculum load in orchard.

2. Vegetative stage: This is about 30-days period from pruning and can be differentiated in to two phases viz., sprouting and shoot growth. Generally temperature starts rising during the period of back pruning. Sprouting takes about 10-15 days and may get delayed due to increase in temperature and lowered humidity. Therefore it needs to take certain measures like providing shade to lower down

temperature and/ or spraying of water twice during noon for increasing humidity.

After sprouting shoot growth period is important from the point of canopy management. Efficient utilization of sunlight which directly reflects into fruitfulness and ultimate production is the basic concept. Simultaneously, sufficient sparse canopy is a prerequisite for integrated disease control and pest management. Keeping this in view, shoot thinning is carried out by maintaining one shoot per 1.5 square feet soil surface area allocated to the vine.

3. Fruit Bud Differentiation: This is the period from about 31 to 60 days from pruning. As the shoot grows, fruit bud differentiation takes place within certain buds most probably 6th to 10th bud. Various parameters influence fruit bud differentiation viz., variety, vigour, sunlight intensity, nutrition, water management, etc. Little water stress is preferred at this stage.

When shoot reaches 9-leaf stage, shoot tip along with two youngest leaves is pinched to allow single lateral shoot to develop. This is called as sub-cane technique that ensures fruitfulness by temporarily diverting food supply to the target bud. If there is poor shoot growth due to prevailing water stress, sub-cane technique should not be followed.

4. Cane maturity: Growing shoots start maturing from 61-90 days after pruning and these are termed as canes. This stage is marked with development of bunch primordial within the buds. The maturity continues up to about 135 DAP and during this period food storage in vine parts i.e. canes, cordons, stem and roots. It is the most important achievement of this phase. Because it builds the foundation for bunch emergence and development during initial phases after forward pruning when stored food is the only source for overall sink.



Back pruning & earthing up



Sprouting after back pruning

Coping with soil organic carbon levels

The crop removes large quantity of plant nutrients from soil, particularly the removal of NPK nutrients at the present level of crop production has been estimated at 125 kg/ha/annum whereas the annual addition is not more than 75 kg resulting in depletion of the nutrient reserve of soil. The excessive reliance on chemical fertilizers and the negligence shown to the conservation and use of organic sources of nutrients have not only caused the exhaustion of soil of its nutrient reserves but also resulted in soil health problems not conducive to achieving consistent increase in agricultural production. Moreover, Indian soils are poor in organic matter and in major plant nutrients. Soil organic matter is the key to soil fertility and productivity. In the absence of organic matter, the soil is a mixture of sand, silt and clay. Organic matter induces life into this inert mixture and promotes biological activities. Although the beneficial influence of organic matter on the physical, chemical and biological properties of the soil is widely known, the full appreciation of the same remains largely ignored in modern agriculture. The regular recycling of organic wastes in the soil is the most efficient method of maintaining optimum levels of soil organic matter. Recycling of organic matter in the soil should become a regular feature of modern agriculture. In the traditional agriculture, followed over generations in India, the use of plant and animal wastes as a source of plant nutrient was the accepted practice. The importance and aim of organic manures and green manure crops have failed to be recognized in modern agriculture.

Production of enriched organic manure and its utilization instead of hazardous inorganic chemical fertilizers is important to maintain soil fertility and to sustain crop productivity. Therefore, development of suitable eco-friendly technologies for accelerating speedy biotransformation of available crop residues which otherwise is wasted and improvement of quality of manure by incorporating plant growth promoting microbes that can replace the chemical fertilizers is important for improving physical, chemical and biological properties of soil.

Enrichment of manure with Biofertilizers:

- Nitrogen fixing bacteria- *Azotobacter*, *Azospirillum* each 2 Kg/MT if solid, 1 L/MT if liquid. Phosphorous solubilizing bacteria (PSB)-*Bacillus polymixa* etc-4Kg/MT if solid, 2 L/MT if liquid.
- Potassium mobilizing bacteria (KMB)-*Fraturia aurantia* 4Kg/MT if solid, 2 L/MT if liquid.

Enrichment of manure with Bio-Agents:

- Bio-Control agents like *Trichoderma viride*, *Pseudomonas fluorescence* at the rate of 2kg/tonne of each if solid, 500ml/tonne if liquid form .

Chemical enrichment of manure:

- Chemical fertilizers like urea, single super phosphate, sulphate or murate of potash, micronutrient mixture 5Kg each are mixed in one MT of manure. All these mixtures are kept for incubation in shadow for 10-15 days before use for soil application. This mixture is sufficient for 1-ac area.

ADVANTAGES OF ORGANIC MANURES

1. Organic manure provides all the nutrients that are required by plants but in limited quantities.
2. It helps in maintaining C:N ratio in the soil and also increases fertility and productivity of soil.
3. It improves the physical, chemical and biological properties of the soil.
4. It improves both structure and texture of the soils.
5. It increases water holding capacity of soil.
6. Due to increase in the biological activity, the nutrients that are in the lower depths are made available to the plants.
7. It acts as mulch, minimizing evaporation losses of moisture from the soil.





Acid lime orchard



Measurements while procurement of FYM



Drip irrigation in acid lime orchard



Intercultivation after back pruning in grape



Working under COVID-19 situations:

During the period of lockdown and there after during relaxations more care is being taken. In view of infection threat all the activities are being continued by following all general precautionary guidelines as follows;

- Proper hygiene of the work place, regular cleaning and spraying at intervals of disinfectant sodium hypochlorite @ 1%
- At work wearing mask made mandatory
- Cleaning hands regularly with soap, avoiding hand to face touch at any time is advised
- Following social distancing during activities, staggering of work is being followed along with allotting works such as to avoid more persons coming together while at work
- Avoiding or taking special care of aged (>55years) and sensitive persons at work
- Taking note of health conditions of workers on daily basis before allotment of work and taking help of doctor at campus to avoid risk

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