

PRACTICE OF MANAGEMENT IN HORTICULTURE

"Farm Practice" account for 80% of the total results obtained. Other factors like Quality of Plants, Nature etc. account for 20% of total results. If farm practices are proper and scientific, then the bad effects of adverse factors are reduced and maximum returns are obtained from favorable factors. Hence the farm practice should be well defined, designed on Scientific Principles. It should be developed with resolution and utmost care. Presently in most of the farms, farm practices are influenced by non-scientific factors and hence they should be upgraded. Diffuser technology is a well-defined farm practice, assuring the adaptor (of the technology) the best results from available resources.

Diffuser technology

Diffuser technology means scientific reasoning to fruit production. It has introduced many new concepts, for want of which concepts our agriculture is trailing behind the world scenario. The application of these concepts should have been made long back but these remained neglected for want of proper device and holistic thinking and approach.

Diffuser technology is application of scientific principles developed by many agricultural scientists during last few decades.

The diffuser technology provides more sensitive and scientific farm practices which lead to better quality and more quantity production at lesser cost. This technology is a breakthrough for fruit grower as it ensures more and assured profits as well as it relieves him from various problems such as shortage of water, temperature variations, poor quality of soil, soil ill health, loss of sustainability etc.

Diffuser technology means proper combination of management and agricultural science principles in a 'standardized farm practice.' The technology can be used for 5-10 plants as well as for thousands of plants.

Some of the principles employed, in diffuser technology are listed below.

1. Production targets based on canopy area.
2. Nutrition support programme for targeted production.
3. Sub-surface fertigation.
4. Integrated water & nutrition management.
5. Law of minimum i.e. supply of 13 elements in right combination.
6. Zero defect production / total quality management in agriculture.
7. Attaining maximum fertilizer-use efficiency.
8. Fertilizer dosing in PPM with maximum splits.
9. Nutrition uptake management.
10. Optimum root wet area with minimum of water input
11. Productivity of water.
12. Optimum growth conditions at Root zone level.

These principles are unique and the traditional farm practice is not able to apply these principles. The application of these principles totally changes the attitude of the grower and hence his life also. The application of these technological principles in farm practice is briefly explained below.

1) PRODUCTION TARGETS, BASED ON CANOPY AREA

This management principle fixes the target of production per acre which is directly proportional to the canopy area of fruit trees in the farm, Technically, it is possible to produce 6-7 Kg. of Mango, Grapes or Pomegranates from one SQ. meter of leaf area (i.e. canopy area) e.g. from 2000 Sq. m. canopy area in an acre, 12 tons of fruits can be produced if proper steps are taken. We define steps / standard farm practices under diffusertechnology for getting the targeted production.

Under traditional farm practice, such target concept does not exist.

2) NUTRITION SUPPORT PROGRAMME FOR TARGETED PRODUCTION

The production of fruits requires core support of definite quantity of 13 elements for cell formation. Fruits are formed out of 13 elements collected from/through roots. Three elements (Hydrogen, Oxygen and Carbon) are collected from air and water. These three elements and water account for 98 to 99% of total weight of fruits and are abundantly available to the plant. Availability of thirteen elements from soil through roots is the critical and limiting factor for production. For one ton production of Grape, Pomegranate and Mango, 10, 15 and 21 Kg. of pure elements (Thirteen elements) are required respectively. For targeted production of 12 Tons, as mentioned earlier, 120, 180 and 252 Kg. of nutrients should be absorbed by the plants (in one acre). The absorption should be done since bearing to harvesting period. This uptake during the particular period is done in a controlled manner by diffusertechnology practices.

In traditional way of harvesting such concept and control does not exist.

3) SUB-SURFACE FERTIGATION

Fertigation means Irrigation and fertilization. Sub-surface fertigation below ground level. In diffusertechnology, water and fertilizers are applied simultaneously and that too 10 cm below ground level i.e. at root zone.

The water requirement of plant is equal to its transpiration requirement. It is 15% of pan evaporation rate. (PER) It amounts to 2 Liter/day/Sq. meter canopy area. (For this requirement PER is assumed at 12 mm) The water requirement, if irrigated on ground, (i.e. as per present practice) will be for evaporation + transpiration. This comes out to 8 to 10 liters per day per sq. m. Canopy area (PER assumed at 12 mm) while under diffusertechnology, the water requirement will be only 2 liters/day/sq. m. canopy area as there is no evaporation loss, water being given below surface. For drip system, water requirement per acre per season is 35 lakh liters, while for diffuser system it is only 10 lakh liters. Sub-surface fertigation will be the order of the day and irrigation on the ground is getting obsolete. diffusertechnology is the best sub-surface fertigation system

in Indian conditions.

4) INTEGRATED WATER & NUTRITION MANAGEMENT

The plant/fruit growth is directly proportional to nutrients absorbed by plant. 70 to 100 gm. biomass growth is obtained per one gram nutrients absorption. Nutrients are absorbed through water, taken in to fulfill transpiration requirement of the plant. On an average the plant absorbs 2 liters of water per sq. m. leaf area (canopy) per day. Hence the quantity of nutrients absorbed is determined by the concentration level of nutrients in water at the root zone. In case of diffuser technology, water and nutrients are fed together at the root zone level in a predetermined suitable proportion so as to get maximum advantage of transpiration led absorption of water.

There are many aspects of this integrate management principle and these will be discussed subsequently.

5) LAW OF MINIMUM i.e. SUPPLY OF 13 ELEMENTS IN RIGHT COMBINATION

The principle of law of minimum is well known in agriculture discipline but is most neglected in actual practice. Lop- sided feeding of nutrients leads to low quality of produce, loss of soil fertility and soil health & causes various deceases. Hence in case of diffuser technology all the thirteen elements (Major, medium, and micro) are supplied in a right combination with every application of water at root zone level. This leads to proper metabolism and formation of healthy cells, Due to the proper balancing of nutrients, the quality of fruits improves in respect of size, glaze and density etc.

6) ZERO DEFECT PRODUCTION / TOTAL QUALITY MANAGEMENT (TQM) IN AGRICULTURE

This principle is applied in advanced industries all over the world. Defects in product develop due to defective process, so improve the process and you will gate better quality of produce. For this purpose six-sigma theory is applied. It is very difficult to apply this principle in agriculture without diffuser technology. We have developed a methodology for total quality management and are gradually improving on it. The crop specific element content of best quality fruit is known. On the basis of this data, we have designed crop & stage specific nutrition application programmes. These programmes are supplied to Diffuser users, free of cost.

7) ATTAINING 90% FERTILIZER USE EFFICIENCY

Chemical fertilizers are in short supply and becoming costlier also. In present traditional farm practice, the efficiency of fertilizer use is 30-35% only, because excess water is used and fertilizer dose is not properly split. Also application of fertilizer is not a proper place.

In case of diffuser technology, fertilizers sufficient for just two days are applied at a time, below ground level (at the root zone) with minium quantity (just sufficient for transpiration) of water, This leads to maximum absorption of fertilizers and it is experienced that with less fertilizer use, more production is obtained. The strategy of

two days dosing with need based minimum water, maintains soil free from excessive deposition and salting of fertilizers and after harvesting, when fertilizer addition is stopped, soil becomes free of fertilizers.

8) FERTILIZER DOSING IN PPM AND WITH MAXIMUM SPLITS

In case of diffusertechnology based farm practices, the fertilizer dosing is measured in PPM and not in kg./bags. The term PPM (parts per million) expresses water and nutrients together. It is a measure of proportion of two different inputs i.e. water and nutrients. The absorption of nutrients by roots is the effect of osmosis process. Due to osmotic pressure, low-density liquid is absorbed by high-density liquid. In this case soil-water (water around roots) and sap inside root cells are two liquids with different densities, of which sap contains nutrients at about 1500 to 2000 PPM. If the soil water contains elements at 200-400 PPM, (density lower than sap) the elements are easily absorbed. In case of diffusertechnology, required quantity of 13 elements is calculated, depending on production target and fruit harvesting nutrient requirement and the same is splitted in 45 to 60 splits and fed at root zone level along-with need based water during the bearing to harvesting period. While calculating the dosing of nutrients, principles like law of minimum, zero defect production are applied. This practice ensures the targeted production with minimum of water and nutrients input and best quality of produce.

9) NUTRIENTS UPTAKE MANAGEMENT

In case of traditional farm practice, water and nutrients are pored in the farm but how much is absorbed by the plants is not known.

In case of diffusertechnology, root zone conditions are created in such a way that it becomes inevitable for the plant to absorb whatever is put in at root zone level. small does of nutrition, transpiration need based water, 50% root wet area, sub-surface fertigation at right location, use of capillary action for water distribution in soil etc. are some of the fertilizer use is attained as compared to 30-35% in traditional farming.

10) OPTIMUM ROOT WET AREA WITH MINIMUM OF WATER INPUT

The present farm practice is silent on the area of roots that should be wetted for optimum use of daylight/solar radiation. The continuous flow of transpiration has a two-fold contribution in production of biomass. (1) Due to continuous transpiration the temperature of leaves is maintained at 30° C. At this leaf temperature, the stoma remains open and photosynthesis activity, fixation of carbon etc. continues. (2) Due to continuous transpiration, maximum uptake of water per sq. m. (Canopy area) per day take place and along with the absorbed water maximum quantity of elements is also absorbed. From each gram of absorbed elements, 100gm. of biomass is produced.

Thus due to unobstructed transpiration, biomass generation is attained to the maximum extent.

At noontime, the transpiration rate is highest. Maximum water and elements are absorbed and biomass generated is above average during noon period. Reciprocally, if there is water strees during noontime, photosynthesis/carbon fixation comes to stand-still and biomass generation is also stopped. If this is for 10% period of day (in the noon)

biomass generation is dropped down by 25%. The transpiration requirement is at the peak level during noontime. To make up said demand, root wet area should be maintained at 50% of the total root end area. The hairy roots are distributed along the periphery of canopy up to 30 cm below ground level. In diffusertechnology, the irrigation is subsurface and 50% root wet area is created with only 2 liters of water input per sq. m. canopy per day. The limited water is totally absorbed along with all elements.

11) PRODUCTIVITY OF WATER

This is the most important principle, every agriculturist should be aware of, because in the agriculture the productivity of all other inputs e.g. fertilizer, labour, land etc. is directly in proportion to the productivity of water. Unfortunately nobody in Agriculture field is aware of this principle and hence there is poverty. We have developed certain systems and measures to attain the productivity of water at the highest level and we extend these systems to ordinary farmers to attain it. By adopting diffusertechnology, one cubic meter (1000liters) of water earns Rs. 150 to 200 (In Drip system only Rs. 30 to 40 are earned per cu.m. of water.) The variable cost of storing the water in plastic lined tank is only Rs. 10 per cu. m., which is affordable as the generation is Rs. 150 to 200 per cu. meter. Thus the productivity of water concept solves the water problem as well as improves the productivity of all inputs and reduces per capita cost of every input.

12) OPTIMUM GROWTH CONDITIONS AT ROOT ZONE LEVEL

Plant/fruit growth is the manifestation of elements absorbed by the plant. Elements are absorbed through roots. The absorption of elements is related with the conditions prevailing at root zone of plants, Hence for maximum possible uptake of nutrients maintaining optimum growth conditions at root zone level of plant is the sure way of success.

The hairy white roots absorb elements and water through their ends. The natural position of root ends is perpendicularly below the canopy boundary and up to 30 cm below the ground level. Hence, optimum growth conditions are created with resolution & special efforts at canopy periphery of plant, by farm practice based on diffusertechnology.

There are many variables of the optimum growth condition, which are taken care of in our farm practices. The variables are (1) The right proportion of organic matter in the soil (2) Root wet area up to 30 cm depth and 50% of canopy periphery (3) Dry soil mulching of upper 10 cm layer i.e. applying water below 10 cm. depth (4) Moisture level of soil should be maintained at around 50% of field capacity (5) Presence of 13 elements (dissolved in water) in right combination / proportion and suitable intensity level (PPM) so as to fulfill the nutrients needs of (canopy area based) targeted production.

All these conditions are created with resolution at root zone level and these conditions take care of proper soil temperature, proper density of soil, proper soil ph, nontoxic condition for bacteria & verms, constant supply of oxygen to the roots and simultaneous removal of toxic gases, like CO₂ from the root zone, sufficient supply of water to leaves necessary during the peak transpiration at noon time.

The plant behavior is controlled and directed to the required direction by

controlling the root zone condition of plant and best results are obtained with minimum of inputs . Proper root zone management is the crux of ideal farm practice , which factor is generally neglected in traditional system; on the other hand it is the specialization area of diffusertechnology that yield fascinating results.