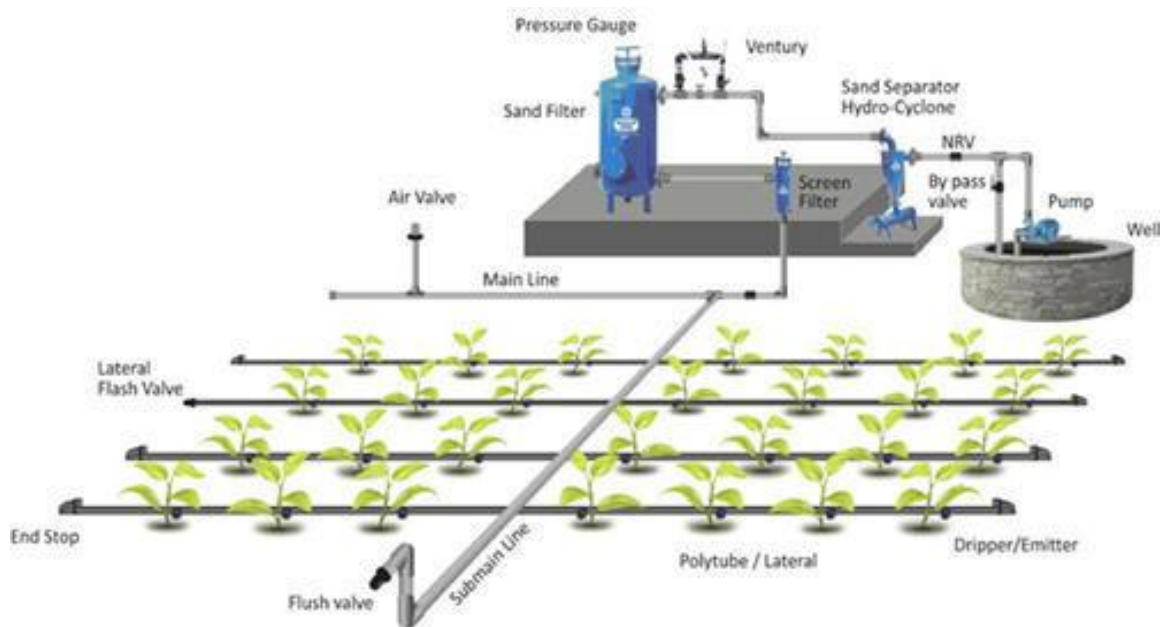


DRIP IRRIGATION

(11)

Irrigation is an important aspect for horticultural crops in arid and semi arid regions. Proper supply of water and nutrients to plants is essential to ensure timely maturity, desired yield and acceptable fruit quality. Drip irrigation is one of the most efficient methods of water and nutrient application to horticultural crops and is being promoted to enhance water productivity and nutrient use efficiency amid concerns over water availability and environmental degradation. It is a method of irrigation where water is carried through a pipe system to the point of application and water is applied in the form of droplets at targeted spots (root spread area), leaving some of the space between the crops as dry.



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ment of water requirement of the crop/plant under consideration is essentially an important step for the design and operation of any irrigation system. The importance of quantification of water requirement can be gauged from the fact that, despite the irrigation practices being used since time immemorial, experiments are still continuing to assess water requirement of different crops. Traditionally, irrigation systems apply a known depth of water based on moisture storage capacity of soil and frequency of application is decided based on consumptive use rate of the crop. Under drip irrigation system, frequency of application is a management decision depending on operational aspect of the system as well as crop response to the frequency of water application and water holding characteristics of the soil.

In general, any water deficits that reduce plant transpiration also decrease the production of biomass in all crops. However, for many tree crops where the fruit is the economic product, a reduction in biomass production does not always result in a parallel reduction in fruit production. It has long been known that fruits from trees grown under water deficits tasted

better than those from fully irrigated trees. There are several advantages of deficit irrigation including improved fruit quality (for specific fruits) coupled with water savings. Nevertheless, some quality parameters, such as fruit size or appearance, may be negatively affected. Basically, there are two methods to implement deficit irrigation for a crop: (1) by reducing the amount of irrigation water applied, and (2) by increasing the period between irrigation cycles. Both strategies are easy to implement with drip irrigation.

Tree transpiration demand under a given climate is governed by its growth habit (evergreen vs. deciduous), canopy size and architecture, developmental stage, and stomatal behaviour. For most species the horizontal projection of their canopies seldom covers more than 70-75 percent of the ground. This is because their growth is often controlled by pruning to allow mechanization and to achieve a more even distribution of direct solar radiation to fruiting branches. As per the standard procedure crop consumptive use requirements for a mature orchard is estimated as [maximum value is considered for deciding design flow rate of the system]

$$ET = K_c \times ET_0$$

Where, ET_c : maximum evapotranspiration from a crop; K_c : crop coefficient; and ET_0 : reference evapotranspiration. K_c should be reduced by 10 to 30 % if mulching is practiced.

FERTIGATION

(12)

Fertigation implies the application of fertilisers through pressurized system, thus forming nutrient containing irrigation water desired concentration as per the crop need. The right combination of water and fertilisers have key role in greenhouse vegetable production for good quality and productivity.

Forms of fertiliser for Fertigation:

- a) Liquid Fertiliser: These are solutions which contain one or more plant nutrients in liquid or suspension form.
- b) Water Soluble Fertiliser: The wholly water soluble fertilisers are present in solid form which are completely soluble in water carrying two or more major as well as micro-nutrients traced as alternative to liquid and conventional fertiliser.

Suitable conditions for fertigation:

The factors affecting the fertigation involves the irrigation system, quality of water, solubility of fertilisers and compatibility of fertilisers. The most suitable method of an irrigation system for fertigation in accuracy of water application which largely depends upon proper designing and installation of drip system and availability of correct equipment for injecting fertilisers.

Method of fertigation:

There are number of techniques which can be used to add fertilisers into the irrigation system. These may be drip irrigation, micro-sprinklers, micro-jets or sprinkle irrigation.

Fertilisers can be added into drip irrigation system by selecting appropriate equipment from wide assortment of available pumps, valves, venturies, etc. The size and the capacity of addition system depends upon concentration, grade and frequency of application. The equipments used for fertiliser application are described as follows:

- a) Ventury: The system of injection is of very low cost, grid works by creation of a practical vacuum in the system and suction of fertilisers into the irrigation stream.
- b) Fertiliser tank: In this system a part of irrigation water is diverted from the main line to flow through a tank containing fertiliser in fluid or soluble solid forms before returning into the main line.
- c) Fertiliser injection: These are piston or diaphragm pumps which are driven by the water pressure of the irrigation system, and as such injection rate is proportional to the flow of water in the system.

Precautions during fertigation:

- Fertiliser tank must be used to inject water soluble fertiliser solution.
- Fertigation should be done in the last half an hour of total irrigation period and then continue drip for another about 5-6 hours after completion of fertigation.
- Concentration of solution should never exceed more than 10 percent.

Other important considerations for irrigation and fertigation include:

- Fertigation frequency, in most situations, is not as important as a correct amount of application of nutrients to the crop during a specified period. On very sandy soils, more frequent fertigation might be necessary to avoid leaching losses. During rainy season, a bulk injection of larger amount of fertilizer might be needed to fertilize a crop when no water is required.
- Phosphorus should not be introduced into the drip lines if soluble Fe ions are present in the water. Once iron phosphate precipitates occur, flushing the system with nitric acid to dissolve the chemical precipitates is the only way to remove the precipitates from the irrigation lines.
- The performance of a micro-irrigation system may rapidly deteriorate if it is not routinely maintained by checking for leaks; backwashing and cleaning filters; periodic line flushing; chlorinating; acidifying (if necessary) and cleaning or replacing plugged emitters.
- Post installation system monitoring is essential to ensure optimum performance/sustainability. Therefore, select a dealer with capability to provide professional/technical service.
- Check the wetted area at the surface for different plants. Any variation in the area of

wetted surface, for fields with uniform soil types, indicates non uniform water application thereby indicating the need for some remedial measures.

- Drip irrigation system may not prove to be effective if it is to be used for old orchards previously being rainfed or being irrigated with surface methods. Micro sprinkler (35- 250 lph), bubbler (270-480 lph) or basin irrigation may be more suitable for such old orchards having spread root system. However, drip irrigation system may be more suited and economical for newly grown orchards or high density orchards.