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*General Article*_____ *Chapter –20*

ROLE OF MICRO-IRRIGATION IN FRUIT CROPS

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Abstract

India is the country of agriculture. Horticultural sector is very important as far as Indian villager's point of view. Productivity of horticulture field's does not depend on excess of water sprinkled to the field, but depends on better matching of water supply with crop demand and uniform environmental conditions that are suitable for farming. To determine the crop water demand it is essential to estimate the soil humidity. Under irrigation or over-irrigation system leads to excessive or less water supply which may cause worse results i.e., yield reduction. Micro-irrigation ensures increased crop yield, high water use efficiency, reduced water and energy consumption and minimal weed problems. Results confirm that it is safe to recommend its use for most horticultural crops particularly those which are widely spaced. Although application of drip irrigation has been quite encouraging infields yet its popularity and adoption under these conditions is not satisfactory.

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Introduction

- ✓ The term "micro-irrigation" describes a family of irrigation systems that apply water through small devices.
- ✓ These devices deliver water onto the soil surface very near the plant or below the soil surface directly into the plant root zone.
- ✓ Growers, producers and landscapers have adapted micro-irrigation systems to suit their needs for precision water application.
- ✓ Micro-irrigation systems are immensely popular not only in arid regions and urban settings but also in subhumid and humid zones where water supplies are limited or water is expensive.
- ✓ In irrigated agriculture, micro-irrigation is used extensively for row crops, mulched crops, orchards, gardens, greenhouses and nurseries.
- ✓ In urban landscapes, micro-irrigation is widely used with ornamental plantings.

What is Micro-Irrigation?

- ✓ Micro irrigation is the system that provides precise quantity of water in and around root zone of plant with the help of emitters.

Indian Scenario (micro irrigated area in ha)

State	Area (Mha)
Rajasthan	1.68
Maharashtra	1.27
Andhra Pradesh	1.16
Karnataka	0.85
Gujarat	0.83

(www.icfa.org.in)

Problems Related to Water Management at Farm Level and Need of Micro Irrigation

- ➢ Improper land grading and shaping of the fields
- ➢ Inadequate maintenance of field channels
- ➢ Uneven flow of water
- ➢ Less water availability in canal commands
- ➢ Abrupt decline of underground water table
- ➢ Loss of water due to deep percolation and evaporation from the soil surface.

Salient Features of Micro-Irrigation

- ➢ Water applications are more frequent than surface method that provides a very favorable moisture level in the soil in which plants flourish.
- ➢ It can be adopted in undulated fields and also suitable for most of the soils.
- ➢ Drip irrigation in particular, is suitable for irrigation with water of poor quality (saline water). Irrigating daily pushes the salt away from the root zone of the crop.

Why Micro-Irrigation?

- High water use efficiency (30-60%)
- High quality &higher yields (10-60%)
- Minimized fertilizer loss & soil erosion
- Can be laid out in undulating fields
- Moisture within the root zone can be maintained
- Efficient weed control (30-90%)
- Water soluble fertilizers can be applied through MI
- Low labour cost

Constraints of Micro-Irrigation

- High initial cost
- Maintenance requirements
- Salt accumulation near plants
- Susceptible to clogging
- Requires technical knowledge
- Lack of information about number of emitters per plant
- Selection of appropriate micro irrigation technology

Drip Irrigation

- Drip Irrigation is also known as **trickle irrigation,** is an irrigation method which saves water and fertilizer by allowing water to drip slowly to the roots of plants, through a network of valves, pipes, tubing, and drippers.
- Drop by drop water is distributed around the root zone with the help of drippers

Irrigation Scheduling

- Irrigation scheduling is the process used by irrigation system managers to determine the correct frequency and duration of watering.
  Irrigation requirement = Water requirement – (Effective rainfall + Ground water)

Water Requirement:

- For online drippers:

Water requirement = No. of plants × Dripper discharge × No. of drippers

Maintenance of Drip Irrigation Equipment

- Clogging is the main problem in drip irrigation

Solution:

- Acidification and flushing of system
  - ✓ Injection of 30% HCl is recommended for removal of precipitated calcium salts on the inner surface of the drip system.
  - ✓ Flush valves are used for regular cleaning of main, submain and laterals.
- Chlorination
  - ✓ When the source of irrigation water is a dam or river, chlorination is recommended, which kills bacteria and algae**.**

Micro-Irrigation System for Fruit Crops

Crop	Irrigation system	Spacing	Lateral spacing	Drippers per plant
Mango	Drip -online	10m × 10m	10m	4
	Drip –online	9m × 9m	9m	4
	Drip –online	8m × 8m	8m	4
	Drip –online	7m × 7m	7m	4
	Drip –online / inline	5m × 5m	5m	4
Sapota	Drip –online	8m × 8m	8m	4
Sweet orange	Drip –online	6m × 6m	6m	4
Acid lime	Drip –online	6m × 6m	6m	4
Guava	Drip –online	6m × 6m	6m	4
Custard apple	Drip –online	6m × 6m	6m	4
Ber	Drip –online	6m × 6m	6m	4
Aonla	Drip –online	6m × 6m	6m	4
Pomegranate	Drip –online	4.5m × 2.7m	4.5m	2
Grapevine	Drip -inline	2.7m × 1.5m	2.7m	2
	Drip -online	2.7m × 1.5m	2.7m	4
Banana	Drip -inline	1.8m × 1.5m	1.8m	2
Papaya	Drip -online	1.8m × 1.5m	1.8m	4
	Drip -inline	1.8m × 1.5m	1.8m	2

Related Studies

Kumar *et al.*(2008) studied theeffect of drip irrigation regimes on growth, yield and quality of mango hybrid Arka Anmol. They found that maximum fruits pre tree and yield (kg/tree) found in 75 % PER and maximum fruit weight (g) found in 100 % PER.

Savani *et al.* (2010**)**studied theeffect of surface and subsurface drip system on yield of mango fruits. In this experiment they have noted yield of 3 different years. They found that maximum yield (t/ha) found in 50 cm below ground level through drip which at par with 40 cm below ground level through drip irrigation in those 3 years.It might be due to drip irrigation applied of water directly to the plants rootzone. Such an effect was responsible for significant improvement in yield of mango.

Panigrahi *et al.* (2010) studied theeffect of irrigation levels on yield and water use efficiency of mango. They found that maximum fruit weight (g), yield (q/ha) and WUE (q/ha-cm) found in drip irrigation with 60% water + polythene mulch. It might be due to

drip irrigation water is made available in root zone. There by reducing the water stress pressure in mango.

Ghosh and Pal (2010) studied theeffect of drip versus basin irrigation on fruit yield in sweet orange. They found that maximum fruit weight (g), fruit diameter (cm) and no. of fruits/plant found thattreatment of irrigation through drip at 1.0 Epan + Black polythene mulch which at par with treatment of irrigation through drip at 0.8 Epan + Black polythene mulch. It might be due to regular and low amount of moisture supply is essential for retention of more no. of fruits of sweet orange.

Ghosh *et al*. (2011) studied theeffect of irrigation and mulching on fruit yield of pomegranate. They found that maximum fruit yield (kg/ha) and water use efficiency (kg/ha/cm) found that treatment of drip irrigation for 3 hours. It might be due to low water stress

Deshmukh *et al.* (2014)studied on yield of papaya as influenced by irrigation scheduling. They found that maximum no. of fruits per plant and yield (kg/plant) found in 100 % CPE and 100% RDF. It might be due to drip irrigation improved the availability of applied water through the establishment of relatively moist condition in the root zone and also increased the availability of nutrients throughout the crop growth period. Such effect was responsible for significant improvement in growth parameter, yield and yield of papaya.

Tiwari *et al*. (2014) studied theeffect of plastic mulch and drip irrigation on growth and yield of Sapota. They found that maximum plant height(m), canopy(m) and yield (t/ha) found in 100% of irrigation requirement met through drip irrigation with plastic mulch. It might be due to the better soil-water environment in root zone. Such effect was responsible for significant improvement in growth parameter, yield and yield of sapota.

Pramanik *et al*. (2014) studied theeconomic analysis of banana cv. Martaman under fertigation and conventional method (per ha per year basis) and they found that maximum yield (45.4 t/ha) and maximum net return (rupees/ha) found in 60% CPE with 80% RDF which was at par with 60% CPE with 60% RDF. It might be due to maintenance of soil near field capacity throughout the growth period in active rootzone. Which thereby facilitated better water utilization, higher nutrient uptake and maintenance of soil-water-air relationship with higher concentration in the rootzone of banana.

Sharma and Kispotta (2016) studied the Effect of drip irrigation in banana and they found that drip irrigation gave maximum plant height (cm), plant girth (cm), no. of leaves (nos./plant), earlier fruit setting period (days), earlier harvesting period (days), bunch weight (kg), water saved (%) and yield t/ha (50). It might be due to drip irrigation delivers water directly to the plants rootzone, in the right amounts, at the right time. Such an effect was responsible for significant improvement in growth parameters, yield attributes and yield of banana.

Esmail *et al*. (2016) studied the beneficial effect of subsurface drip irrigation system on yield, fruit quality of Valencia orange trees. They found that fruit no., fruit weight (g) and fruit yield (kg/tree) found in T_4: Subsurface irrigation with 12 drippers per tree.

Hamied *et al*. (2017) studied theeffect of water amounts and different drip irrigation systems on yield, weight and number of clusters in Flame Seedless grapevines. They found that maximum weight of cluster (g), no. of cluster and yield (kg) found with

80% of irrigation water requirement through subsurface drip irrigation system. It might be due to subsurface drip irrigation system directly applied of water in plants root zone so that better moisture conditions in the plants root zone.

Shukla *et al.* (2017) studied theeffect of micro irrigation on growth, yield and quality of sardar guava. They found that maximum plant height (g), fruit weight (g) and yield (kg/plant) found that 4 drippers /plant per day which was at par with 3 drippers /plant per day.

Pareek *et al.* (2020) studied theeffect of irrigation and fertigation scheduling on growth and yield of guava under meadow orcharding. They found that maximum plant height (m), fruit weight (g) and fruit yield (t/ha) found in 100% IW/CPE with 60,30,30 g NPK WSF which was at par with 100% IW/CPE with 45,20,20 g NPK WSF. It might be due to better water and nutrient uptake from the rootzone.

Goramnagar*et al*. (2020) studied theeffect of micro-irrigation and fertigation on yield and yield contributing characters of Acid Lime. They found that maximum flowers/shoot, fruit set (%) and fruit yield (kg/plant) found in 80% Evp with 100% RDF which was at par with 80% Evp with 80% RDF. It might be due to drip irrigation facilitated better water utilization, higher nutrient uptake and maintenance of soil-water-air relationship with higher concentration in the rootzone of acid lime.

Tyagi (2021) studied theeffect of drip irrigation and mulching on Fruiting, yield and quality attributes of Litchi (cv. Rose Scented) under high density planting. They found that maximum fruit weight (g) and yield (kg/plant) found in Drip irrigation at 100 per cent level with mulch application. It might be due to better soil-water environment in rootzone.

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