

# Good Horticultural Practices (GHP)

for effective resource conservation and productivity in vegetables

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*Good Horticultural Practices (GHP) holds a promising option for improving profitability and sustainability in dryland region of India. Good Horticultural Practices was initiated as one of the interventions under Farmers FIRST Project (FFP) for improving the sustainability and profitability of agriculture in Pudur Mandal, Vikarabad district, Telangana. The four major technologies selected under this intervention were a) plastic mulching with drip irrigation schedules, b) pest control in vegetables, c) vegetable nursery and d) staking in creepers. Results to be added after this in tomato polythene mulching remarkably improved the plant biomass, earliness and registered 94.7% higher dry matter over unmulched control. Maximum fruit yield (3.66 kg/plant) was recorded with polythene mulch. Nursery is convenient to look and after the baby seedlings, it is possible to provide favourable growth conditions. In tomato crop staking yields 38.1 t/ha and pruning yields 31.7 t/ha is better than control yield 30.4 t/ha.*

**Keywords:** Drip irrigation, Nursery, Plastic mulching, Staking, Vegetable crops

**U**NDER Farmers FIRST Project (FFP) for effective resource conservation and productivity in vegetables in Pudur Mandal, Vikarabad district, Telangana, Good Horticultural Practices (GHP) encompasses some basic concepts and practices which can help farmers to be more productive, save time and energy and help maintain our natural resources. The typical farm production includes site selection, planting, irrigation, crop management, harvesting and storage. For implementation of GHP, there is need to identify easy adaptable, cost effective technologies at each stage of horticultural plant production process in a participatory way. GHP has evolved in recent years in the context of a rapidly changing and globalizing food economy and as a result of the concerns and commitments of a wide range of stakeholders about food production and security, food safety and quality and the environmental sustainability of agriculture. Presently, GHP

is formally recognized in the international regulatory framework for reducing risks associated with the use of pesticides, taking into account public and occupational health, environmental and safety considerations. Considering the importance of GHP vegetable farmers should adopt it and minimize the risk of contamination, right from pre-planting stage to post-harvest stage of the crop. Four major technologies selected for interventions at the farmer's field were: Plastic mulching with drip irrigation schedules, Pest control in vegetables, Vegetable nursery and staking in cucurbits and tomatoes.

#### **Plastic mulches with drip irrigation schedules**

Mulches are well known for modifying the energy and water balance at surface of soils and creating more favourable conditions for plant growth. This may include temperature moderation, soil conservation and weed control.

Mulching modulates the micro-climate of the soil, preserve the moisture in area of root zone; thereby helping the optimum uptake of the water and available nutrients for better growth and efficient crop yield. Mulching is preferred in fruit orchard, flower and vegetable production and nurseries. Nowadays use of inorganic mulches became more popular due to their efficiency in weed control, less pest and disease problem, moisture conservation and increase water use efficiency; easy availability in market, durability, easy in mechanized agriculture, early growth and increased in potential yield of crops.

Drip irrigation is the slow and frequent application of small amounts of water through emitters or tiny holes spaced along polyethylene tubing or tape. The advantages of drip irrigation include improved water and nutrient management, potential for improved yields and crop quality, less weed growth and

pest and disease infestation, greater control on applied water resulting in less water and nutrient loss through deep percolation, and reduced total water requirements.

Superior growth of vegetable with mulching and without mulching can be visualized in Table 1. Yield of tomato under mulching with 50% evapotranspiration (ET) drip irrigation system and without mulching with 100% ET drip irrigation system was similar (42.02-43.75 t/ha). Under mulching, the yield was significantly ( $P<0.05$ ) improved at 80–100% ET (52.58–57.87 t/ha). However, water use efficiency (WUE) under the above treatments with mulching were maximum at 50% ET (1.67 t/ha-cm) and minimum at 100% ET (1.10 t/ha-cm). The WUE was minimum (0.80 t/ha-cm) without mulch when the drip irrigation was done at 100% ET.

#### Management of fruit fly using Cue Lure

The melon fruit fly, *Bactrocera cucurbitae* (Coquillett) (Diptera: Tephritidae) is distributed widely in temperate, tropical, and sub-tropical regions of the world. It has been reported to damage 81 host plants and is a major pest of cucurbitaceous vegetables, particularly the bitter melon (*Momordica charantia*), muskmelon (*Cucumis melo*), snap melon (*C. melo* var. *momordica*), and snake gourd (*Trichosanthes cucurmerina*). The extent of losses varies between 30 to 100%, depending on the cucurbit species and the season. Its abundance increases when the temperatures fall below 32°C, and the relative humidity ranges between 60 to 70%. It prefers to infest young, green, soft-skinned fruits. It inserts the eggs 2–4 mm deep in the fruit



Mulching and without mulching in tomato crop

**Table 1.** Yield and water use efficiency of tomato under mulching with drip irrigation system

| Treatment                                    | Yield (t/ha)       | Water applied (cm) | Water-use efficiency (t/ha-cm) |
|----------------------------------------------|--------------------|--------------------|--------------------------------|
| 50% ET with PM under drip irrigation         | 43.75 <sup>a</sup> | 26.2               | 1.67                           |
| 80% ET with PM under drip irrigation         | 52.58 <sup>b</sup> | 43.1               | 1.22                           |
| 100% ET with PM under drip irrigation        | 57.87 <sup>c</sup> | 52.4               | 1.10                           |
| 100% ET under drip irrigation, without mulch | 42.02 <sup>a</sup> | 52.4               | 0.80                           |

<sup>abc</sup> Significant at 5% level of significance

tissues, and the maggots feed inside the fruit. Pupation occurs in the soil at 0.5–15 cm below the soil surface. Keeping in view the importance of the pest and crop, melon fruit fly management could be done using local area management and wide area management. The melon fruit fly can successfully be managed over a local area by bagging fruits, field sanitation, protein baits, Cue-lure traps, growing fruit fly-resistant genotypes, augmentation of biocontrol agents, and soft insecticides (Table 2).

Cue Lure: mix Ethyl Alcohol-60 ml + Cue Lure (p-Acetooxyphenylbutanone-2) 40 ml + malathion 20 ml (i.e. in the ratio of 6:4:2) were demonstrated and distributed in bitter gourd, ridge gourd and cucumber crops of 99 number of farmers.



Cue lures for fruit fly control in ridge guard

#### Raising of vegetable seedlings under pro-trays

A good quality seedling production is very essential for getting higher yield and quality of produce. Vegetable seedling production is a specialized activity and farmers buy the seedlings from the nurseries. The pro-tray nursery is an upcoming technique

for quality vegetable seedling production, where seedlings are produced under shade net and such seedlings have better germination, appears healthy and are protected from pest and diseases and build-up well developed root system within 25–30 days. The benefits of pro-tray nursery include production of pest free quality seedlings, having independent area for each seed, improved seed germination, better root development, minimized seedling mortality and damping off disease, provides uniform, healthy and early maturity, easy handling and cheaper transportation and good main field establishment and crop stand. Since the hybrid seeds are expensive, this method helps to reduce cost by minimizing the seed wastage.



Pro-tray with coco peat for nursery raising in shade nets in Devononiguda village

**Raising and management:** The seedling tray (pro-tray) is filled with the growing medium (coco peat):

- A small depression (0.5 cm) is made with fingertip in the centre of cell of the pro-tray for sowing.

**Table 2.** Effect of Cue Lure treatment on yield and fruit fly incidence in bitter gourd, ridge gourd and cucumber crops of Pudugurthy village

| Crop         | Yield (t/ha)  |                  | Fruit fly incidence |                  |
|--------------|---------------|------------------|---------------------|------------------|
|              | with Cue Lure | without Cue Lure | with Cue Lure       | without Cue Lure |
| Bitter gourd | 12.5          | 6.8              | 7.9                 | 30.75            |
| Ridge gourd  | 8.7           | 5.25             | 8.57                | 29.60            |
| Cucumber     | 8.5           | 4.9              | 7.34                | 22.50            |

**Table 3.** Effects of staking and stem pruning on yield of summer tomato and ridge gourd

| Treatment | Plant height (cm) | Days to flowering | Fruit set (%) | Days to first harvest | Days to last harvest | Individual fruit weight (gm) | Fruit length (cm) | Fruit diameter (cm) | Yield per plant (kg) | Yield (t/ha) |
|-----------|-------------------|-------------------|---------------|-----------------------|----------------------|------------------------------|-------------------|---------------------|----------------------|--------------|
| Staking   | 135               | 46                | 37.15         | 86                    | 121                  | 47.8                         | 4.36              | 4.50                | 1.37                 | 38.1         |
| Pruning   | 147               | 46                | 38.64         | 83                    | 116                  | 50.1                         | 4.47              | 4.59                | 1.19                 | 31.7         |
| Control   | 121               | 45                | 26.12         | 88                    | 125                  | 42.6                         | 4.15              | 4.36                | 1.05                 | 30.4         |

- Treat the seed with bavistin or captan @2.5 g/kg of seed.
- One seed per cell is sown and covered with medium.
- Coco peat with 300–400% moisture is used and hence no immediate irrigation is required until germination.
- After sowing kept the 10 trays one over other for 3 to 6 days, depending on the crops. The entire stack will be covered using polyethylene sheet to ensure conservation of moisture until germination. The stacked trays are spread once the germination commences to avoid etiolation.
- The trays then shifted to net house on germination of seedlings and spread over the beds.
- The trays are irrigated lightly every day depending upon the prevailing weather conditions by using a fine sprinkling rose can or with hose pipe fitted with rose.
- Drenching the trays with fungicides (COC or carbendazim or thiram) as a precautionary measure against seedling mortality is also being done.
- The seedling growth should be encouraged by foliar application of water-soluble fertilizers 19:19:19 @3 g/litre on 12 and 20 DAS.
- The trays are provided with protective cover from rain by covering with polyethylene sheets in the form of low tunnel whenever it rains.
- The seedlings at right stage of planting are hardened by withholding irrigation and reducing the shade before transplanting or selling to the growers.
- Systemic insecticides should be sprayed 7–10 days after germination and before transplanting for managing the insect vectors.
- The seedlings would be ready in about 21–42 days for



Staking in (a) tomato and (b) ridge gourd crop

transplanting to the main field depending upon the crop.

#### Staking vegetable production in tomato and ridge guard

Yields of summer tomato do not always reach the full production potential because of inadequate management. Improved management such as, staking and pruning could improve the yield of tomatoes. Staking refers to support of plants with sturdy material to keep the fruits and foliage off the ground. Staking increases fruit yield, reduces the proportion of unmarketable fruit, enhances the production of high quality fruits, prevents disease and fruit rot, allows better aeration and better exposure of the foliage to sunlight and photosynthetic activities.

In tomato and ridge gourd, plants are staked by jute or nylon string hanging from the top of the tunnel which is less costly. Pruning is the selective removal of side shoots or stem to limit plant growth and to divert nutrients to flower clusters on the remaining shoot or stem. In order to maximize the efficiency of photosynthesis and minimize the risk of diseases, pruning is necessary when the growth is extremely dense. Pruning tomato plants regulate N: CHO ratio within the plant, and enhance fruiting. Literature indicates that productivity per area increases when pruning tomato plants to two stems. That greater marketable yield/area was obtained by pruning indeterminate tomato plants to two stems rather than one

(Table 3). So, the requirements of stem pruning and staking system are variable for different variety and growing conditions.

In our study plants were staked on inverted V shaped staking hanging from the top of the poly tunnel and the plants were pruned to two stem at the farmers' field.

#### SUMMARY

In vegetable crops plastic mulching increases the temperature of the plow-layer, reduces soil moisture loss during crop growth, increases radiation and water use efficiencies, produces more photo assimilates and increases source and sink size during crop growth ultimately increasing crop yield. Drip irrigation prevents disease by minimizing water contact with the leaves, stems, and fruit of plants. By following the other Good Horticultural Practices, viz. reduce leaching of water and nutrients below the root zone, manage insects and mites by using insecticidal soaps and horticultural oils on soft-bodied insects and mites, hand-picking of larger insects such as tomato hornworms, farmers can grow healthy seedlings of vegetables in a protected environment. Farmers can earn more profit by using modern technology. Studies carry out at different locations shows that crops grown vertically increases yield three times than when they were allowing to run on the ground.

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