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Cultivation of Cucurbits in Off – Season Under Low Tunnel

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Off-season cultivation of cucurbits under low tunnel technology offers an effective solution to overcome climatic constraints and enhance vegetable productivity in India. Low tunnels create a favorable microclimate by increasing air and soil temperature during winter, leading to early crop establishment and growth. This technology enables advancement of harvesting by 30–60 days compared to open-field cultivation. Cucurbits such as muskmelon, cucumber, bottle gourd, and summer squash respond well under low tunnels. The practice improves yield, quality, and market value while remaining cost-effective for farmers.

Introduction

India is the second largest producer of vegetables in the world next to China. Presently the total vegetable production of India is approximately 169.1 million metric tonnes from a total area of 10.1 million ha under vegetable crops, but the productivity and quality of most of the vegetable crops is very poor due to several biotic and abiotic stress conditions under open field cultivation.

Production of vegetables under protected structures such as low tunnel provides the best way to increase the productivity and quality of vegetables, especially cucurbits. Row covers or low tunnels are flexible transparent covering that are installed over the rows or individual beds of transplanted vegetables to enhance plant growth by warming the air around the plants in the open field during winter season.

Low tunnels are also advantageous in warming the soil, protecting the plants from bad weather, preventing the plant to get injured and advancing the crop by 30 to 40 days as compared to the normal sowing.

Low tunnels technology is mainly suitable for off season cultivation of cucurbits like muskmelon, round melon, long melon, bitter grand, bottle gourd and summer squash etc. Northern parts of the country, where the night temperature during winter

season goes below 8°C for a period of 30- 40 days, this technology could be quite suitable and cost effective for cucurbits growers and very profitable crops.

Benefit of Low Tunnel

- Raising healthy seedlings
- Maintains optimum temperature for plant growth and development
- Enhances nutrients uptake by the plants
- Increases photosynthetic activities of the plants
- Used for cultivation during winter.
- Protection against wind, rain, frost & snow.

Materials Required for Construction

- High Density Polyethylene (HDPC) I Polyvinyl Chloride (PVC) pipes of one inch diameter and 2 meter in length.
- Transparent Low Density Polyethylene (LDPE) films of 25-5o microns having 2 meter width.
- 5o cm long with 6 mm diameter Galvanised Iron (Cl) wires in which Peg to be made
- 2 number of poles having 5 cm diameter.
- Twin Poly Propylene (PP) ropes.

Nursery Raising for Off-season

Seedlings are raised in plastic pro-trays having 1.5" cell size in soil-less media in month of December or January and seedlings are ready for transplanting of 28-32 days old at four leat stage is recommended under low tunnels in the open field from mid january to mid february. These crops are growing such as cucumber, kakri, sponge gourd, Ride gourd, bottle gourd, summer squash, pumpkin, bitter gourd can be transplanted in the month of December. These crops are ready for harvesting in the first fortnight of February and very profit

Transplanting of seedlings

Seedlings are transplanted in a single row one a bed at spacing of 1.5-1.6*0.50 m. Before transplanting of the seedlings on beds, flexible galvanized iron hoops are fixed manually on a distance of 1.5 m to 2.5 m. The width of two ends of hoop is kept 40-60 cm with a height of 40-60 cm above the levels of the beds for covering the plastic on the rows or beds for making low tunnels. Transparent, 30 micron, plastic is generally used for making low tunnels, which reflects infra-red radiation to keep the temperature of the low tunnels higher than outside field. The plastic is usually covered in the afternoon after transplanting the desired vegetable like muskmelon, summer squash, bottle gourd, bitter gourd, round melon, cucumber etc. The plastic can be vented or slitted during the growing season as the temperature increases within the tunnels during the peak day time. Generally, 3-4 cm size vents are made on eastern side of the tunnels just below the top on a distance of 2.5 to 3.0 m after transplanting, Later on the size of the vents can be increased by reducing the distance between two vents with the increase in the temperature and ultimately the plastic is completely removed from the plants in the month of February and March depending upon the date of transplanting, growth of the crop and prevailing night temperature in the area.

Pollination under Low Tunnel Crops

Generally pollinating agent in low tunnel is honeybees (Apis spp.) andmost of the cucurbits being monoecious needs pollination as well as kept the beehive box for well pollination. Generally two beehive box per hectare is required.

Fertigation and Plant Protection in Low Tunnel

Fertilizers are applied through drip irrigation. In muskmelon water can be applied © 4.0 m3/1ooom2 at an interval of 6-7 days during the first month i.e., January and February. Fertilizer solution of N: P: K (5:3:5) is applied @ 80-1o0 ppm per cubic meter of water. During second month 4.0 m3 of water can be applied on duration of 4 days with fertilizer solution @ 120-150 ppm / m3 of water till beginning of flowering in the crop. Thereafter the

fertilizer quantity is reduced to 20-30 ppm till the fruits are of lemon size after that the quantity is again increased to 120-150 ppm per cubic meter of water. Before the ripening of the fruits, the quantity of fertilizer solution is again reduced to 50-60ppm for enhancing the quality of fruits in muskmelon. But in other cucurbits the quantity of fertigation is always in increasing order, starting from 5o ppm to 30o ppm at the peak fruiting period.

If required systemic insecticide can be applied through drip irrigation water for control of insects at early stage of the crop when the crop is under plastic tunnels and no foliar spray is possible.

Harvesting and Crop Advancement

Different cucurbits can be transplanted from first week of December to first week of February and can be advanced 30-60 days over their normal season of cultivation.

S.No.	Crop	Transplanting	Harvesting time	Crop advancement (Days)	Expected cost benefit ratio
1.	Summer squash	1st week of Dec	1st week of Feb	60	1:3 to 1:4
2.	Musk melon	3rd week of Jan to 1st week of Feb	2nd week of April to last week of April	30 – 40	1:2.5 to 1:3.5
3.	Bottle gourd	3rd week of Jan to 1st week of Feb	2nd week of April to last week of April	30 – 40	1:2.5 to 1:3.5
4.	Bitter gourd	3rd week of Jan to 1st week of Feb	2nd week of April to last week of April	30 – 40	1:3 to 1:4
5.	Water melon	3rd week of Jan to 1st week of Feb	2nd week of April to last week of April	30 – 40	1:2 to 1:2.5
6.	Cucumber	3rd week of Jan to 1st week of Feb	1st week of Feb	30	1:3 to 1:4

Off-season fruits produced under low tunnels can fetch very high price in the market this technology is quite economical for growing off-season vegetables in per-urban areas of the northern plains of the country.

Low tunnels is very important and very profitable ot off- season cultivation with location specific modifications, are highly suitable for growing vegetables in the per-urban areas of the northern plains, cold desert areas as well as other areas of the hilly states like Himachal Pradesh, Jammu and Kashmir, uttarakhand and North Eastern states. Indigenous technological database need to be developed in hilly regions to make adoption of protected cultivation sustainable. Cost effective and location specific design of the greenhouse needs to be developed.

The package of practices including fertigation, need to be worked out for different agro-climatic situations. Use of biodegradable plastics or polymers should be encouraged to combat environment pollution. The further refinement in existing technology will definitely go a long way to harness the full potential of low cost poly tunnels in vegetable production in the hilly regions.

Conclusion

Low tunnel technology plays a vital role in successful off-season cultivation of cucurbits by ensuring early harvest, higher yield, and better quality produce. It is economically viable and highly suitable for peri-urban, northern plains, hilly, and cold desert regions of India. Proper management of nursery raising, fertigation, pollination, and ventilation is essential for optimum results. Adoption of location-specific designs and biodegradable plastics can improve sustainability. Further refinement of packages of practices will enhance the long-term potential of low tunnel cultivation in vegetable production.