

Surface Covering Protective Vegetable Nursery for Hot Arid Climate

The north-western part of India is distinct for the promotion of arid horticulture owing to vast land resources and scope for cultivation of daily-need vegetable crop plants. Tomato, chilli and brinjal are high in consumption and abundant in demand. The unavailability of quality and disease-free seedlings during the transplanting period is a big problem and results in poor harvest. Extreme high and low-temperature condition is the prime constraint for the raising of seedlings in time with common practices of nursery. In this context, ICAR-CIAH, Bikaner has developed SOP's as a package of practices and defined as technology "Surface covering protective vegetable nursery scheme" for seedling production year-round. It is a local fabrication, simple, cost-efficient and an excellent mechanism to escape from the severity of temperature. Coat-type frames are arranged on raised beds (50-60 sq. m plot area and a pair bed of 25 × 01 m) and transparent polythene (120-200 gauge) and 40 mesh insect-proof nylon-net sheet is used to cover the structures in respect of winter and summer season sowing under hot arid climate.

VEGETABLE nursery management is a well-established process for raising crop-specific seedlings and handling them before the field transplanting. Tomato, chilli and brinjal are important vegetable crops of the north-western part of India, and thus, require quality and timely seedlings during the variable transplanting periods (January-April and June-August) for cultivating healthy harvest concerning season and region.

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The north-western area of the hot arid region experiences extreme temperature conditions *i. e.* high (March to October) and low (December-January) for prolonged periods, and scanty rain is also uncertain. Besides, high solar radiation, low humidity, desiccating hot winds, frost and cold waves are the associated factors restricting the production of quality and disease-free seedlings of the solanaceous crops during the desired planting period. Growers of the region are very uncertain about the ready-made seedlings of crop genotypes from the nearby favourable climatic states and are also not in a position to produce their planting material from open-field nurseries as per the desired time of transplanting.

In this region, the timely availability of solanaceous crop seedlings to raise spring-summer and rainy-winter seasons is always in concern owing to climatic adversity. Based on long-term studies on crop genotypes and the environment of production sites, a series of locally fabricated and cost-efficient structures have been designed for surface nursery development and tested at ICAR-CIAH with different types of covering materials for the

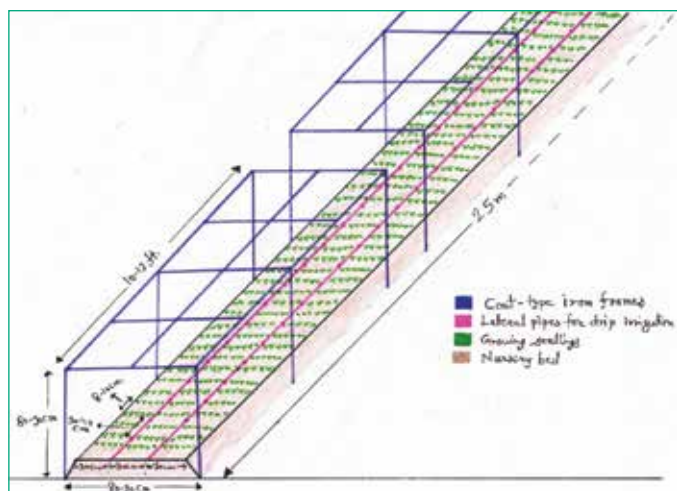
specific season. The coat-type structures and transparent polythene or nylon-net sheet are found to be most appropriate for developing surface covering protective vegetable nursery schemes and raising seedlings year-round at the production site.

Selection of Site and Nursery Preparation

The desert and sand-dunes landscape coarse soil is an excellent medium for surface nursery development and quality vegetable seedling production. Land area should be well protected, open and connected with the water supply pipeline. Nursery sites should be thoroughly ploughed and prepared during November and May and used in rotation. Soil solarization is essentially done during May month as the temperature is very high (above 45 °C). For this, wet the selected nursery site area soil with water and cover it with a transparent polythene sheet (120-200 gauges) for a week, and it should be air-tight.

For a hectare crop area seedling, 50-60 m² surface nursery plot is enough. It is prepared in two parallel beds (length × width of 25×01 m). The field should be prepared to the fine-tilth and enriched with organic manures. Apply 1.5 kg well-rotten and fine-grain sheep-manure or farm-leaf compost and 500 g vermicompost per square meter area of the nursery bed. Plough 2-3 times with power-tiller for thorough pulverization. Beds should be about 20 cm raised from field-plot.

For preparation of surface covering vegetable nursery, coat-type structures of 10-12 feet length and 80-90 cm width and height are fabricated using 1.5 cm wide and lightweight angle-iron. About 15 structures are enough



Schematic layout for surface covering protective vegetable nursery

for 50-60 m² nursery area with two beds and arranged properly just after seed sowing. For uniform and regular irrigation, a pair of lateral lines 30 cm apart (16 mm) with 4 lph in-line emitters at 30-40 cm distance is fixed on each raised bed. Transparent polyethene and 40 mesh insect-proof nylon-net sheet (3 m wide and 25 m length) are used to cover the coat-type protective structure with respect to winter and summer disease-free seedling production under hot arid climate.

Sowing technique: Line sowing is best for obtaining high-quality seedlings. Lines are made at 8-10 cm apart and perpendicular to the length of bed. First of all, 2-4 cm deep lines are made by use of pencil-thickness twig or wire and single seed sowing is done at 1-2 cm distances. Seed should be treated with fungicide and first watering is done with the use of rose-cane. With a protective nursery scheme, a seed rate of 150-175 g for chilli, 100-120 g for brinjal and 80-100 g for tomato is found optimum for the 50 m² sown area of two beds (25 m length and 1 m width) and to raise 25,000 to 30,000 seedlings as needed for a hectare crop planting.

Irrigation and inter-culture: After sowing and covering the coat-type structures, seed beds are drip irrigated through 16 mm lateral pipe-lines as laid down in a pair mode for the nursery. To maintain proper soil moisture and uniform water distribution through emitters, drip system is operated for 1.0–1.5 hours on an alternate



Soil solarization



Nursery bed preparation



Line sowing

day concerning the age of seedlings and weather of the season. The covering material of coat-type structures should be opened once a week only from the east-side for monitoring and two inter-culture operations, and hoeing is done at 12-15 days intervals.

Hardening: Hardening is a very important nursery practice and it should be done 5-7 days before transplanting. It is a physiological treatment given to young seedlings grown under protection to make their tissues firm enough to withstand unfavourable weather situations like low and high temperatures and dry winds. Here, nursery seedlings are exposed to sunlight for 5-7 days by removing covering material in a phased manner from the coat-type structures. In addition, one prophylactic insecticidal spray is given and some stress is created by withholding irrigation before uprooting and transplanting.

Plant protection measures: To obtain healthy and disease-free solanaceous crop seedlings, prophylactic and integrated measures are essentially needed in the nursery for managing damping-off, leaf-blight, leaf-curl, leaf-miner and borers. For damping-off, seed treatment with fungicide e.g., bavistin @ 2-3 g/kg and drenching of nursery beds is found beneficial. Leaf-miner can be managed by spraying indoxacarb 15.80 EC @ 0.5-0.8 ml/litre of water.

Provision of virus complex-free seedlings is a primary requirement for a healthy crop harvest and now, this is practicable with a protective vegetable seedlings production scheme as developed at ICAR-CIAH, Bikaner. Leaf-curl and viral complex diseases are spread by white-fly, aphid, jassid, thrips and other sucking insect pests, and it begins from seedling stages and continues to the crop harvest. This is the most serious issue in tomato, chilli and brinjal and it can be managed in an integrated approach:

Selection of proper field site for raising nursery



Arrangement of coat-type iron structures after sowing



Covering with 40 mesh insect-proof net sheet during the summer-rainy season



Covering with transparent polythene sheet during the winter season



Better germination inside coat-type structure



Healthy and disease-free tomato seedlings inside the nursery structure



Seedling (tomato) suitable for transplanting



Transplanting of vegetable seedlings during evening hours under hot arid climate

seedlings and adoption of SOP's as a package of practices of the "Surface covering protective vegetable nursery scheme" described in respect of season and crop-genotypes for the region in particular.

Timely sowing, inter-culture, foliar nutrition and spray of imidacloprid 17.8% SL @ 0.3-0.4 ml/litre water in the nursery at 15-18 DAS and 25-30 DAS or 2-4 days before transplanting.

After sowing, the seed-bed structures should be covered properly with insect-proof nylon net sheet as demonstrated. Remove the sick plants from the nursery and crop area, and adopt clean cultivation practices.

Transplanting: The surface covering protective vegetable nursery scheme is a practical concept for timely, uniform, disease-free and cost-efficient seedling production under hot arid climate. Summer and winter

month seed sown seedlings are ready in 25-30 and 35-40 days, respectively and found to be the best for the rainy-winter and spring-summer season crop harvest. Nursery beds should be heavily irrigated before up-rooting of seedlings and after-noon time is better for field transplanting. Seedling vigour and height play a critical role in the field establishment under the sandy soil. Therefore, robust seedlings having 15-18 cm stem height and good rooting should be used. While planting, stem of the seedlings should go 2 - 4 cm deep (from the stem-root junction) in the soil.

For further interactions, please contact:

¹Scientist (Vegetable Science), ²Principal Scientist (Horticulture)

³Scientist (Horticulture) *Corresponding author: ICAR-CIAH, Bikaner 334 006, Rajasthan E-mail: hramdhanari@gmail.com

Technology for Propagation of Clonal Rootstocks of Apple through Cutting under Greenhouse in Soilless Beds

Sunken beds of dimensions 2.5 0 ft (76 cm wide) and 1.0 ft (30 cm) depths were prepared. After preparing the sunken beds, the beds were filled with sand and cocopeat. The lower 6 inches (15 cm) of the bed were filled with sand while the upper 6 inches (15 cm) were filled with cocopeat. The purpose of digging out soil from the beds is to fill it with sand and cocopeat to make soilless beds conducive for planting the cuttings, and to avoid weeds and reduce the water requirement considerably. The cuttings of 30 cm size of pencil thickness (8-10 mm) with 8-9 buds were selected and planted in the first week of March in these beds. The lower portion of the cuttings was given a horizontal cut and light cut on either side of the cutting at the base to expose more of the cambium for callusing. Before planting, the cuttings were given fungicidal treatment (Carbendazim 3 g/litre of water) for 20-25 seconds and dipped in rooting hormone Indole Butyric Acid IBA (2500 ppm) for 10-15 seconds. The cuttings were planted in the soilless beds at a spacing of 3 inches (7.62 cm) both in a row-to-row and cutting-to-cutting to accommodate 52 cuttings per sq. meter area. With this technology, 40-45 plants with well-developed root systems were harvested per square meter area of the soilless beds. This technology will revolutionize the production of clonal rootstocks in the country from the wasted portion of the plant. By adopting this technology, the cost of rootstock/planting material will get reduced and dependence on import for quality planting material will decline drastically.



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