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Vegetable Nursery Excellence: A Guide to Successful Management

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Abstract

Nursery management plays a pivotal role in the successful cultivation of vegetables, serving as the foundation for healthy and robust plant growth. The nursery environment must provide controlled conditions conducive to seed germination, fostering healthy root development and sturdy stems in seedlings. Critical practices such as adequate watering, nutrient provision, pest and disease control, and gradual hardening off before transplanting ensure the resilience and adaptability of the young plants. Varietal selection and the creation of an ideal growth environment, with attention to spacing, irrigation, and environmental factors, form the cornerstone of effective nursery management. A well-managed nursery sets the stage for successful vegetable cultivation, contributing significantly to higher yields and healthy crop establishment in the main field. This article encapsulates key aspects of nursery management in vegetable cultivation. It encompasses seed selection, optimal germination practices, and meticulous care of seedlings.

Keywords: vegetables, nursery management, healthy seedlings & higher yields

Introduction

In the nursery, plants receive optimal care and growth conditions, ensuring their proper development. Nursery management significantly expedites the cultivation cycle for subsequent crops. The primary goal of effective nursery management is to provide superior planting materials for new agricultural regions and replanting efforts. Inadequate planting materials often result in decreased yields and unnecessary maintenance in transplanted fields. Various vegetables, including tomato, brinjal, chillies, capsicum, cauliflower, cabbage, knol-khol, Chinese cabbage, Brussels sprouts, broccoli, kale collard, celery, parsley, and cucurbits also

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necessitate nursery-raised seedlings for transplantation into the main field. Seedling production represents a substantial expense for vegetable growers, emphasizing the need to produce high-quality seedlings at a reasonable cost. Therefore, adopting efficient nursery growing techniques is crucial for growers to minimize overall vegetable production expenses (Chaurasia *et al.*, 2023). A vegetable nursery acts as a facility for nurturing young vegetable seedlings until they reach suitable maturity for permanent planting, ensuring optimal germination and subsequent robust growth before transplantation into open field conditions. The nursery bed refers to a prepared area within a nursery where seeds are sown to cultivate seedlings, while a seedling denotes a young sporophyte emerging from a plant embryo within a seed.

Why to raise the vegetable nursery?

- Quality seeds and seedlings are critical for achieving maximum yield in vegetable crops due to increased pest and disease occurrences and poor germination caused by inadequate moisture management.
- Hybrid seeds, although costly, are extensively used in India's vegetable cultivation as they offer higher yields and superior produce quality.
- Some high-value vegetable crops such as tomato, brinjal, capsicum, and cucurbits are transplanted after nursery cultivation to ensure optimal germination rates and healthy plant establishment, mitigating the high cost of seeds.
- Certain vegetables with small seed sizes and those reliant on hybrid seeds necessitate special care during early growth stages, making direct field cultivation impractical and costly.

Fig. 1 Nursery of Brinjal

Advantages of raising seedlings in nursery

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- Facilitating the growth and maintenance of a large quantity of plants per unit area.
- Efficient cultivation of valuable and tiny seeds without any wastage.
- Protection of seedlings from both biotic and abiotic stresses.
- Convenient care for young and delicate seedlings within the nursery.
- Improved management of seedlings using land, labor, and capital efficiently, unlike direct sowing, requiring minimal attention due to the small nursery area.
- Maintenance of a uniform and complete crop stand in the primary field.
- Easily creating favourable growth conditions for successful seedling cultivation.
- Early or stand crops in the field, potentially fetching higher prices upon harvest.
- Extra time available for preparing the primary field as the nursery is cultivated separately.
- Provision of favourable conditions for both germination and growth.
- Resolution of challenging soil-related issues.
- Simplification of weed control procedures.
- Accurate prediction of a uniform harvest date.
- Encouragement of entrepreneurship in rural areas.
- Generation of employment opportunities, especially for rural women.

Selection of site for vegetable nursery

- Continuous access to ample sunlight throughout the day
- Access to reliable and effective irrigation systems
- Adequate protection against animal harm and strong winds
- Limited presence of weeds
- Absence of water accumulation or logging
- Ensure convenient accessibility, preferably near a road while minimizing dust from the road
- Favourable soil conditions with efficient water retention capabilities
- Shielded from extreme heat conditions
- Provision of adequate drainage systems
- Isolation from neighbouring vegetable farms, ideally at least 50 meters away, to prevent the spread of pests and diseases**Preparation of land**

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The soil ideal for nurturing vegetable seedlings should range from loam to sandy loam, offering a loose and crumbly texture with rich organic content and efficient drainage. It's optimal to maintain a soil pH around 7.0. Preparing the soil involves deep plowing of the nursery area using either a soil turning plow or a spade, followed by 2-3 rounds of hoeing with a cultivator. It's crucial to eliminate all clods, stones, and weeds from the field, ensuring a level surface. Incorporating 4-5 kg of well-decomposed fine Farm Yard Manure (FYM) or 500 grams of vermi-compost per square meter into the nursery soil is recommended (Vishwakarma *et al.,* 2018).

Soil treatment

The soil hosts detrimental insects, their eggs, larvae, pupae, disease-causing fungal spores, bacteria, nematodes, and weed seeds, all of which can impede the growth and subsequent development of seedlings. These challenges can be addressed through chemical and solar treatments. There are various methods for soil treatment:

1. **With Formalin**: Applying 2.5 ml of commercial-grade formaldehyde per liter of water, the soil is soaked with 4-5 liters of this solution per square meter to saturate the topsoil to a depth of 15-20 cm. After drenching, the treated area is covered with a 200-gauge polythene sheet, allowing the formalin fumes to permeate the soil and eliminate pathogens. Following 48 hours, the polythene cover is removed, and the soil is loosened to facilitate the release of formaldehyde gas. The bed is left uncovered for 7-10 days before sowing seeds.
2. **With fungicides**: captain or thiram @ 5 g/m^2 are used.
3. **With Insecticide**: Insecticide, such as chloropyriphos @ 2 ml/litre of water is sprayed.
4. **With Hot Steam:** Following the airtight sealing using a polythene sheet of the designated space, continuous hot steam is introduced for duration of 4-6 hours using fume-generating machines**.**
5. **Soil Solarization**: The most suitable period for soil solarization occurs between April and June in the plains of North India, coinciding with temperatures of 47ºC or higher. This process induces alterations in the soil at physical, chemical, and biological levels.

Procedure of Solarization

After thoroughly moistening the elevated nursery beds, cover them with a transparent 200-gauge polythene sheet for 5–6 weeks, particularly during the summer. Wet soil conducts heat more effectively than dry soil, rendering soil organisms susceptible to heat-induced

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elimination. To ensure an airtight seal, enclose the edges with compacted damp soil to prevent moisture loss and inhibit air entry from below the polythene sheet. Following the 5–6-week period, remove the polythene sheet for seed sowing. This approach effectively manages weed seeds within the top 5-6 inches of soil, as well as controls insect pests, their eggs, larvae, pupae, and pathogens causing damping-off.

Seed treatment

Seeds harbor pathogens causing particular diseases and insect pests. To prevent issues related to diseases and insect pests, it is recommended to chemically treat the seeds before planting. This treatment safeguards the seeds from infections transmitted through both seeds and the soil. Fungicides such as captan or thiram @ 2 g/1kg of seed should be treated.

Nursery bed preparation: There are two types of beds that can be prepared**.**

- **Raised nursery bed**

Raised nursery beds are favored across all seasons, especially during the rainy period. These beds are constructed approximately 15-20 cm above ground level and are sized at 3×1 m or 5×1 m, aligning in the same direction as flat beds. This setup ensures proper drainage during rainfall and prevents water accumulation. A gap of 30−40 cm is maintained between adjacent beds to facilitate hassle-free cultural practices and shown in fig.2 **.**

Fig. 2: Raised bed

Fig. 3: Flat bed

Flat nursery beds

Flat beds, measuring 1 meter in width from East to West and 3-5 meters in length from North to South as required, should be arranged. A space of 30-40 centimetres is maintained between adjacent rows to create drainage channels, particularly for managing heavy rainfall or excessive irrigation during the rainy season and to facilitate bed maintenance. These beds are

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established during non-rainy periods, such as summer and winter, to prevent waterlogging and shown in fig.3.

Sowing of seeds

Seeds within the nursery are planted using various techniques such as broadcasting and line sowing. Of these, line sowing emerges as the most effective approach for sowing vegetable seedlings. The method involves creating shallow furrows 0.5 cm deep aligned width wise (East to West), maintaining a 5 cm spacing between them. Seeds are then sown individually or positioned approximately 1-2 cm apart along these furrows. A fine mixture of sand, soil, well-decomposed, and sifted Farm Yard Manure (FYM) or leaf compost, in a ratio of 1:1:2, is applied to cover the seeds. Subsequently, a gentle watering using a rose can is administered after covering the seeds.

Mulching

For optimal seed germination in the nursery, moisture, oxygen, and temperature are crucial factors. Hence, to foster the growth of robust and healthy seedlings, attention should be directed towards the following measures:

- Apply mulch to the seedbed immediately after sowing seeds until germination.
- Mulching plays a vital role in regulating temperature, preserving moisture, shielding seeds from displacement by rainfall, suppressing weed growth, and can serve as decomposed fertilizer later on (Kumar, *et al.*, 2023).
- Acts as a safeguard against bird damage.

It's advisable to remove the mulch during evening hours to prevent the adverse effects of intense sunlight on newly emerging seedlings (Ahmad et al., 2017).

Irrigation

The nursery beds need light irrigation facilitated by a rose can until the seeds germinate. Any surplus rainwater or excessive irrigation must be promptly drained from the field as necessary to prevent potential plant mortalities due to water saturation. The frequency of watering in the beds is contingent upon prevailing weather conditions. Irrigation should be done twice in summer and once in winter in a day.

Thinning

Thinning is a crucial task involving the elimination of weak, unhealthy, diseased, insect-infested, and thickly crowded plants from the nursery beds, ensuring a space of

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approximately 1.0 cm between each plant. This process of thinning enables equal distribution of light and air to every individual plant.

Weed control

To manage weed growth, various methods are employed including manual removal, planting cover crops, applying mulch, and utilizing chemicals such as herbicides (weedicides). Pre-emergence herbicides can be applied shortly after seed sowing to curb weed growth. For instance, spraying Stomp at a rate of 3 ml per litter of water on the nursery beds post-seed sowing is recommended. Additionally, Basalin or post-emergence weedicides like 2,4-D and Roundup prove effective in weed control.

Hardening

It's toughens the seedlings, enhancing their resilience against environmental stresses, ensuring better adaptation, and increasing their chances of survival and successful growth upon transplantation. Before the transplanting in main field, irrigation should be stop for 5-6 days. Then at day of transplanting, the light irrigation provides to seedling easily can uproot the seedling and less damages.

Uprooting and packing of nursery plants

Once the seedlings reach maturity (approximately 25-30 days), 5-6 leaves should be carefully uprooted for transplanting. During uprooting, utmost care should be exercised to avoid damaging any roots, ensuring the seedlings' early establishment; hence, open roots should be avoided for transplanting. A slurry is prepared using soil, water, biofertilizers, captan, or thiram. The seedlings, bundled in groups of 50-100, have their roots immersed in the slurry. Packing refers to the method employed to bind or group the young plants until they are transplanted. It is crucial to pack the seedlings in a manner that retains their firmness and enables them to establish themselves at the new site without losing vigor.

Conclusion

Efficient nursery management is pivotal in vegetable cultivation, ensuring healthy seedlings for successful crop production. It facilitates optimal growth conditions, offers protection from pests and diseases, and enables proper care during the critical early stages. Adequate soil preparation, ideal watering, and nutrient provision are essential. Nursery-raised seedlings enhance crop vigor, uniformity, and overall yield potential. Careful handling during transplanting further ensures successful establishment in the main field. Thus, effective nursery

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management plays a crucial role in guaranteeing robust seedlings, which are fundamental for achieving higher yields and quality produce in vegetable farming.

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