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## NURSERY PRODUCTION OF VEGETABLE CROPS: AN ADDITIONAL SOURCE OF INCOME FOR FARMERS

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The study focused on the management of nurseries for vegetable crops. A significant part of effective vegetable development is growing seedlings under good nursery management practices. The consistency of the growing media used in the seedling tray is affected by the growing media's physical, chemical and biological properties. For the effective development of high-quality seedlings, safe seedling tray technology has been developed. The key aim of growing seedlings in a protected structure is to grow off-season quality and disease-free seedlings to cultivate early crops in a protected condition or to achieve greater benefit in open field conditions. Good nursery management strives to make planting materials of the best possible quality available for new growth and replanting areas. The use of poor planting materials reduces yield and increases the overall cost. All key aspects of nursery management are discussed in this study, including the value of nursery, forms of nursery, nursery management, and various activities such as seedling, manuring, irrigation, plant conservation steps, weed control and nursery plant packaging.

The nursery is the location where seedlings are grown in the main parcels before transplanting. For vegetable crops, seeds are typically used to grow as seedlings. Therefore, depending on how the vegetable seed is sown, the consistency of the seed is very critical. There are certain crops that cannot grow by sowing the seeds directly into the plot, such as tomatoes, eggplant, cabbage and cauliflower. The seedlings of these crops must first be grown and then transplanted into the plot (Sharmila *et al.*, 2014). The vegetables whose seeds are directly sown in fields are generally coated with dirt after sowing, such as okra, mustard, legumes etc. In certain cases, if seeds are sown close to the soil surface, the risk of being sun-dried or consumed by birds or rodents is greater. Based on their size, there are many different varieties of vegetable seeds and it is important to keep the distances between plant to plant and row to row. The seeds are sown once in the nursery during off-season vegetable growing

and transplanted into the main plot to raise seedlings. At the same time, temperature, light, water, insects, pests and diseases are very vulnerable. Immediately after transplanting from the nursery bed, the seedlings are very small. Therefore, instead of raising them directly in the field, seedlings need to be grown in the nursery.

### Types of Nurseries

Based on time duration, the nurseries are of the following types:

**Temporary nursery:** In or near the planting field, a sort of nursery is established. When the seedlings are grown for planting, the nursery becomes part of the site being cultivated. Moving nurseries are often referred to as "flying nurseries." This form of nursery is only established for seasonal crops or a targeted project necessity. The nurseries for the development of transplanted vegetable crop seedlings are transient in nature.

**Permanent nursery:** This type of nursery is set up permanently for the growing of seedlings on a continuous basis. The functions that operate to establish this type of nursery are permanent. The permanent nurseries produce mother plants for the establishment of orchards. In this nursery, the work of growing seedlings is continued throughout the year. The size of nurseries varies depending on the purpose and the number of seedlings produced annually. In small nurseries, less than 1,00,000 seedlings can be developed at a time, whereas large nurseries can retain more than one lakh. Always, permanent nurseries need to be well-designed, appropriately situated and sufficiently supplied with water.

### Selection of Location

The essential prerequisite for establishment of a nursery is the site. The site is a location where plant seedlings can be grown. The attributes of a good location are:

- The proximity of a lane
- Location should be near a habitat
- Adequate atmosphere
- Neither shady area nor uncovered territory
- Enough light in the sun
- Good infrastructure for irrigation
- Strong state of the soil
- Good facility for transportation

- The region should be free from water logging.
- Pets and wild animals should be fenced in the field.

### **Preparation of Land and Soil**

The soil should be loam to sandy loam, loose and friable, rich in organic matter and well-drained with a pH of 7.00 for growing vegetable seedlings. Soil preparation includes deep land preparation either by spade or by moldboard plough, followed by subsequent 2-3 ploughing by the cultivator. After ploughing, remove all the clods, blocks and weeds from the field and lastly, level the soil. Mix 100 kg of well-rotten and fine FYM with 500 g of vermi-compost mixed in the soil per square meter (Pandiyaraj *et al.*, 2017).

### **Treatment of Soil**

Soil solarization practiced on the ploughed soil by covering the soil with plastic for around 4-5 weeks. Soil drainage is required 15-20 days prior to sowing @ 4-5 liters of water with a concentration of 1.5-2% per square meter of formalin solution and coated with a plastic membrane. Fungicides such as Captan and Thiram are applied for protection from pathogens. Furadon and Heptachlor insecticides are mixed with the dry soil @ 5 gm/meter square, applied during nursery preparation up to a depth of 15-20 cm of soil surface. Supply the hot steam water under covered polythene sheet continuously for at least 4 hours and in such way the soil prepares for seed bed preparation.

### **Preparation of Nursery Bed**

Nursery bed preparations are based on seasons and crop, the raised beds are prepared in the rainy seasons, whereas flat beds are prepared during winter and summer seasons. Soil mixture prepares with a ratio of 1:1:1 of soil, sand and well-rotten FYM or leaf mould and fills the raising structure of seedlings with prepared mixture so that it becomes easy to remove the excess water from the structure.

### **Beds in Elevated Nursery**

A width of 1 m with a height of 15-20 cm of bed is prepared at the ground level. An area of 30-40 cm is left between two beds, gradually it transforms in to furrows. For fast drainage, the nursery bed should be flat and slightly elevated in the middle relative to the margin. The bed should be prepared in the direction of east and west and the line on the beds should be made north to south (Singh *et al.*, 2017).

## Crop, Seed and Required Area

Requirement of seeds and raising area differs depending on the soil, crop, seasons and nursery raising techniques. The specifics are as under following:

Vegetable	Seed rate (gm)	Area required (cm <sup>2</sup> )
Tomato (hybrid)	200-250	75-100
Tomato (OP)	400-500	100-125
Brinjal	400-500	75-100
Chillies	500-600	75-100
Capsicum	400-600	100-150
Early flower	700-750	100-150
Mid late flower	400-500	100-150
Cabbage	450-500	75-100
Kohlrabi	700-750	100-150
Onion	8000-10000	500

(Source: Sabir and Singh, 2013)

## Sowing Techniques of Seed in the Nursery

After formation of the seed bed, the seeds are sown through various techniques in the nursery beds. Major techniques are as under follows:

**Broadcast:** Broadcasting is a common technique of seed sowing applied for most of the crop in direct seed sowing method. Under this method, seeds are transmitted and later covered the beds with well rotten, fine sieved and handled FYM or compost. The major disadvantage of this method is there is uneven distribution of seeds in the nursery becomes dense but this method is usually practiced.

**Line Sowing:** It is a best method of sowing seeds in nursery. Lines are rendered at a distance of 5 cm from the line 1 cm wide, parallel to the width. Seeds are planted or placed separately at a distance of approximately 1 cm apart. Lastly, cover the seeds with the fine mixture of soil, sand and FYM in the ratio of 1:1:1. After covering a light irrigation is must with the fine rose can.

## Manuring and Irrigation

Generally, an adequate amount of nutrients is not present in the soil that can be fulfilled through application of fertilizers and organic manures. Well-rotten FYM / manure and leaf mould can also be applied in the soil during soil preparation. Fertilizer application is required before transplantation to the permanent field. The use of fertilizers helps to provide a

strong root and shoot system for stable and robust development of plants. Irrigation depends on the various factors like type of soil, crop, season etc. During summer season, frequent irrigation is required, whereas winter and rainy seasons demands less irrigation.

### **Plant Protection of Saplings**

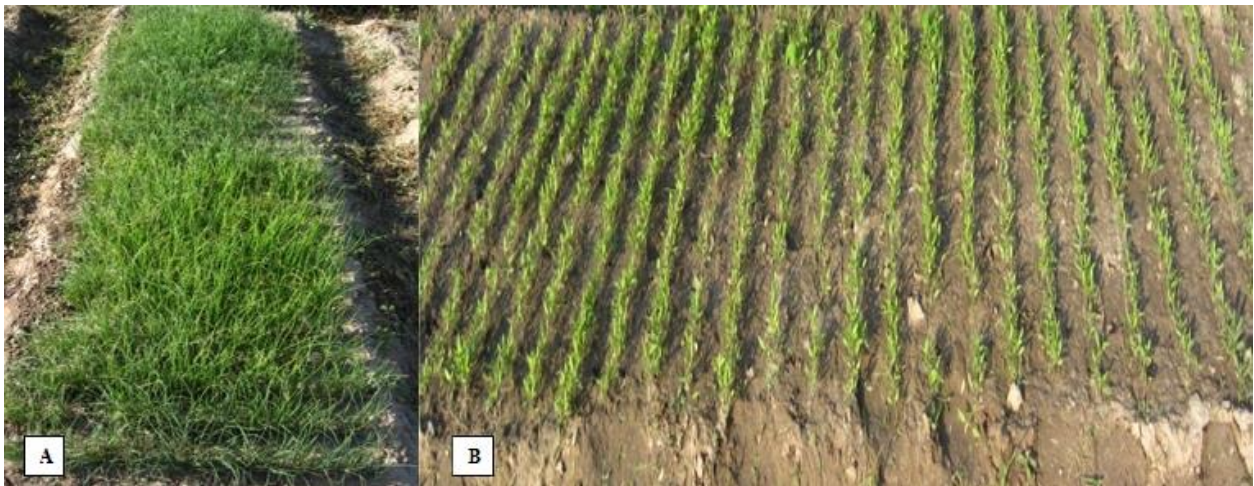
The implementation of plant conservation measures is required well in advance and in a scheduled manner for the efficient raising of nursery plants. Regular observation should be adopted for better protection of saplings from pests and diseases. Unfortunately, if any disease or pest attacks on the nursery treatment should be applied immediately as per identification.

### **Regulation of Diseases in Seedbed**

Damping off is the major disease at nursery stage can be controlled with pre-emergence treatment. Strong sanitation conditions are also effective for control the same. Moreover, preventive steps such as treatment with 50 per cent ethyl alcohol, 0.2 per cent hypochloride with calcium and 0.01 per cent mercury chloride are also effective. These therapies are applied for 5 to 30 minutes. Seed treatment is very effective to control the damping-off. Major types of seed treatment are as under follow:

- **Disinfection:** By using formaldehyde, hot water or mercuric chloride, the bacteria presented in seed can be destroy.
- **Hot water treatment:** Dry seeds are placed in hot water for 10-30 minutes at a temperature of 48°C - 55°C.
- **Protection:** Organo-mercuric and non-mercuric compounds such as agallal, aretan-6, and tafasan-6 should be applied for dry seed treatment. The seeds should be placed in seed jar for soaking for control of same.
- **Soil treatment:** Soil consist with the toxic fungi, bacteria, nematodes and even seed of weeds that have a negative impact on plant growth and development. These problems can be controlled by heat and chemical therapy. Under heating therapy, there is need to treatment the soil at 60°C temperature for around 30 minutes duration.
- **Chemical treatment:** For chemical treatment of the soil, chemicals such as formaldehyde, methyl bromide, chloropicrin, vapam are used. These treatments can also be applied for controlling diseases such as rust, powdery mildew, leaf blot, bacterial blight and yellow vein mosaic. *Tricoderma viride* can also be used as a bio-fungicide.

- **Weed management:** Weeds compete for food, space and other essentials with plants, so timely weed control is important. The use of cover crops, mulching and use of pesticides (weedicides) is practiced for pot control weeding. It is helpful to use pre-emergence weedicides such as basaline or post-emergence weedicides such as 2,4-D and roundup.
- **Steps against cold and heat:** The younger seedlings are vulnerable to intense sunshine and low temperatures. Shading with the help of a 1-metre-high timber frame can be used to shield from heavy sunshine. The net house and green house can also be used for protection against same.



**Fig. 1.** Raising of vegetables nurseries (A) onion and (B) tomato.

### Nursery Management

Nursery plants requires proper care and management either after before or after germination or have been raised from other origins like rootstock or through the technique of tissue culture. Generally, nurseries grow in open nature (field) where it faces climates of region. It is the responsibility and primary goal of a commercial nursery grower to provide the nursery plants with sufficient conditions required for their growth and production (Singh, 2012). This is the main nursery management job that involves all such operations right from the emergence of young plants until they are developed or ready for plantation in main field for further development and production.

### Packing of Nursery Plants

Packing is the process or practice in which young plants are attached or held together before they are transplanted. saplings must also be packaged in such a way that they do not lose their turgidity and are able to build themselves on the new site. At the same time,



successful packaging guarantees their transplant effectiveness. Generally, wooden boxes and plastic bags are used for carrying baskets. Banana leaves are also used in certain parts of the world to bundle the plants with their earth ball. Mostly, this practice is adopted in rural areas.

### Control of Sale

Generally, nursery market is on peak during the rainy season, as it is favorable season for transplanting of saplings. Most of the nursery growers are able to sale their saplings in locality areas while their nursery growing capacity area high. So that to favorable policy would be profitable for nursery growers as well as those farmers who purchased saplings form market. Implementation of advertisement tools like social media, daily newspapers might be helpful for nursery growers for selling nurseries in remote area.

### Conclusion

The production of vegetable nurseries has highly commercialized India, in which most farmers purchase their saplings from experienced growers. Various factors affect to better seedlings production like high-quality seeds, growing media with good drainage, water holding capacity and application of fertilizers. Moreover, seedlings are germinated under more or less optimum conditions to achieve uniform stands and are cultivated under greenhouse conditions in a safe culture. Under these conditions, the rate of plant growth, root structure, plant height and vegetative growth can be closely regulated. In order to increase the plant sizes, there should follow the thumb rules of nursery production and container cell sizes should be changed timely for proper development of saplings. The use of tray filling robotics in the production under greenhouse and the mechanization of both the planting and growing process, as well as the fertilization of the tray and harvesting process, will further minimize the requirements of labour in nursery development. Production with nursery has been reduced the costs incurred for seed, moreover development of plants by seed takes more time to produce fruit and complete their life cycle. In the future, several more crops, especially those of high economic value and potentially high seed cost, may be grown as seedling transplants.

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