Agnote

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# Raising Vegetable Seedlings in Containers

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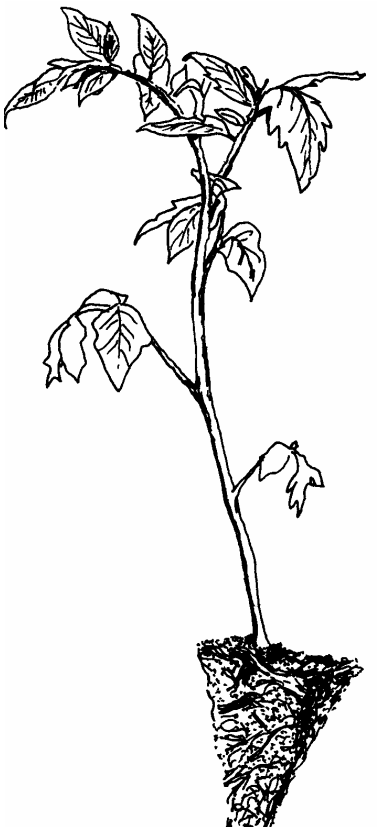
The first step towards achieving a maximum vegetable crop production is the establishment of a healthy uniform stand of seedlings. By raising the seedlings in containers, the grower has more control over the initial development of his crop. Directly seeded crops may be subject to a number of hazards in the initial stages such as poor or uneven germination, inclement weather causing high soil temperature, or heavy storms washing seed away or damaging germinating seedlings. The gaps left in the crop can cost the grower in terms of reduced yield and, if they are replanted, higher costs, uneven maturity and an extended harvesting period. However, when using seedlings ensure they are not suffering from insufficient nutrients or from pests and diseases. They must not be stressed by drying out or by being left too long in containers before planting out.

Well grown container raised seedlings have a number of advantages over other methods of crop establishment, including:

- Fewer losses at transplanting.
- Earlier establishment at the beginning of the Dry.
- Plants are already quite advanced by the time the land is prepared leading to earlier harvesting.
- Less transplant shock resulting in more uniform flowering compared with bare-root seedlings.
- Small seeds (e.g. cabbage and tomato) have a better chance of even germination.
- Better plant uniformity.
- Less time in the field, fewer risks, less irrigation and sprayings.



However, there are a number of disadvantages in raising seedlings in containers such as:

a. Cost of capital structures (shade houses), potting mix materials, equipment (concrete mixer, irrigation, containers) and labour.

b. Some crops such as crucifers, tomatoes and capsicum are well suited to this system, while others such as carrots, onions, lettuce, pumpkins, watermelons and sweet corn are not.

c. There will be some transplant shock, especially if the seedlings have not been hardened off properly before planting out.

## POTTING MIXES

Numerous potting mixes have been used quite successfully for raising seedlings. Good potting mixes should have the following properties:

- Good water retention.
- Adequate aeration.
- Good nutrient holding capacity.
- Freedom from pests and diseases, particularly damping off organisms. This may require sterilisation of some materials but should not be necessary with peat and vermiculite.
- Permeability to allow the plant to form a solid mass of roots which can be easily pulled from the container with the root mass intact.
- Ready availability.
- Uniform quality.

German peatmoss and vermiculite are well suited for this purpose and mixed at 50:50 (peatlite) give an ideal mix which also has the advantage of being light in weight, clean to work with, has a good nutrient exchange rate and is elastic, thus allowing the roots to compress the media as they develop.

Other materials which could be used are coarse sand, rice hulls, peanut shells, crushed bark and composted sawdust (only from untreated timber). All these may have various disadvantages such as introducing weed seeds and disease organisms, and are often quite variable in their physical and chemical structure. Animal manures and soil are not recommended as they can harbour diseases and weed seeds and often restrict drainage and aeration.

## NUTRIENTS

The following rates are for German peat moss and vermiculite mix (peatlite). Vermiculite contains a moderate amount of available potassium, but soil-less mixtures without vermiculite would require additional potassium.

Phosphorus is an important element and is involved in healthy root development. Some plants such as tomatoes take up most of their phosphorus requirements in their first few weeks of development, making it essential to have the phosphorus available in the mix right from the start.

Plants require relatively large amounts of nitrogen throughout their growth. High levels of nitrogen can damage the root system so an initial "starter" dose of nitrogen should be mixed with the potting mix. This is rapidly depleted through plant use and leaching, requiring regular applications in the form of a liquid fertiliser from about the second week after germination.

As peat is naturally acid, relatively large amounts of neutralising agents are needed to raise the pH. This mix (see below) has been modified for tropical conditions to have a pH of 6.0-6.4 and an electrical conductivity of 0.5-0.8 ms/cm. Peatlite mixes are developed for southern, cooler conditions. High rates of added nutrients should not be used under tropical conditions as seedlings scorch and die.

## THE MIX

**Main Ingredients**

| | | |
|---|---|---|
| Peat (shredded) | 20 L | (two heaped 9 L buckets) |
| Vermiculite | 20 L | (two heaped 9 L buckets) |

**Additives**

| | |
|---|---|
| Dolomite | 340 g |
| MAP (mono ammonium phosphate) | 5 g |
| KNO3 (potassium nitrate) | 6 g |
| Trace element mix (e.g. Micromax) | 6 g |
| Water | 3 to 4 L |

This modified peatlite mix has only small amounts of essential plant nutrients in order to keep the conductivity down to acceptable levels. As a result, supplementary feeding with nutrient mixes such as Phostrogen® and Aquasol® is essential for good seedling production. Depending on weather and shade conditions supplementary feeding should commence at half strength at the first true leaf stage and be carried out at least twice a week until the final week before transplanting when no nutrients should be added. Immediately prior to transplanting a nutrient drench will help establish seedlings in the soil.

## MIXING

The key to a successful mix is uniformity throughout the whole process, i.e. in each mix as well as between batches. Without a uniform potting mix you cannot expect to grow uniform plants.

The peat must first be shredded to facilitate mixing. Carefully measured amounts of peat and vermiculite are then placed in a concrete mixer, together with the chemical additives.

The chemical additives should be finely ground beforehand to ensure even distribution throughout the mix. After the ingredients have been thoroughly mixed add water to make the mix moist but not wet. Mixing is then repeated. The mixture should be used within five days, but should be allowed to stand for two days until the pH stabilises. It must be kept moist during this period.

## CONTAINERS

There are a number of re-usable containers in the market which are ideal for raising seedlings. With care, these can be used several times.

Speedling® trays are made of styrofoam and are rigid and can be placed on racks. The cells are tapered and promote an even vigorous root system, the tap root being air pruned when it reaches the bottom of the cell. The main disadvantage with this system is that the trays are bulky and when not in use require a relatively large storage space.

Growing trays are more flexible and require solid benches if used above the ground. They are available in black polythene as well as long life white PVC. The trays come in a range of different sizes and nest when stacked, needing less storage space. These trays are cheaper than Speedling® trays.

## PLANTING

Fill the trays and water lightly if necessary. A dimple board can be used to make a small depression in each cell. Place one to two seeds in each cell and cover with a thin layer of peatlite mix. Then give the tray a good watering to leach out any excess salts and ensure the mix is evenly moist. Place the trays in a protected area away from breezes and direct sunlight to ensure even germination.

## MANAGEMENT

After planting, the trays can be drenched as a precaution with a suitable fungicide against damping off.

Seedlings should be watered as often as necessary to keep the mix damp. That would be two to three times daily in hot, dry weather, once per day in cool weather. Over watering leaches nutrients from the mix. Plants should not be watered late in the afternoon as this encourages disease. Once a fortnight the trays should receive a heavy watering to leach out any harmful salt buildup due to supplementary fertilising (see Nutrients).

As a precaution against pests and diseases a weekly spraying with a fungicide and an insecticide should be carried out. Never exceed the recommended rates for sprays and drenches, as container seedlings are sensitive to high concentrations of chemicals which can burn roots and leaves.

Seedlings should be raised under 32% shade and protected from strong breezes. They should be protected from rain at all times to prevent physical damage to plants as well as leaching nutrients from the mix. During the "wet" season plastic sheeting or reinforced fibreglass sheets can be placed over the propagation house. This should be as high as possible above the seedlings i.e. at least 1.5 - 2 m, or scorching may occur.

Seedlings are hardened off to reduce transplant shock at planting. This should be done in gradual stages beginning about two weeks before planting out. Plants are exposed to full sun in the mornings only for the first few days, eventually they can be left in full sun and exposed to breezes all day. Avoid over watering and reduce the nitrogen supply during this period, but do not over stress the plants as this can affect their vigour when planted out. During wet weather the trays can be placed on a trailer or trolley and wheeled under cover.

Hygiene is important at all stages of production. Trays should be washed and sterilised before re-using. This can be done by submerging them for 30 minutes in a 200 ppm bleach solution. This solution is made by dissolving 500 mL of household bleach (4% available chlorine) in 100 L of water. Peat moss and vermiculite are generally free of pests and diseases, but if sand or soil are used the mix should be sterilised. Trays should not be placed on the ground but rather on shelves or concrete slabs as diseases can be picked up from direct contact with the soil or by splashing onto the trays. Water should be clean, as muddy water from dams and creeks can be a source of infection.

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