PROCEDURES FOR PRODUCING AND USING LEAF-BUD CUTTINGS (LBCs) FOR MINITUBERS PRODUCTION

Yam production has traditionally been done using small tubers sorted after the harvest of a ware yam crop. Recent research has demonstrated that yam multiplies faster when mother plants are produced from disease-free planting materials in a screenhouse, and leaf-bud cuttings from the plants are used to produce minitubers. The following procedures explain how to multiply yams using leaf bud cuttings rapidly.

Produce mother plants in the screenhouse for minituber production

Requirements: Water, cleaning brush, sponge, cleaning agent (detergent), disinfectants and spraying tanks.

1. Remove all dirt and plant residues from the screenhouse.
2. Take out all substrates used in the previous planting cycle.
3. Wash the screenhouse nets thoroughly and all the materials inside, including the planting containers, with clean water. Rinse with 5000 ppm of sodium hypochlorite (household bleach).
4. Prepare a mixture of 100 g of Mancozeb plus 100 ml of cypermethrin in 10 litres of water. Mix the chemicals with a small quantity of water, then adjust to the required volume.
5. Spray the screenhouse and its contents with the above solution.
6. Clean also the surroundings of the screenhouse.

Preparation of the growth medium

Requirements: Substrate, disinfectant and means of sterilization

1. Use any available media for growing yam, including rice husk (fermented, carbonized and ashes), cocopeat, sand, and good topsoil.
2. A combination of the above substrates may also be used, e.g., 1:1 fermented rice husk and topsoil.
3. For organic substrates, heat sterilization (82oC for 30 minutes) is used, and for sand, treat it by washing it with 5,000 ppm of sodium hypochlorite to destroy pests and diseases.

Sourcing and preparing planting materials

Get planting materials from a reputable source (registered seed company or a research institute mandated for yam early generation seed production).

Three types of planning materials could be used to start a mother garden:

a) Minitubers of 1 – 5 g.
b) Plantlets derived from LBCs or SAH. They should be six to 10 weeks old without signs of tuberization.
c) LBCs from well-nourished disease-free plants in the screenhouse.

Planting materials: minitubers, plantlets and leaf bud cutting

1. Select healthy viable minitubers of less than 1 - 5 grams, which exhibit signs of dormancy break (visible young sprouts). Shoot emergence is delayed when dormant tubers are planted, and some may rot in the substrate.
2. Dip tubers in a solution of fungicide and insecticide (as above) for 10 minutes and allow the solution to dry on the tubers for about six hours.
3. If using plantlets, handle carefully, ensuring the plantlet has a ball of substrate around its roots.
4. See the preparation of LBCs below.
5. Plant in prepared medium.

Planting to produce mother plants

1. Place treated substrate in the desired container, which may be crates, buckets, polyethene troughs, nursery bags, etc. The number of planting materials to plant per container depends on the size of the container, the quantity of substrate and the size of the minituber desired.

2. Plant minitubers, plantlets or LBCs spaced 10 cm apart.
3. Gently firm the substrate around the planting material.

Watering mother plants

Apply water to the substrate immediately after planting. For freshly planted LBCs and plantlets, ensure that the leaves are not dehydrated at any time within the first two weeks of planting. After that, the quantity and frequency of watering depend on the substrates used and the prevailing weather conditions, which significantly affect the rate of water loss. In cool months, water once or twice a week for a substrate that retains moisture, while during hot periods, watering may be done daily when light substrates that cannot retain water for an extended period are used.

Fungicide application

To prevent the spread of fungal infection, spray plants fortnightly with broad-spectrum fungicides like Mancozeb 80% WP (7 g/L of water).

Insecticide application

Hand-picking pests should be done when there is a mild infestation. Once a serious infestation is observed, apply an insecticide such as Cypermethrin Chlorpyrifos. Mix 7 ml per litre of water and spray on both sides of the leaves. A sustained integrated pest management system is advised to prevent significant plant damage.

Staking of mother plants

A trellis system is recommended for staking. Ropes are tied between two strong poles at the beginning and end of a row of plants, and strings direct the plants to the rope. See the picture of the mother plants below.

Fertilizer application

Apply fertiliser (NPK15:15:15) to the plants at intervals during their growth.

1. The first application is made four weeks after planting (WAP); at this stage, apply 18 g of NPK 15:15:15 fertiliser per bucket containing 15 kg of soil with two plants.
2. At 8 WAP, apply 9 g of NPK 15:15:15 fertiliser as the second dose.
3. Follow up by applying 9 g of NPK 15:15:15 one week after every harvest of vines.
4. Adjust the rate of sfertiliser application depending on the type and quantity of substrate.

Mother plants in a screenhouse

Cutting vines from mother plants, handling, storage and transportation

Requirements*: Sharp cutting implement, container of clean water, plastic bags, Styrofoam boxes*

1. Apply water to the planting medium of the mother plants the day before cutting to ensure that the plants are not under stress when harvesting vines.
2. Cut vines from healthy mother plants, leaving two to three nodes at the base of the plant for regrowth.
3. Place the cut vine into a container of clean water.
4. Handle vines carefully to avoid damage to the nodes and leaves.
5. Vines can be stored for two to three days in plastic bags with perforations at the top portion.
6. Vines are safer in Styrofoam boxes when transporting over long distances.

7. The vines must be kept moist during storage and transportation. After being cut from mother plants, they can be kept in good condition for up to one week.

Cut vines in a plastic bag for short-term storage and a Styrofoam box for transportation and storage.

Preparation of leaf bud cuttings (LBCs)

Requirements: *A sharp implement (scissors, razor blade, budding knife), basins/buckets, water, fungicide, stirrer, and hand gloves.*

1. Get cuttings from healthy and robust 10 – 12 weeks-old mother plants.
2. Use a sharp implement such as scissors to cut vines.
3. Immediately drop the vines into a container of clean water.
4. Cut the vines into LBCs 1 cm of stem piece on each side of the bud and a leaf.
5. Drop the LBCs into a fungicide solution (Mancozeb 80% WP at 2 g/litre).

Preparing leaf bud cuttings, vines in water and LBCs in fungicide

Planting and maintenance of LBCs in the Screenhouse

***Requirements**: Planting medium (substrate), containers, water, watering cans or irrigation system.*

1. Prepare the substrate and wet it with water.
2. Place the wet substrate in the containers.
3. Plant the LBCs with the stem portion and half of the leaf stalk buried in the substrate. The leaf blade should be fully exposed.
4. Avoid overcrowding the LBCs. Overlapping leaves will prevent water from getting to the substrate.
5. Water the LBCs immediately after planting. Keep the substrate moist and apply a mist to the leaves, especially during hot weather.
6. **Cuttings must not dehydrate, especially during the first two weeks after planting. Unrooted cuttings with flaccid and rolled leaves rarely survive.**

Establishment of Leaf-bud Cuttings (LBCs) in the field

Site selection for field planting

Choose sites with a nearby water source, fertile soil, and a good crop rotation history for planting LBCs. To prevent a mixture of varieties, avoid planting on land with a history of yam during the past three years.

Land preparation

1. Where fertile soil is unavailable, apply poultry manure at 5 - 10 t/ha. Applying neem leaves/seeds in powdery or liquid extract helps mitigate soil-borne pest (nematode) infestation.
2. The field should be disc-harrowed and made into 1.2 x 10 m long beds spaced 0.5 cm apart.

Construction of shade

A double-layer shade provides a conducive environment for the fragile LBCs to establish. The shade's microclimate protects the planted LBCs from the detrimental effects of direct sunlight. The shade is provided for the LBCs until 6 - 8 WAP when plants have 2 – 4 open leaves.

Planting of LBCs in the field

The cut LBCs are planted with the stem portion entirely buried in the prepared substrate. Firm the substrate around the planted LBC.

Watering LBCs after planting

During the first two weeks, water once or twice daily, depending on the prevailing weather conditions. Also, periodically sprinkle water or mist the planted LBCs to prevent dehydration.

Fertilizer application

The optimum performance of LBCs depends on the availability of nutrients. To Prevent undue competition between plants, provide sufficient nutrients. For example, apply 250 kg/ha of NPK 15:15:15, 4 WAP and another 200 kg/ha 8 WAP.

Staking established plants

Stake using the trellis system described above for mother plants.

Weed control

Once LBCs are planted, avoid using herbicides. In a well-mulched field, weeds are hand-picked from the top of the bed, and the furrows are weeded using hand-held hoes.

Removal* of *shade

The first layer of shade is removed at about 6 WAP, while the second layer is removed at 8 WAP (when plants have 2 – 4 leaves). This allows the plants to adapt to the outside environment. Once the shade is removed, the plant's growth becomes faster due to more access to sunlight.

Harvesting

Minitubers can be harvested as early as three months after planting LBCs. However, allowing plants to grow for five months will produce bigger seed yam tubers.

Cleaning, treatment/storage

Harvested tubers are cleaned by trimming the excess roots and vines. Before storage, a mixture of cypermethrin and mancozeb should be used to treat the harvested tubers. Allow wounds on tubers to heal well before they are packaged, labelled and kept in a storage facility, which should be clean, cool, well-aerated and protected from rodents.