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A RAPID PROPAGATION SYSTEM FOR CASSAVA

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A RAPID PROPAGATION SYSTEM FOR CASSAVA[1]

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Cassava, like most vegetative propagated crops, has a slow rate of propagation. A mature cassava plant will give about 10 to 30 normal sized (25 cm) stakes after one year; thus the propagation rate is only 10 to 30 times per year. This rate can further be increased to about 100 times per year by using two-node cuttings, but considerable care is required to obtain good results with this system.

These rates of propagation are not sufficiently rapid to give large short-term increases in planting material from new varieties or to supply disease-free stock for commercial planting. A simple rapid propagation method that requires minimum facilities to function was developed by inducing stake sprouting and shoot rooting. This method can provide approximately 36,000 cuttings per year from only one mature plant. This is not the only system that can be used; for example, rooting under mist or in peat pots in humid chambers has been successful. However, this system is the easiest to use to date.

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1 The initial work on propagation was the research for D Wholey's PhD thesis; later J C. Lozano rooted plantlets in water under laboratory conditions and then J H Cock put the system together.

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Materials

1. **Propagation frames.** A level, well-drained site (1.20 x 5 m) should be chosen and delimited by a wall of hollow concrete blocks (0.4 x 0.15 x 0.10 m). The blocks should be placed with the holes in a vertical plane, sealing the holes at the bottom with concrete to form water reservoirs. Crushed stone (about 5 cm) is placed to a depth of 10 cm in the area enclosed by the blocks. The frame is then filled with a soil that drains well. Both sand and lateritic soil brought to pH 6.0 gave good results. A roof made from wood or aluminium covered with polyethylene is placed over the centre of the holes on the blocks (Fig. 1).

2. **Rooting area.** A table covered with a transparent propagation roof frame over it to prevent rain water splash is used. The propagation frame must be higher than 1.50 m to prevent high temperatures inside resulting from sunshine.

3. **Containers.** Small 25-ml glass flasks, 2 cm in diameter, are used (Fig. 2). Old medicine vials are a cheap and effective container.

Figure 1. The propagation frame showing many shoots ready for cutting.

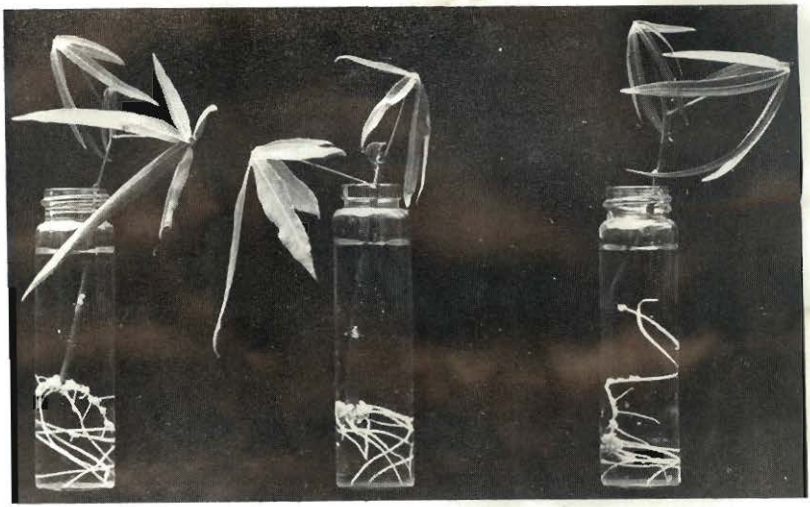

Figure 2. **Shoots rooted in water. These plants have passed the stage when they should be planted.**

4. **General sundries.** Razor blades and a caldron to boil water, sodium or potassium hypochlorite for tool sterilisation, and a soil sterilant (methyl bromide, Terraclor, Brassicol, etc.) are needed.

Methodology

Shoot production. Incorporate fertiliser in the seedling beds if soil has low fertility. Sterilise the soil using a soil fumigant or chemical sterilant according to the manufacturers' instructions. Many of these are highly toxic, thus great care should be taken in their use.

From a mature plant (eight months or older), cut two node cuttings from the woody mature part of the stem, using a saw. Plant these cuttings horizontally, 1 cm below the soil surface (Fig. 3). Moisten soil to field capacity and maintain at this level by watering daily. Fill the water reservoirs in the concrete blocks with water and place the roof on the concrete blocks.

About three weeks after planting, a considerable number of shoots form (Fig. 1); with a razor blade sterilised in 1 percent sodium or

Figure 3. Planting two-node cuttings in the propagation frame.

potassium hypochlorite, cut shoots of 8 cm or more just below a node, leaving a 1-cm stub on the parent cutting. Shoots will continue to be formed (Fig. 4); these should be harvested at three- to four-day intervals, once they reach the appropriate length (8 cm).

Figure 4 Two-node cuttings after repeated removal of young shoots shows the capacity to produce up to nine shoots per node planted.

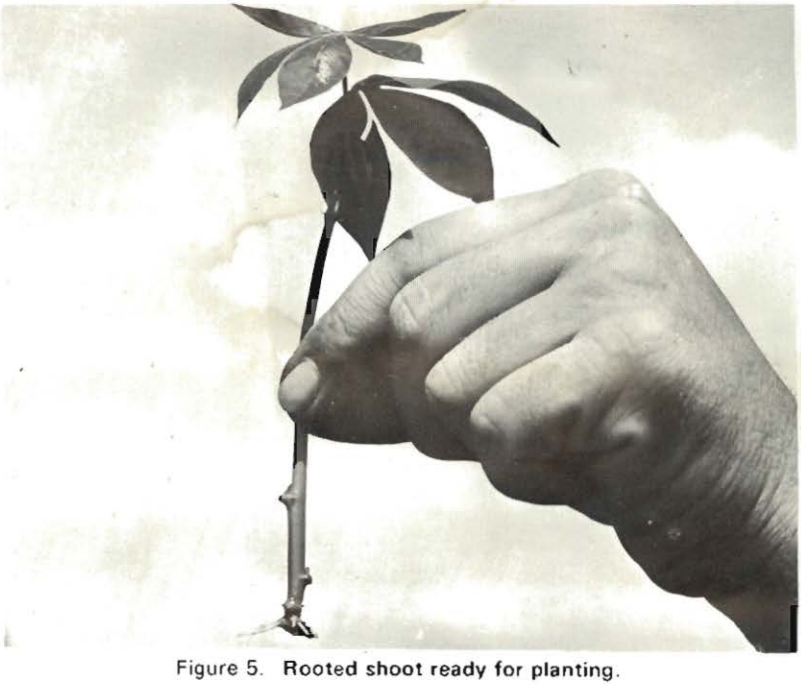

Figure 5. **Rooted shoot ready for planting.**

Sterilise the glass flasks by placing them in boiling water for at least half an hour. Boil more water for half an hour, allow to cool and then fill flasks to 5 cm.

Clean latex that has oozed from the cut end of shoots by washing them in a container filled with boiled water. This water should be changed at regular intervals. Place shoots in flask (1 shoot/flask is best) and leave them inside the rooting area.

During the first week many leaves may wilt and fall. After one to two weeks, shoots will form roots (Fig. 5). When the first roots appear, transplant directly to the field, taking care not to damage the roots. The depth of planting should be such that the plants are buried to the base of the lowest leaf (5 cm approximately). Plants should be well watered for the first ten days.

Discussion

The method depends on the growth of new shoots from the cut base of the first shoot (Fig. 6). It was found that up to nine shoots can be produced from one nodal unit; it is reasonable to expect a production of eight shoots per two-node cutting during the four months after planting.

Starting from a mature plant with 30 normal cuttings, the rate of normal methods can be compared with the rapid system.

Normal System

One mature plant

↓

30 mature plants or (30 x 30)= 900 normal planting pieces after one year

Rapid System

One mature plant

↓

150 two-node cuttings after four months (150 x 8)= 1,200 plants that give (30 x 1,200)= 36,000 normal planting pieces after one year.

In many parts of the world cassava bacterial blight (CBB) is a severe disease, causing yield losses of up to 50 percent. The disease spreads rapidly through diseased propagating material, reducing establishment and yield and increasing the incidence of root rot. With this propagation method, healthy material can readily be produced and CBB-free "seed" stock built up.

Thus the system can also provide rapid build-up of planting material free of cassava bacterial blight.*

If planting material is to be taken from a CBB-infected plantation, the following recommendations are suggested:

1. Select those apparently healthy plants inside the plantation. They can be identified because of absence of defoliation, dieback, leaf

* See CIAT Annual Reports 1973, 1974 and Cassava Bacterial Blight (CIAT Series IE-8)

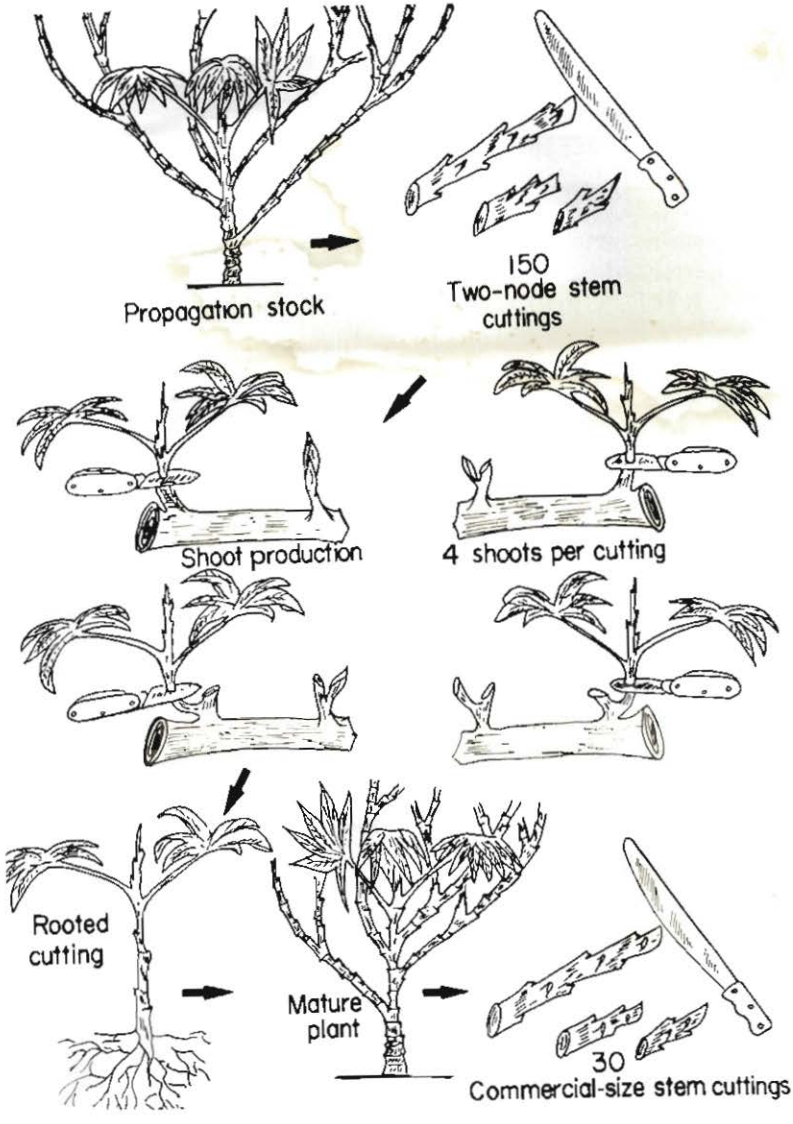

Figure 6. The rapid propagation system.

spot and blight, and exudation of gum along the green stem portions.

2. Take the most lignified (mature) portion of stems and cut them, sterilising tools in between cuts with 5 percent solution of commercial formalin.

3. Plant this material in isolated propagation frames, avoiding spray watering. After sprouting, select only those shoots that are healthy. These must be harvested before 20 days after planting because CBB is able to infect young shoots systemically from diseased cuttings.

4. Observe shoot-rooting material daily and eliminate any suspicious or CBB-infected shoots. After shoot harvesting, burn initial planting material and sterilise frames and covers with a soil sterilant (Dowfume, formalin, etc.) before replanting.

Plantlets obtained by this method constitute the foundation block of CBB-free material. These must be planted in an isolated field free of previous CBB infection or in a field that has had no cassava or volunteer cassava plants for at least six months. Plants obtained are sources of clean material for further propagation six to ten months after planting.

Generally, it is recommended to use only CBB-free planting material for propagation since contamination could occur easily if care is not taken.

If a plantation is CBB-infected, clean material must not be planted immediately after harvesting. The elimination of CBB from the soil may be possible through a fallow or crop rotation, releasing the land from cassava for at least six months. All infected cassava residues should be destroyed by burning. It is also recommended that large areas be maintained between clean and infected plantations because of danger from infection through wind-borne rain,soil splash, insects, irrigation, drainage water, and any other mechanical and accidental means of CBB dissemination.

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