CIP SLIDE TRAINING SERIES

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SINGLE-NODE CUTTINGS, a Rapid Multiplication Technique for Potatoes

Series I: Rapid Multiplication Techniques

Guide-Book I/2

INTERNATIONAL POTATO CENTER (CIP)
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INTERNATIONAL POTATO CENTER (CIP)
DEPARTMENT OF TRAINING AND COMMUNICATIONS

Series I: Rapid Multiplication Techniques

This CIP Slide Training Series was produced by the Department of Training and Communications of the International Potato Center to guide training of those who are or will be involved in the implementation of rapid multiplication techniques for potatoes in developing countries.

The objective of CIP Series I is that each participant describe the steps involved in four rapid multiplication techniques for potatoes presently developed. The techniques are:

- Sprout Cuttings (Set 1)
- Single-Node Cuttings (Set 2)
- Stem Cuttings (Set 3)
- Leaf-Bud Cuttings (Set 4)

The CIP slide training sets are designed to be used in instructor-directed training. They may also be used for individualized learning, in which learners may study directly from the guide-book aided by the slides, or for on-site recall. In all cases, complementary practice activities are essential for effective skill development.

SINGLE - NODE CUTTINGS a Rapid Multiplication Technique for Potatoes

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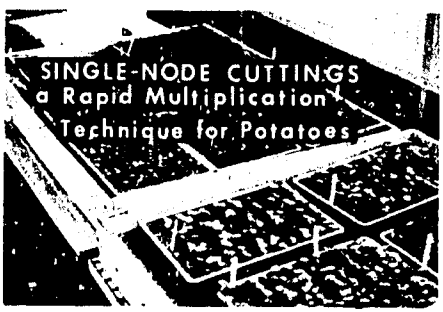
1



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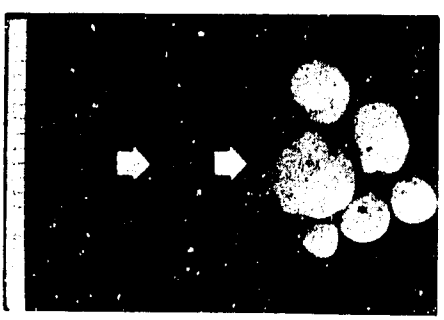

Introduction.

One rapid multiplication technique used to produce many plants in the first generation of a basic seed multiplication program is called single-node cuttings. The young mother plantlet with 5 to 6 simple leaves is cut into segments, each with a leaf and node. These cuttings are rooted in fine sharp sand and transplanted to pots or the field when a new stem forms. Each rooted cutting may yield 0.5 kg when transplanted to the field.

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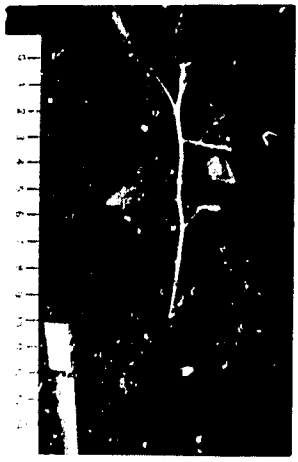


Procedure.

The small mother plants may originate from sprout cuttings, plants derived from meristems, stem cuttings, small tubers or true (botanical) seed. Cuttings are taken when the plant has 5 to 6 simple leaves. Apply a foliar fertilizer 2 to 3 days prior to removal of the cuttings.

4

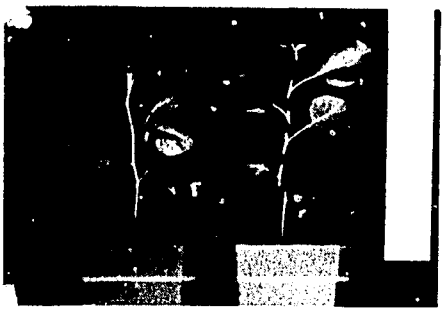
Follow strict sanitary procedures to prevent spread of contact viruses and other diseases. Before working with each plant:

a) wash hands and knives in a strong soap solution or other approved chemicals that have a high pH;
b) use other chemicals or methods depending on potential disease problems: and
c) wear clean clothes that have not been in contact with other plants.

5

With aseptic scalpel or razor blade, remove the stem, leaving one strong bottom leaf. Do not damage axillary bud at the leaf. A folded paper towel used as a base behind the cut gives support necessary to make a clean cut and prevents cutting fingers.

6



After the stem is removed from the mother plant, carefully cut it into sections, each with a leaf and axillary bud in the center. Root the apical portions together, as they root and grow faster than lower cuttings. Leave one strong leaf at each harvest. A new stem forms and is ready to harvest in 15 to 20 days. Each mother plant can be harvested 2 to 10 times. Each harvest is greater than the first because more than one stem forms after the second harvest. New rooted cuttings become new mother plants until the desired number of mother plants are available, then, all new cuttings are transplanted to the field.

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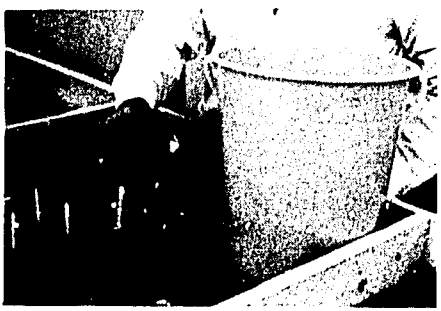
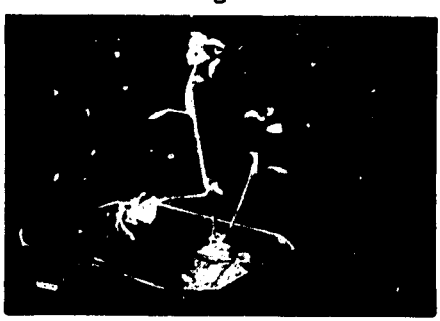


After each harvest of cuttings, fertilize the mother plant with a liquid N-P-K fertilizer to stimulate new plant growth. Dissolve 12-14-12 or similar fertilizer in water, 5 g per liter and use about 50 cm^3 for each small pot. A high phosphorus content water soluble fertilizer such as 10-52-10 or 12-50-12 at 1/4 teaspoon per gallon of water can also be used.

8



A few days after harvest, a new vigorous stem starts growing at the leaf node remaining at the base of the stem. Temperatures of 23°-26° C and a long photoperiod stimulate rapid growth.

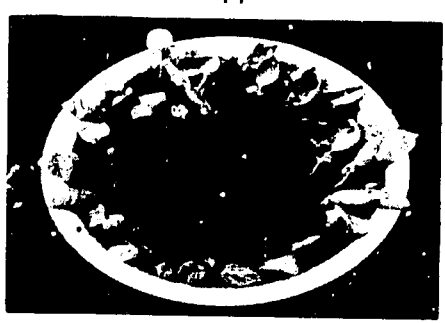
9

Use a rooting hormone to assure uniform and fast rooting of cuttings. Place the entire stem portion of the cutting in the rooting hormone for 10 seconds before planting.

10

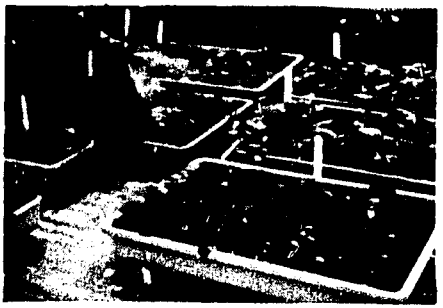
The type of rooting substrate is important. Use a fine sand of less than 1 mm grain size. Provide holes so the substrate container is well drained. A layer of small stones below the rooting sand benefits drainage. Stones and sand are separated by a screen to avoid mixing them when they are removed for disinfection. Excess water inhibits root formation.

11



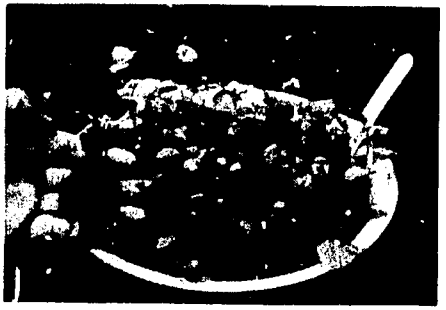
Place cuttings in the sand for rooting, utilizing all space, but not so close that leaves overlap or roots become entangled. Place cuttings deep enough so that node and stem are covered with sand and do not become exposed after several waterings. The cuttings must have firm contact with sand to ensure rooting. The optimum rooting temperatures are 20° to 23° C. Optimum temperatures for new stem growth from the node is 23° to 26° C.

12



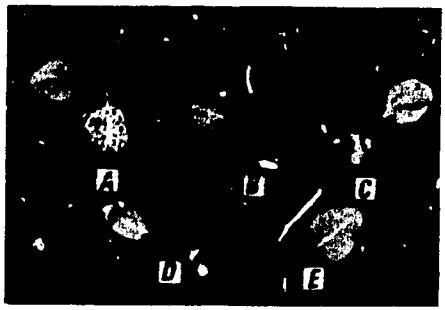
Irrigation of the cuttings during rooting and growth is critical. Excess water inhibits rooting. Too little water causes stress, delays rooting and growth. If the substrate container is properly drained, irrigation can lower temperatures and raise humidity as needed without danger of over irrigation. Use a fine spray for all irrigation to avoid sand movement and not move the original leaf. The first irrigation should be delayed 2 to 3 hours when a rooting hormone is used to allow the hormone time to penetrate the plant tissue.

13



Speed of rooting and development depend on variety, temperature and management. Normal time needed to grow a plantlet with adequate roots and 3 or 4 leaves is from 15 to 20 days. The plantlet shown here is ready for transplanting to the field. The container can be carried to the field at the time of transplanting. The rooted cutting is carefully lifted and placed directly in the soil. Do not remove sand from the roots or otherwise disturb them more than necessary.

14



At time of transplanting eliminate any single-node cuttings not properly rooted. If many cuttings are not useable, determine why and prevent this loss.

A. Young, properly rooted single-node cutting.
B. Apical growth, no roots. Use a rooting hormone, apply better contact of sand and cutting. Check drainage or irrigation methods.
C. Roots and stolon with tuber. Lengthen the day length of the mother plant; perhaps it is becoming too old. Lengthen the day lenght on cuttings while rooting.
D. Tuber formed, no roots. Too short a day length of mother plant or mother plant too old.
E. No roots. Improper use of rooting hormone or poor contact of cutting with sand.

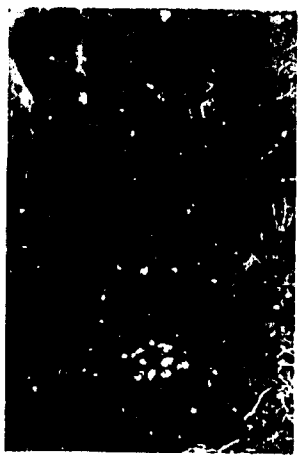
15

Single-node cuttings being transplanted directly to the field in Costa Rica. Density of planting depends on size of tubers desired, soil type and variety. This field was planted with 15 cm between plants. Soil humidity should be moist, but not wet when transplanting. Single-node cuttings can also be transplanted in the planthouse for further multiplication. The field in the upper right hand corner of the photo was planted with tubers 2 days prior to the cuttings.

16

The same field as shown in the previous slide with a 94% stand. Most losses resulted from cut worms. These plants have been in the field 60 days or less. Compare them with the plants in the background that are growing from tubers.

17

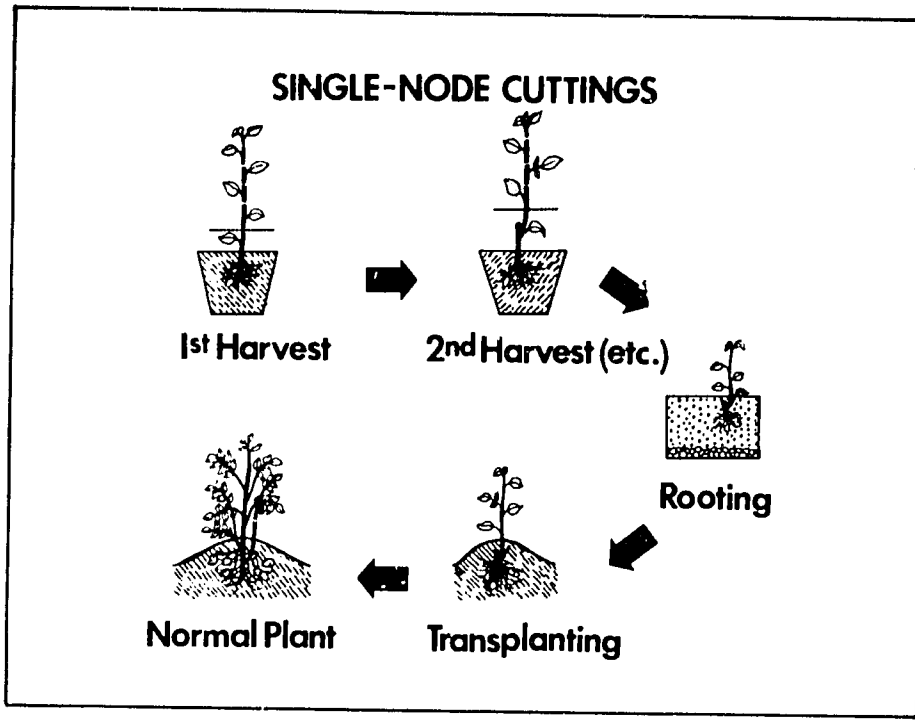


Average yield per plant grown from single-node cuttings in the previous slide was 500 g.

18

The tubers are ideal size for seed.

19



Summary.

This technique for rapid multiplication involves:

a) cuttings are taken from small mother plants;
b) consecutive harvests of mother plant each 15 to 20 days, each time leaving a new basal leaf and node;
c) rooting and growth of the cuttings in fine sand;
d) transplanting to field or plant-house; and
e) development of normal plants.

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The International Potato Center (CIP) is a scientific institution, autonomous and non-profit making, established by means of an agreement with the Government of Peru with the purpose of developing and disseminating knowledge for greater utilization of the potato as a basic food. International funding sources for technical assistance in agriculture are financing the Center.