

SPROUT CUTTINGS, a Rapid Multiplication Technique for Potatoes



Series I: Rapid Multiplication Techniques

Guide-Bock I/1



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:

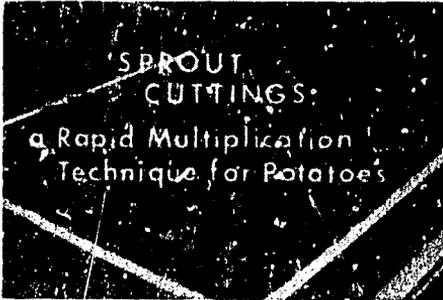
- Sprout Cuttings (Set 1)
- Single-Node Cuttings (Set 2)
- Stem Cuttings (Set 3)
- Leaf-Bud Cuttings (Set 4)

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.

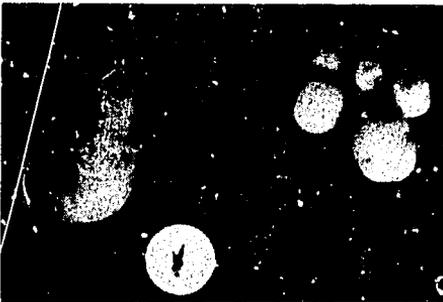
SPROUT CUTTINGS, a Rapid Multiplication Technique for Potatoes

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Introduction.

Sprout cuttings for rapid multiplication of potatoes give increase ratios of 50 to 300 plants per tuber. Steps in sprout cuttings technique are the following:

- a) mother tubers are sprouted; the sprouts may be treated with gibberellic acid to increase sprout growth;
- b) sprouts are cut into pieces containing one or more nodes;
- c) sprout cuttings are rooted in sand; and
- d) they may be transplanted to the field where they yield up to 500 g per plant. If transplanted in the planthouse these plants are ideal initial mother plants for producing single-node cuttings.

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Procedure.

Carefully select tubers free of important systemic pathogens. The surface should have been disinfected previously. If dormancy is not broken, do so using locally approved methods.

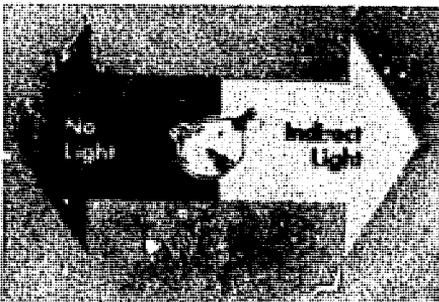
4



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



After dormancy is broken, encourage strong sprout growth by transferring the tubers every 7 to 10 days from dark to indirect light. Darkness increases internodal development and growth, while indirect light enhances strong sprouts and short internodal distance.

6



Long sprouts are easier to handle than short sprouts but they generally yield fewer and weaker cuttings. The tubers on the left were given the indirect light and darkness treatment, and show proper sprout development for cutting. The tubers on the right were left much longer in the dark. The sprouts are etiolated and because of excess evapotranspiration the tuber will only produce one strong set of cuttings.

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When sprouts are about 3 cm long, an optional step is the removal of the apical growing point with a sharp scalpel or razor blade. This stimulates lateral growth of the nodes and therefore many more cuttings are taken from each tuber. Use a paper towel to support the cutting from behind in order to give a clean cut, perpendicular to the axis of the sprout.

8



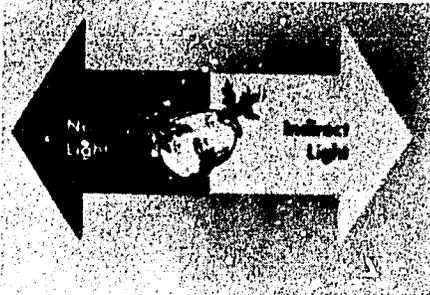
Careful removal of the apical growing point stimulates lateral growth of all buds on the sprout. Avoid damage to the nodes and primordial roots. Make clean, sharp cuts without ragged edges.

9



Immerse tuber and sprout for a maximum of 10 minutes in a 1 to 2 ppm solution of gibberellic acid (GA_3) to increase growth of sprout branches. Take extreme care to insure proper concentration of GA_3 . An excess such as 5 ppm may result in a very slender sprout that is difficult to handle and root.

10



Transfer the tuber from dark to indirect light to obtain the desired internodal distance. Adequate length is determined by ability to cut and plant sprout cuttings. High humidity stimulates early root formation.

11



Effect of different concentrations of GA_3 :

(A) 1 ppm and (B) 2 ppm have strong, thick side sprouts coming from the nodes;

(C) 5 ppm and (D) 10 ppm have more and longer side sprouts but they are so thin that rooting is very difficult.

12



Desprout the tubers by cutting. Leave a small portion of the sprout on the tuber if another harvest of cuttings is desired. If another harvest is not needed, desprout using the fingers with a firm twist. Two to three harvests of sprouts can be taken from each tuber if it is physiologically young. If the tuber is to be planted, only one or two harvests of sprouts should be taken.

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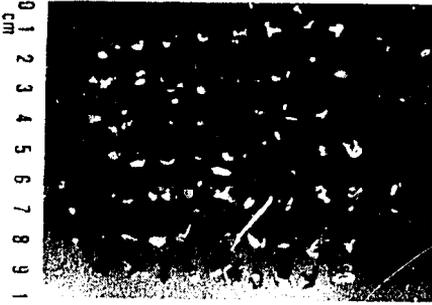
After removal from the tubers, sprouts are cut into pieces, each piece having one or more nodes. Take care not to damage apical nodal growth or primordial roots when cutting.

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Sprout cuttings should have at least one shoot tip and two root tips to insure growth of the new plantlet. The shoot tip is the future stem and the root tips are the future roots.

15



A single tuber will produce about 40 sprout cuttings from each harvest, depending on tuber size, number of sprouted eyes and sprout management. This tuber yielded 66 cuttings.

16



Proper drainage gives aeration and is essential for good rooting. The drain in the pan and pebbles below the sand aid drainage. The screen helps separate the rooting sand from the pebbles and facilitates later disinfection of both.

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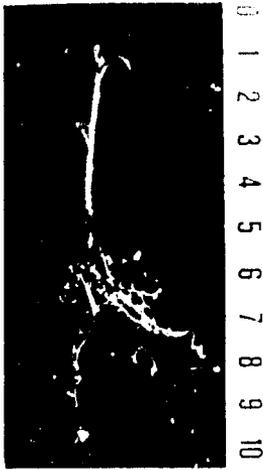


Place sprout cuttings in moist, fine sand of less than 1 mm grain size and ensure good contact with the moist sand. The shoot tip portion of the sprout should be slightly above sand level after the first watering.

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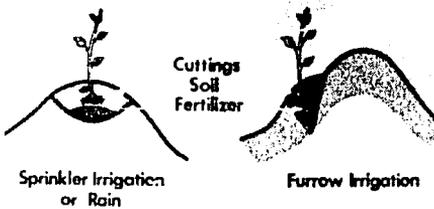


Apical cuttings of the sprout should be planted apart from the lower cuttings because they root and grow faster.



Roots form and the sprout should be ready for transplanting in about 15 days. This rooted sprout cutting is ready to transplant into pots but not to the field. Two days prior to transplanting, spray the plantlets with a foliar fertilizer following manufacturer's directions.

TRANSPLANTING TO THE FIELD



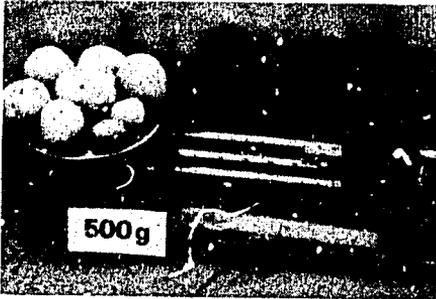
Rooted sprout cuttings can be transplanted either to pots in the planthouse or to the field. When transplanting to the field care must be taken to ensure adequate but not excessive root-soil contact. At least one leaf node should be below the soil surface. This is best done by watering the plantlets after transplanting. Good results are obtained by mixing a water soluble fertilizer having a high P_2O_5 content with the water. The roots should never come in contact with dry fertilizer. As seen here, transplanting procedures are slightly different depending on irrigation methods.

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After 2 to 3 weeks, when cuttings are established in the field, they are treated as normal potato plants. Early hilling insures that the stolon-producing stem nodes are below soil surface to maximize tuber production.

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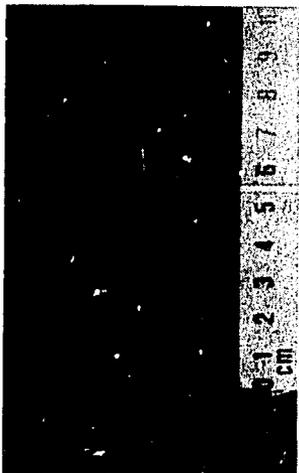
Average yield from rooted sprout cuttings sprouts planted in the field should be about 500 g of normal tubers.

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Approximately 15 days after cutting, the rooted sprout cuttings may be transplanted to small pots or glasses to use as mother plants for single-node cuttings. Three or four rooted cuttings can be transplanted to large pots to give further multiplication by stem cuttings, leaf-bud cuttings or for tuber production.

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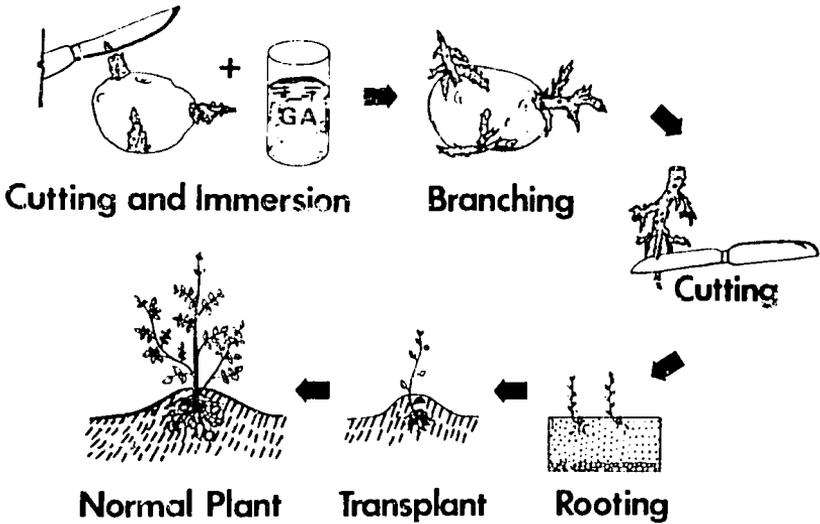
This plantlet developed 20 days after transplanting the sprout cutting. At this point the single-node cuttings technique for rapid multiplication may begin.

25



Harvest of tubers from 4 sprout cuttings grown in one 20 by 20 cm pot in the planthouse. The yield is similar to that of three to four stem plants grown from tubers in pots.

SPROUT CUTTINGS



Summary.

This technique includes the following steps:

- remove the sprout tip and immerse in 1 to 2 ppm of GA₃ solution if necessary;
- sprouts branch;
- desprout and cut sprouts into pieces;

- root sprout cuttings in fine sand;
- transplant to the planthouse or the field; and
- normal plant develops from the sprout cutting.

For additional information see CIP publication: Bryan, James E.; M.T. Jackson and N. Meléndez G. 1981. Rapid Multiplication Techniques for Potatoes. International Potato Center, Lima. 22 pp.



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