Distinguishing apical cuttings from stem cuttings for potato

Rapid bulking of seed potato is constrained by the inherently low multiplication rates of the commonly available starter materials. Commonly-used minitubers produce 3-7 tubers per unit, thus require many generations to bulk the requisite seed quantities. Apical cuttings are transplants produced in a screenhouse from tissue culture (TC) plants and handled the same way in the field as nursery-grown seedling. The cuttings produce 10-25+ tubers per unit and can mature quickly in the field, with egg-sized tubers observed 35 to 45 days after planting in some varieties. These cuttings provide an alternative starter material for onward multiplication of certified or on-farm seed production.

Apical cutting technology is especially important in bolstering seed production in areas with insufficient land for traditional seed bulking and crop rotation. Seed produced from apical cuttings can be sold commercially after only two seasons of multiplication. In Kenya and Uganda, there has been great interest in apical cutting technology among public and private sectors since its introduction, witnessed by investments in nurseries and high sales among seed producers.

While all the nurseries have good intentions to produce apical cuttings, many mismanage the process, unintentionally producing stem cuttings (rather than apical cuttings) from mother plants. Thus, it is important for nursery producers and operators to understand the major differences between apical and stem cuttings.

In this brochure, we focus on the distinctions between apical and stem cuttings and provide guidance for producing apical cuttings.

Features of apical and stem cuttings

There is a role for both apical and stem cuttings in seed production. The producer should choose the type of cutting based on his or her yield and sales expectations.

Apical cuttings are derived from mother plants *maintained in a juvenile state* and are highly productive (10-25+ tubers) due to the high yield potential in the physiologically young tissue.

Stem cuttings are produced when cuttings are taken from mother plants originating from tubers (the traditional way of producing mother plants) or when mother plants from TC mature. When planted in the field, stem cuttings generally yield 3-7 tubers per stem.

To produce apical cuttings, *it is essential to maintain the juvenile state of the mother plant.* Allowing a mother plant to mature, by producing compound leaves, will result in stem cuttings with lower productivity.

Mother plant management to ensure apical cuttings

Ultimately, producing apical cuttings (rather than stem cuttings) lies in the production process and depends on the physiological state of the mother plant. The only way to achieve yields of 15-20+ tubers per cutting is to ensure production of physiologically young cuttings. To better ensure production of apical cuttings, follow these principles:

- Mother plants for producing apical cuttings always originate from tissue culture plants.
- The apical cutting mother plant should be maintained in a juvenile state throughout the production cycle (up to 9 months) by cutting back the shoots regularly.
- A juvenile mother plant typically displays round, simple leaves throughout the production cycle (Figure 1a).
- Leaves starting to compound on the mother plant signify that the plant is starting to mature (Figure 1b) and the resultant cuttings will not have the same yield potential as an apical cutting. These cuttings will start to resemble a stem cutting.

Simple, round leaves indicate the juvenile state of the mother plant

Compound leaves from a mature mother plant. Cuttings derived from compound leaves become stem cuttings.

Figure 1: Both pictures feature mother plants for producing potato cuttings from tissue culture plants. Picture a (left) shows a plant in juvenile state that will produce apical cuttings. Picture b (right) is a mature mother plant that will produce stem cuttings that are less productive than apical cuttings. Note the round leaves in the apical cuttings compared to the compound leaves on the right.

- If a mother plant has shoots that are starting to mature, it can be rescued by cutting back all shoots and observing if the new shoots are juvenile.
- The bottom leaves of apical cuttings taken from juvenile mother plants are often simple and round in shape (Figure 2a).
- The bottom leaves of commercial cuttings taken from mature mother plants are compound (Figures 2b & 2c).

More details are available in this brief: Apical cuttings of potato: Management of mother plants.

Features of quality apical cuttings

A quality apical cutting must be sold or transplanted at the right stage: not too young, not too short, and not too long (Figure 3). If there is not a ready market at the time when a cutting should be harvested, you can transplant it to produce minitubers or basic seed.

When buying an apical cutting, you should look for the following characteristics:

- 8-12 cm high from the collar (stem at the base of the growing medium). Cuttings longer than this are weaker and require more labor to plant;
- Short internodes;
- A strong collar and stem
- Well-developed roots that are not root-bound (i.e., roots that grow in a round pattern because they were developed in a too-small container); and
- Dark green leaves and strong appearance (not wilted or falling over).

Figure 2: Comparison of (a) commercial apical cutting with commercial stem cuttings (b and c) for potato. Note simple leaves in apical cutting and compounding leaves in stem cuttings

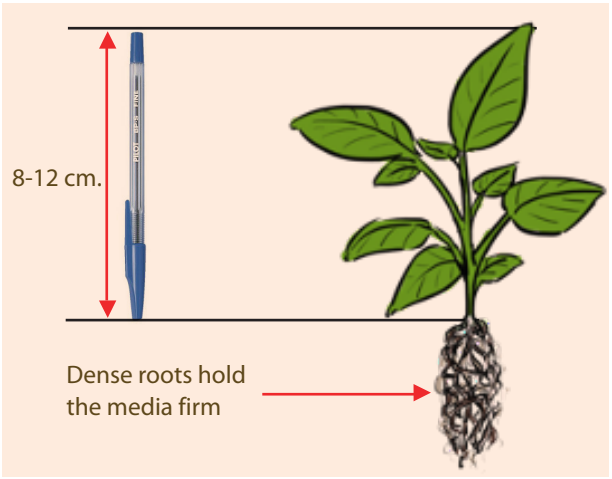

Figure 3: Proper size of commercial apical cutting for sale or transplanting

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