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A Simple Method for Extracting and Cleaning Seeds of *Rhipsalidopsis* and *Schlumbergera* (Cactaceae)

Thomas H. Boyle

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Summary. A simple, vacuum-filtration method was developed for extracting and cleaning seeds from the fleshy fruits of *Rhipsalidopsis* Britt. & Rose and *Schlumbergera* Lem. (Cactaceae). The method uses readily available equipment and supplies, and is suitable for extracting seed from small quantities of fruit, as is commonly the case in commercial breeding programs. Seeds are extracted onto disks of coarse-porosity filter paper and rinsed thoroughly to remove the fruit pulp and to reduce clumping. Seeds from one fruit can be extracted and cleaned in ≈ 30 s.

Department of Plant and Soil Sciences, University of Massachusetts, Amherst, MA 01003.

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Cultivars of *Rhipsalidopsis* (Easter cactus) and *Schlumbergera* (Christmas cactus or Zygocactus) commonly are grown as flowering pot plants in North America and northern Europe (Boyle, 1991; Cobia, 1992). New cultivars are bred primarily by selecting individual seedlings from segregating populations (Cobia, 1992; Gräser, 1956; Hansson, 1992). Hence, seed harvesting and processing are of prime importance in breeding these two genera.

Breeding work on *Rhipsalidopsis* and *Schlumbergera* was initiated at the Univ. of Massachusetts in 1987, and is directed primarily toward the production of novel and superior clones. It was therefore highly desirable to de-

velop an efficient procedure for extracting and cleaning seeds.

The Cactaceae exhibit several different types of fruit, ranging from indehiscent, fleshy berries to dry, dehiscent capsules (Buxbaum, 1955). Fruits of *Rhipsalidopsis* and *Schlumbergera* are fleshy berries that are ≈ 10 mm wide and ≈ 10 to 15 mm long. Each berry contains up to ≈ 300 small seeds (≈ 1 mm wide and ≈ 2 mm long) that develop within a central cavity. The pericarp softens during fruit maturation and is juicy in ripe fruit. Seeds can be extracted and cleaned by cutting the fruit open, squeezing or scooping the seeds into a water-filled container, pouring the seed onto absorbent paper, and scraping away the fruit pulp (Horobin, 1981). This method, however, is time-consuming. Because relatively small quantities of fruit are harvested for seed, large-scale procedures like those used for extracting seed from the fleshy fruits of *Lycopersicon esculentum* Mill. or *Cucumis melo* L. (George, 1985; Hartmann et al., 1990) are not practical. A vacuum-filtration method, described below, was devised for extracting and cleaning seeds of *Rhipsalidopsis* and *Schlumbergera*. The method uses readily available equipment and supplies, and is suitable for handling small quantities of fruit, as is commonly the case in commercial

Fig. 1. Vacuum-filtration apparatus for extracting and cleaning fruit of *Rhipsalidopsis* and *Schlumbergera*, showing the vacuum pump (v), trap bottle (t), filtering flask (f), Büchner funnel (b), and spatula (s).

Fig. 2. Circle of blotter paper containing germinated *Schlumbergera* seeds. The blotter paper was divided into eight sectors prior to seed extraction to facilitate the counting of germinated seed.

breeding programs.

The vacuum-filtration apparatus consists of a Vacu/Trol™ vacuum pump with regulator (Spectrum Medical Industries, Inc., Los Angeles), a trap flask (250-ml capacity), a heavywall filtering flask (500- or 1000-ml capacity), and a 100-mm-diameter porcelain Büchner funnel (Fig. 1). Filtration is performed with a qualitative-grade, coarse-porosity filter paper (catalog no. 09-795C; Fischer Scientific, Pittsburgh). Before extraction, a 9-cm circle of filter paper is placed in the funnel, moistened, and sealed tightly against the perforated plate by applying a vacuum for a few seconds. Ripe fruit are cut open longitudinally, and the seeds are scooped out with the pointed end of a curved metal spatula (Fig. 1). The spatula facilitates seed extraction while excluding most of the other fruit

tissue. The vacuum is applied, and the seeds are washed onto the filter paper using a polyethylene wash bottle. The seeds are rinsed thoroughly to remove the fruit pulp and to reduce clumping.

The seeds from one fruit can be extracted and cleaned by vacuum-filtration in ≈ 30 s, which is more efficient than the method described by Horobin (1981). One circle of filter paper can accommodate ≈ 500 seeds. After extraction, the filter paper is placed in a beaker or small cup for drying. The seeds are removed easily from the filter paper once they have dried.

The vacuum-filtration method also can be used in conjunction with germination tests. Damage to seeds is prevented by cutting through the pericarp, but not through the ovary cavity. Seeds are extracted and cleaned as described previously, except that circles

of blotter paper are substituted for filter paper. The blotter paper is transferred subsequently to a covered petri dish for germination. The blotter paper can be inspected under a dissecting microscope, and the fruit pulp can be removed with a pair of forceps.

Germination counts can be simplified by using the following technique. Prior to extraction, a ruler and a graphite pencil are used to draw eight, wedge-shaped sectors on the blotter paper; the sectors are then numbered (Fig. 2). The number of germinated seeds can be counted in each sector and the total number of germinated seedlings can be obtained by addition.

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