Fertility in an Intergeneric Somatic Hybrid Plant of *Rutaceae*

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There are many species in the family *Rutaceae* that are difficult to sexually hybridize because of problems related to their sterility and/or polyembryony. Protoplasm fusion provides an alternative way for producing hybrids between such species. In 1985, we developed a protoplasm fusion procedure in citrus and produced intergeneric somatic hybrid plants between 'Trovita' sweet orange [*Citrus sinensis* (L.) Osb.] and trifoliolate orange (*Poncirus trifoliata* Raf.) (Ohgawara et al., 1985). Many other somatic hybrids of citrus have been produced since then by a similar procedure (Grosser et al., 1988; Kobayashi et al., 1988; Ohgawara et al., 1989). These somatic hybrids were morphologically normal, vigorous, and had the expected amphidiploid chromosome number of 36. It is important to determine whether these somatic hybrids are fertile. One of our somatic hybrids between 'Trovita' sweet orange and trifoliolate orange has reached the flowering

stage. We report herein the flower and fruit characteristics and fertility of this somatic hybrid.

In 1985, the six clones of the somatic hybrid were top-grafted onto 7-year-old nucellar seedlings of satsuma mandarin (*C. unshiu*). One of the clones developed 50 flowers and set fruit in 1989. Although half of the flowers had an abortive pistil, one of the normal flowers set a fruit. The flower morphology of the somatic hybrid was intermediate to that of the parents. Petals were spoon-like in shape, as for trifoliolate orange, and the stigma resembled that of sweet orange. The ovary of the somatic hybrid was spherical, as for sweet orange, and highly pubescent, as for trifoliolate orange (Fig. 1). Pollen germinability of the somatic hybrid was determined by a germination test on an agar medium (2% agar and 20% sucrose) at 25°C for 20 h. Ten flowers were used for the germination test, and ~500 pollen grains in each flower were examined from two plates. Pollen from the somatic hybrid had ~50% terminability. The fruit of the somatic hybrid weighed 100 g, had a diameter of 6.8 cm, and an irregular oblate shape. The rind was rough and extremely thick (Fig. 2). The juice was scant and acidic and had an unpleasant flavor. The somatic hybrid had one well-developed pol-

Fig. 1. Flower of the somatic hybrid.

yembryonic seed that germinated (Fig. 3).

The somatic hybrid obtained by our fusion method had both pollen and ovule fertility. Fertile somatic hybrids are valuable in breeding because they can be crossed with diploids to produce seedless triploid plants. This report encourages the practical application of somatic hybridization to citrus breeding programs.

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Fig. 2. Whole and cut fruits of 'Trovita' sweet orange (O), trifoliolate orange (T), and somatic hybrid (H).

Fig. 3. Seedling of the somatic hybrid.