Novel Watermelon Breeding Lines Containing Chloroplast and Mitochondrial Genomes derived from the Desert Species *Citrus colocyntis*

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The U.S. Department of Agriculture, Agricultural Research Service, announces the release of three novel watermelon (*Citrus lanatus* (Thunb.) Matsum. & Nakai) breeding lines: USVL-200, USVL-205, and USVL-210. These lines contain the nuclear genome of cultivated watermelon (*C. lanatus var. lanatus*) and chloroplast and mitochondrial genomes derived from the desert species *C. colocyntis* (L.) Schrad.

Chloroplasts and mitochondria are maternally inherited in crosses between cultivated watermelon and the related subspecies *C. lanatus var. citroides* (Havey et al., 1998). Our experiments, using DNA markers, confirmed that chloroplast and mitochondria are maternally inherited in crosses between cultivated watermelon and the wild desert species (Levi and Thomas, 2005). In addition, this study confirmed that the chloroplast and mitochondrial genomes of the wild desert species are retained in successive backcrosses, where a watermelon cultivar is the recurrent male parent and the backcross plant (carrying the the wild desert species chloroplast and mitochondrial genomes) is the female parent (Levi and Thomas, 2005; A. Levi, unpublished data).

**Origin**

USVL-200 was produced by first crossing an F1 hybrid (*‘New Hampshire Midget’* C. *lanatus var. citroides* × Griffin 14113 (C. *lanatus var. citroides*)) with the wild desert PI 386015 as the female parent. Then, most of the nuclear genes of the F1 hybrid plant were replaced with those of the cultivated watermelon through a series of six successive backcrosses with watermelon cultivars that were used as the male parents. The watermelon cultivars that were used in the six successive backcrosses to replace the the wild desert species nuclear genome were 1) ‘Charleston Gray’, 2) ‘Callow Grey’, 3) ‘Charleston Gray’, 4) ‘Crimson Sweet’, 5) ‘New Hampshire Midget’, and 6) ‘Charleston Gray’. A BC3 plant was self-pollinated, followed by self-pollination and selection of the plant with best fruit quality in five successive generations to produce USVL-210 seeds (BC5).

**Description and Performance**

USVL-200 and USVL-205 produce one female flower for every 5 to 7 male flowers. Each of the plants of these breeding lines produced three fruit in the field in Charleston, S.C., during Summers 2004 and 2005. USVL-200 and USVL-205 produce globular fruit with a thick, dark-green rind. USVL-200 has a yellow-pink flesh with a firm texture devoid of hollow heart, while USVL-205 has the same fruit characteristics except for having a red flesh (Table 1, Fig. 1). The fruit of USVL-200 and USVL-205 have an intermediate solid soluble content (Table 1) and are not as sweet as the cultivars used in their development (‘Allsweet’, ‘Charleston Gray’, ‘Minilee’; ‘Black Diamond’, and ‘New Hampshire Midget’). The fruit of these two lines are ready for harvest in early to midseason, similar to ‘New Hampshire Midget’.

USVL-200 is a ‘Charleston Gray’-type watermelon. Typical fruit are oblong with light green to grey rind and a pink flesh color (Fig. 1). The flesh has a pleasant flavor and an intermediate-high content of soluble solids (Table 1). USVL-210 plants produce one female flower for every 7 to 10 male flowers, similar to ‘Charleston Gray’. An average yield of USVL-210 plants, in the field in Charleston (during Summers 2004 and 2005), was 2.6 to 3 fruit per plant. Overall, fruit of USVL-210 have thick rind, crispy flesh texture, and do not imply endorsement of the products names nor criticism of similar ones not named.
not exhibit hollow heart (Table 1). They are ready for harvest in mid to late season, similar to ‘Charleston Gray’. 

Low genetic diversity exists among watermelon cultivars, and there is a need to broaden their genetic base using related wild species or subspecies that have been collected throughout the world and have wide genetic diversity (Levi et al., 2001). The breeding lines reported here may be useful in introducing the chloroplast and mitochondrial genomes of the wild species into watermelon cultivars. They may be used in studying the effects of foreign cytoplasm (chloroplast and mitochondria of C. colocynthis) on photosynthesis, respiration, flower production, fruit quality, and disease or pest resistance in cultivated watermelon. USVL-200 and USVL-205 may be useful in improving watermelon cultivars for production of early globular fruit with a thick dark green rind and a firm flesh, devoid of hollow heart. USVL-210 might be useful in improving watermelon cultivars with respect to production of elongated fruit with a thick light-green rind and a firm pink flesh.

Seed Availability

Small samples of seed of USVL-205 and USVL-210 are available for distribution to interested research personnel who make written request to Amnon Levi, U.S. Vegetable Laboratory, 2700 Savannah Highway, Charleston, SC 29414-5334. Seeds of USVL-200, USVL-205, and USVL-210 also will be submitted to the National Plant Germplasm System where they will be available for research purposes, including the development and commercialization of new cultivars. It is requested that appropriate recognition of the source be given when this germplasm contributes to research or development of a new breeding line or cultivar.

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