Cucumber Population WI 6383 and Derived Inbreds WI 5098 and WI 5551

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A gynoecious, multiple-disease-resistant, white-spined cucumber (*Cucumis sativus* L.) germplasm pool Wisconsin 6383 (WI 6383) and derived inbred lines WI 5098 and WI 5551 was released in Sept. 1990 by the U.S. Dept. of Agriculture, Agricultural Research Service (USDA/ARS). WI 6383 was made available to U.S. cucumber breeders to supply a source from which they may extract multiple-disease-resistant (MDR; greenhouse seedling tests) lines with a multiple lateral (ML) and sequential fruiting (SF) habit suitable for use in hybrid production or line development. WI 5098 and WI 5551 are gynoecious, MDR, and possess an ML and SF habit with a day-neutral flowering photoperiodism adapted to Wisconsin conditions.

Origin

WI 6383 originated from a cross between commercially adapted and exotic germplasm. The *C. sativus* var. *sativus* L. four-way cross (WI 1606 × WI 1589) × (WI 1983 × WI 1895), which was released by the USDA/ARS as WI 2843 (Peterson et al., 1985), was crossed to an F₁ between two *C. sativus* var. *hardwickii* (R.) Alef. plant introductions (PI 183967 and PI 215589; Fig. 1).

The four inbred *C. sativus* var. *sativus* components of WI 2843 resulted from efforts to establish multiple disease resistance while maintaining variability for horticulturally acceptable fruit characteristics. They were selected because of diversity in origin and variability in fruit type. Although the pedigrees of those inbred lines are complex (Fig. 1), it is possible to trace each parent to original sources of disease resistance and other fruit and vine characteristics. Their paren-

lagenarium (Ross.) Ellis & Halst], downy mildew [*Pseudoperonospora cubensis* (Berk. & Curt.) Rostow], and powdery mildew [*Sphaerotheca fuliginea* (Schl. ex Fr.) Poll.] from PI 197087. Additional introduced sources of resistance are PI 212233 (powdery mildew), Wisconsin SMR-18 [CMV, scab; *Cladosporium cucumerinum* Ellis & Arthur, and fusarium; *Fusarium oxysporum* (Schlecht.) Synd. & Hans f. sp. *cucumerinum* Gwen] and Chinese Long and Tokyo Long Green (fusarium). Gynoecious flowering habit was introduced from PI 220860, parthenocarp from the Dutch glasshouse cucumber 'Spotvrige' and nonbitter from Dutch accession, ILG 58049.

The *C. sativus* var. *hardwickii* accessions were selected for ML and SF habit (Kupper

tage is typically derived from Gyl14 with resistance to anthracnose [*Colletotrichum*

Fig. 1. Pedigree of cucumber population WI 6383 and derived inbreds WI 5098 and WI 5551.

Fig. 2. Fruit of cucumber population WI 6383 [(A) (*C. sativus* × *C. hardwickii*) F₁ mass] and derived inbreds WI 5098 (B) and WI 5551 (C) harvested 48 days after planting at Hancock, Wis. Scale = centimeters.

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and Staub, 1988). These accessions lack apical dominance and thus produce more and longer lateral branches than *C. sativus* var. *sativus*. They are short-day plants and produce small (4 to 8 cm long), ellipsoid fruits with large seed cells, tough skin, black spines, and bitter taste.

Progeny of the initial four-way $\times F_1$ cross were self- or sib-pollinated for four generations, during which individuals were selected for disease resistance (as listed above), white spine, nonbitter, and gynoeious characteristics. About 100 F_4 individuals were randomly mated to produce the population WI 6383 that is homozygous for resistance, white spine, nonbitter, and indeterminate traits.

Seed of $\approx 500 F_4$ individuals from the F_4 mass were sown 91 cm apart in rows that were on 1.5-m centers and subjected to three cycles of recurrent half-sib family selection (10% selection intensity) for three-harvest fruit yield (fruit count in three harvests). Self-pollination of selected cycle 3 plants led to F_5 families that were evaluated in replicated trials under various spacings (Staub, 1985). The highest-yielding families were designated WI 5098 and WI 5551.

Plant and fruit description

Plants of WI 6383 are vigorous compared with 'Calypso' or 'Endeavor', possess a ML, SF habit, and are predominantly gynoeious. Fruit are bitter-free (*bibi*), coarse to fine, white spined, with a blocky to a slightly tapered blossom end (Fig. 2A). Fruit vary in length : diameter ratio from 2.1 to 2.6 (mean of 'Calypso' = 2.8), and seed cavity : fruit diameter ratio ranges from 0.63 to 0.54 (mean of 'Calypso' = 0.54) (Staub and Fredrick, 1988). Fruit firmness, as measured by a punch test at the stem end with a Magness-Taylor pressure tester (0.79-cm tip size), ranges from 19.0 to 22.5 (mean of 'Calypso' = 23.3).

Fruit yields of WI 5098 and WI 5551 (Fig. 2 B and C, respectively) are 37% to 51% higher than commercially adapted germplasm (Fredrick and Staub, 1989; Staub, 1985). The combining ability of WI 5098 and WI 5551 for fruit yield as evaluated in F_5 combination with commercially adapted inbred lines indicates that further selection within these high-performance *C. sativus* var. *sativus* $\times$ var. *hardwickii* derivatives for fruit shape will produce lines that perform well at a high planting density (58,000 plants/ha) when crossed with *C. sativus* var. *sativus* 'lines having good general combining ability (Fredrick and Staub, 1989).

Availability

Seed of WI 6383, WI 5098, and WI 5551 from hand-pollinated greenhouse increases may be obtained from J.E.S.

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