Phoma complanata-resistant. UG-10 Parsnip Germplasm

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In North America, several canker-forming fungal pathogens affect parsnip (*Pastinaca sativa* L.), with the most important incited by *Phoma complanata* (Tode ex Fr.) Desm. (Cerkaskas, 1986) and *Itersonila perplexans* Derx (Davis et al., 1989; Wilkinson, 1952). The canker caused by *P. complanata* can be a limiting constraint in parsnip production (Cerkaskas, 1987b). The pathogen is specific to parsnip and does not infect other vegetables (Cerkaskas, 1987a). Symptoms of this seed-borne disease include formation of dark-tan or brown leaf spots, leading later to blighting of leaves, and black lesions (cankers) on petioles and roots (Cerkaskas, 1985). Root cankers may occur in the field or arise during long-term cold storage at IC or above, resulting in yield and quality losses. Enhanced concentrations of various phototoxic furocoumarins have also been found in parsnip cultivars infected with *P. complanata* (Cerkaskas and Chiba, 1991). At present, only low to moderate resistance against this pathogen exists in commercially available cultivars adapted to muck soils (Table 1).

UG-10 is being released, as it possesses resistance to *P. complanata* and maybe useful to commercial breeders or hobbyists in the development of muck-adapted hybrids or open-pollinated populations.

Origin

UG-10 originated from a seed population developed in 1986 by randomly intercrossing 10 selected 'Harris Model' and three 'Hollow Crown' plants that displayed low levels of foliar and root symptoms when field-inoculated with *P. complanata*. From 1986 to 1990, four cycles of mass selection were used to intensify *Phoma* canker resistance within this initial genetic material. Each year, more than 2000 plants were grown on muck soils at the Muck Research Station, Kettleby, On-

tario, under standard commercial practices (Shattuck et al., 1987). To ensure uniform and high selection pressure for resistance to *P. complanata*, 90-day-old plants were sprayed until run-off with a blended spore suspension of 5×10^5 spores/ml prepared in distilled water containing 0.1% Tween 20. The spore suspensions were produced by combining spores from various isolates of *P. complanata* of known pathogenicity that were isolated from diseased plants from fields within the Cookstown and Bradford Marsh areas of southern Ontario. Forty to 50 days after inoculation, the plants were harvested and visually screened for *Phoma* canker resistance along with commercially acceptable root characteristics, including smoothness, firmness, white flesh, and medium to small lenticels. Plants selected at harvest had <1% of the foliage area covered with lesions and had no lesions on roots. Selected roots were placed in cold storage at IC and 95% relative humidity for 3 months to assess storage potential and for vernalization. Since *P. com-*

Table 1. Incidence of root canker caused by *P. complanata* at harvest of parsnip cultivars grown on muck soils in 1986 at the Muck Research Station, Kettleby, Ontario.

Cultivar	Roots with canker' (%)
All-American	20.6 a
Avonresister	37.5 ab
Gladiator	50.7 b
White Gem	78.7 C
Harris Model	90.3 c

'Roots were evaluated 65 days after foliar inoculation; mean separation by Duncan's multiple range test, $P = 0.05$.

planata is still active above 0C, the roots were reassessed externally for the presence of lesions following cold storage. Roots showing <0.570 of the surface area covered with lesions were planted and allowed to mass-pollinate in screen tents within the greenhouse during the winter. The number of roots selected for each cycle varied, but usually ranged from 2% to 3% of the total number of roots grown in the field. Common houseflies (*Musca domestica* L.) were used to effect pollen transfer in this predominantly cross-pollinated crop. Seeds were harvested from vigorous greenhouse-grown plants, bulked, and sown in the field for disease screening.

Description

When grown on muck soils, UG-10 plants are vigorous and foliage is moderate. At harvest, UG-10 plants that were inoculated with *P. complanata* lacked root cankers but exhibited variation in the number of lesions on foliage. Generally, the lesions on plants cov-

Fig. 1. Representative roots of UG-10 parsnip germplasm.

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ered <0.1% of the foliage area. In comparison, > 90% of inoculated 'Harris Model' plants, grown in each selection cycle as a susceptible check, were devoid of foliage, and the corresponding roots had canker lesions covering $\approx$ 20% of the surface area. UG-10 roots have been selected for resistance to sprouting during vernalization, and many roots are devoid of *Phoma* cankers after 3 months of cold storage. However, all roots from cold storage, when planted, will exhibit lesions during the regrowth of foliage. Roots range in shape from wedge to bayonet (Fig. 1), which- should allow plant breeders the opportunity to select out preferred shapes. Greenhouse seed production and seed set in

plants comprising UG-10 is comparable to 'Harris Model'.

Availability

A limited amount of 1990 greenhouse-harvested seed is available upon request by writing R.F. C.

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