ROOTKNOT-EELWORM RESISTANCE IN SOME SOUTH AMERICAN TUBER-FORMING SOLANUM SPECIES

Heinz Brucher

Several collections of *Solanum* species made by the author in the area of the Argentine Cordilleras between the years 1949-1959 provided European potato breeders with valuable sources of resistance to the golden eelworm, *Heterodera rostochiensis* Wollenweber. The resistance of these species has been combined with some European potato varieties with high yield and quality. As a result, good commercial potato varieties, resistant to golden eelworm, soon can be expected in Europe. (13, 14, 15, 17.)

The rootknot disease caused by species of *Meloidogyne* is responsible for severe potato crop losses in many semi-tropical regions of the world — India, South Africa and certain South American countries. The problem in controlling *Meloidogyne* is in many ways more difficult than that with *Heterodera* for the host range of the former is not restricted to a few solanaceous crops.

The first evidence of field resistance to rootknot disease was observed in 1958-1960 among indigenous potatoes of the Juella Valley in northern Argentina (8). This resistant material was further tested in heavily infested soils in the Province of Mendoza. In order to overcome the heavy losses caused by *Meloidogyne* in South Africa (18) a part of my potato collection was transferred to the Experimental Station at Roodeplaat, Republic of South Africa, where it was tested for resistance to four species of the genus *Meloidogyne*.

Pure cultures of *Meloidogyne hapla*, *M. javanica*, *M. incognita* and *M. thamesii* were kindly provided by Dr. Heinz (Inst. of Plant Protection, Pretoria) to whom we are indebted for helpful advice. After a preliminary multiplication of the different rootknot nematodes in separated bean cultures, the highly infested soil together with the decayed bean plants was transferred to four fibro-cement trays (300 cm x 80 cm x 15 cm). These contained a sterilized soil mixture of sandy loam, where some weeks before tomatoes and beans had been sown.

After two weeks, an even infestation in each of the different cement trays with its special *Meloidogyne* strain was obtained.

In the meantime, several hundred small plastic pots (7 cm diam.) were planted with tubers from our collections of wild and primitive potatoes, grown from true seeds. These pots had been perforated with a hot iron (20 holes of 3 mm diam.). It was expected that the nematodes would easily penetrate from the infested soil outside into the plastic pots, where a dense root system was developing. The four replications of plastic pots were put in the same order in each test tray by four different persons to avoid casual contamination. The whole experiment was supervised by a responsible technician in a greenhouse where optimal conditions for the parasites existed (mean temp 22 C, Max 30 C under day time, 20 C min during the night). After 3 months, flowering, tuberization

---

1 Accepted for publication January 4, 1967.
2 Depto. de Genetica, Fac. de Ciencias, Univ. Central de Venezuela, Caracas.
or strong stolon formation, according to the different species of Solanum had begun.

At this time, several species showed visible growing defects. This stage of plant growth was chosen as the time to inspect for nematode infections. Again, four different workers, each concerned with a specific *Meloidogyne* sps., removed the plastic pots from the soil in the cement trays. The commercial variety, Up-to-Date, was used as a standard and it was found to be heavily infested. A heavy infestation of roots and tubers was the usual observation with most of the tested cultivars. Those plants that were heavily infested were discarded. In this way roughly 80% of all numbers were eliminated from further consideration. Tubers from the apparently resistant cultivars were collected whenever possible and, after a sufficient rest period, were submitted to a final screening with *M. javanica* and *M. hapla*. The results of this test are presented in Table 1.

The subjective influence on the judgment of the four different workers making the disease ratings was reduced by withholding the identity of the cultivars with which they were working. Promising results were obtained as most of the cultivars received similar infestation ratings in the various replications of this experiment.

Most of the numbers tested for the second time with *M. javanica* and *M. hapla* reacted as they had in the preliminary screening. Eight of the cultivars were placed in Class I — free or nearly free from infestation with both *M. hapla* and *M. javanica*.

Numbers 600-890 were indigenous potatoes collected in northern Argentina; numbers 900-1050 were collected in southern Bolivia while numbers 2300-2450 were cultivars from the Island of Chiloe (4, 5). With the exception of numbers 1059-1073, collected in the same valley, and numbers 2112-2124 from the vicinity of Tilcara, there is no geographical relation between *Solanum* cultivars and resistance to *M. javanica*. This perhaps would be expected in view of the widespread custom of interchanging seed potatoes among the indigenous populations of the Andes. Thus, the resistance to *M. javanica* occurring in some cultivars collected in Chiloé may have been transferred there from their zone of origin in the North.

As shown in Table 1, the most fruitful area for making collections of *Solanum* cultivars, resistant to *Meloidogyne*, is the irrigated valleys of the province of Jujuy, Argentina. Here in a rather highly developed indigenous agriculture, potatoes have been grown for thousands of years with the consequent accumulation of parasites in the soil. Clones highly resistant to rootknot eelworm were found near Pampa Grande in the Juella Valley.

The reactions of some wild growing *Solanum* species to four species of *Meloidogyne* are presented in Table 2. Restrictions imposed by the South African Plant Control made it impossible to screen a representative collection of the different botanical series within the Section Tuberarium. The few results obtained indicate, however, that resistance to *Meloidogyne* may be found in the series Commersoniana and Tuberosa. The resistance found in *S. chacoense* Bitter and *S. tascalense* Brücher (7) surpasses that found in any of the cultivars reported in the previous test. The species