virulent on *A. lycopsoides* or *A. gloriosa*. The latter hypothesis agrees with the field observations of Pantone, Griesbach and Maggenti (1986) who reported that known hosts of the nematode were unaffected at several sites of nematosis where only one species was galled.

A. spectabilis, which is in the section Microcarpae, is not as close taxonomically to *A. intermedia* as is *A. menziesii*, the later two species both being in the section Muricatae (Ray & Chisaki, 1957*a*). The hypersensitive reaction within the gall that formed on *A. spectabilis* could have been a defense mechanism that prevented the nematode from reproducing.

Nagamine and Maggenti (1980) are the only other researchers who have reported *Anguina amsinckiae* forming leaf galls. They hypothesized that only under very moist environmental conditions will leaf galls form. Other studies failed to find evidence of nematode galls on any tissues other than floral tissues (Steiner & Scott, 1934; Godfrey, 1940; Pantone & Womersley, 1986). It is probable that the high relative humidity in this experiment provided the conditions necessary for leaf galls to form.

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ASSESSING RESISTANCE OF CITRUS ROOTSTOCKS TO *TYLENCHULUS SEMIPENETRANS* WITH ROOTED LEAVES (1)

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A major problem in citrus rootstock breeding programs is the extended period needed to obtain seedlings adequate for the evaluation of desired characters — among these, resistance to the citrus nematode, *Tylenchulus semipenetrans* Cobb, 1913. It has been suggested (Ford, 1957) that rooted leaves might be useful for this purpose, and techniques for rooting citrus leaf cuttings have been known for many years (Halma, 1931; Salomon & Mendel, 1965). However, Inserra and O'Bannon (1975) have shown that the burrowing nematode, *Radopholus similis*, reproduced equally well after 30 days on callus and roots produced from leaves originating from citrus varieties resistant and susceptible to the nematode. The aim of the present investigation, therefore, was twofold : *(i)* to assess the rooting potential of leaves from different citrus rootstocks, susceptible and resistant to the citrus nematode; and *(ii)* to determine whether the resistance or susceptibility exhibited in natural roots of the parent plant is retained in roots produced by their leaves.

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Leaves with petioles, collected from 10-year old trees were disinfected with 0.2 % Daconil (chlorophalonil) and embedded in a medium containing peat and polystyrene flakes (1 : 3), previously disinfested with 0.3 % Previcurn. They were kept on a bench enclosed within a polyethylene sheet, and intermittently (15 sec. every hour) sprayed with an atomizer, to maintain 95 % humidity. Average temperature was 24.5°. The following five citrus rootstocks were assayed : sour orange (*Citrus aurantium* L.); Troyer citrange (*C. sinensis* L. × *Poncirus trifoliata* L.); Poorman orange 44/12 and 48/21 (both *P. trifoliata* × Poorman orange, new rootstocks developed in the Dept. of Fruit-Tree Breeding, ARO, The Volcani Center, Bet Dagan, Israel). Half the number of leaves in all five groups were treated by dipping the petioles in « Harmoril », which contains 0.8 % indolebutyric acid (IBA), an effective hormonal rooting agent (Hartmann & Kester, 1983). Twenty days after initiation of the experiment, ten leaves were sampled for rooting assessment from all groups at 10-day intervals, for a total period of 60 days. Rooting performance of leaves of

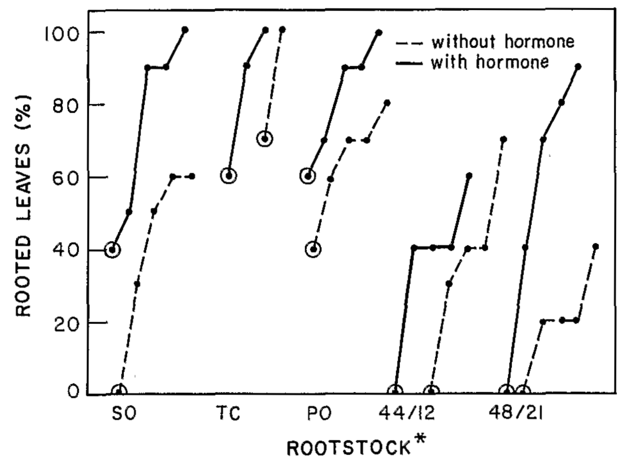

Fig. 1. Mean percentage of rooted leaves (ten replicates) from five citrus rootstocks at different time intervals. Encircled point indicates first sampling date. (SO = sour orange; TC = Troyer citrange; PO = Poorman orange).

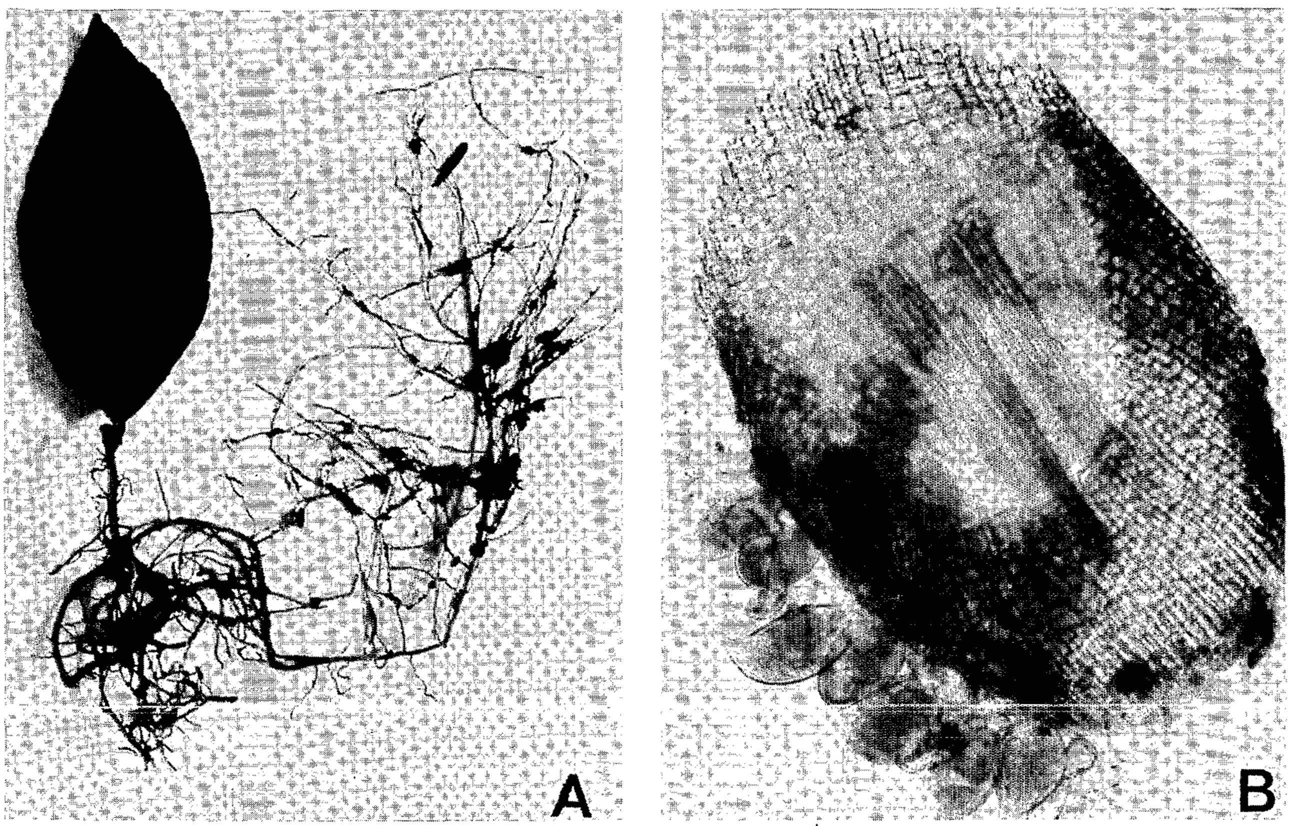

Fig. 2. Roots produced by leaf of sour orange, infected by the citrus nematode. A : rooted leaf; B : section of root infected by group of *Tylenchulus semipenetrans* females.

Poorman orange and Troyer citrange was found to be superior to that of the other varieties (Fig. 1), particularly since they exhibited high rooting percentages already after 20 days, while all the other rootstocks began rooting only 10 days later. Evidently, also, the hormonal treatment generally improved rate of rooting, which in the case of sour orange and 48/21 was statistically significant (P = 0.05).

Nematode infection of roots produced by leaves was studied on " Eureka " lemon (*C. limon* L.); sour orange; citrumelo (*P. trifoliata* × *C. paradisi* Macf.); and *Severinia buxifolia* Poir. Of these, the former two are known to be susceptible and the latter two resistant, to varying degrees, to the Israeli populations of the citrus nematode (Gottlieb, Cohn & Spiegel-Roy, 1986). Leaves of these plant varieties were rooted as described above, then transferred into plastic containers on a medium of peat and sand (2 : 1), and kept in a growth chamber at 25 ± 1°. The plants were inoculated by introducing 17 500 free-living stage *T. semipenetrans* into the rhizosphere, and were removed for examination of nematode build-up four months later (Fig. 2). Nematode infection and multiplication were determined by counting the number of free-living stages emerging from roots incubated overnight in modified Baermann funnels. Results (Tab. 1) indicate that whereas leaf roots of the susceptible varieties showed a high degree of nematode infection, the two resistant varieties did not support nematode reproduction.

Table 1

Citrus nematode infection rate of roots produced by leaves from different rootstocks

Rootstocks	No. of replicates	Mean no. of nematodes/ g root*
" Eureka" lemon	4	2173 ± 609
Citrumelo	7	(6 ± 1)
S. buxifolia	9	(3 ± 1)
Sour orange	4	1130 ± 192

* Parentheses indicate no adult females present on roots.

Free-hand cross-sectioning of infected susceptible leaf roots revealed a similar pattern of nematode parasitism as that known from normal citrus roots, *viz.* embedding of the female head within the cortical tissue of the root, surrounded by a small feeding zone comprising a number of discolored parenchyma cells (Cohn, 1965).

We conclude, therefore, that roots produced by leaves in citrus species and hybrids are functionally similar to natural roots in their reaction to parasitism by *T. semipenetrans*, and can serve as a useful tool for rapid evaluation of resistance to the citrus nematode.

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ON *MACROPOSTHONIA* AND *CRICONEMOIDES*, AGAIN (NEMATA : CRICONEMATIDAE)

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In his recently published book on Tylenchida Siddiqi (1986) revalidated the genera *Macroposthonia* de Man, 1880 and *Criconemoides* Taylor, 1936. Both these genera have been declared *genera dubia*, and so rejected, by Luc and Raski (1981), who presented a detailed and factually based argumentation for such a nomenclatorial action. Consequently most of the species in these two genera were placed in the genus *Criconemella* De Grisse &

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