Interaction between Root Knot Nematode and Pseudomonas marginata on Gladiolus Corms

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ABSTRACT

The presence of the root knot nematode *Meloidogyne javanica* greatly increased the severity of gladiolus scab, caused by *Pseudomonas marginata*, as well as the number of scabbed corms. This is the first record of an interaction between these organisms.

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Insects, mites, and/or certain undetermined nematodes have been suggested by several investigators to be instrumental in spreading and increasing the damage caused by the gladiolus scab organism *Pseudomonas marginata* (McCulloch) Stapp.

Young, in 1954 (17) indicated that the amount of gladiolus scab is influenced by the prevalence of soil insects, which provide wounds through which infection occurs. Forsberg, in 1954 (5) found that corms free from white grub (*Phyllophaga* spp.) damage were also free from scab, whereas many of the corms damaged by grubs displayed scab lesions. In 1955, Forsberg (6), reported that soil samples taken from plots in which gladiolus corms showed scab lesions, were carrying large populations of undetermined species of nematodes. Forsberg, in 1959 (7), stated that the bulb mite (*Rhizoglyphus echinopus*) was found on all scabbed corms but not on the healthy ones, and that severe scab lesions developed in the presence of both the mites and *P. marginata*. He added that in soils to which *P. marginata* was added alone, only a few minor lesions developed on the corms.

Several bacterial phytopathogens have been reported to interact with root knot nematodes on roots and other underground plant parts of certain crops (3, 4, 8, 9, 10, 11, 12, 13, 14). It seemed possible that such an interaction might take place in the case of root knot nematode and *P. marginata* on gladiolus corms.

Therefore, the present work was undertaken to investigate a possible interaction between *P. marginata* and *Meloidogyne javanica* (Treub) Chitwood (12), the most prevalent root knot nematode in Alexandria governorate, relating to incidence and severity of gladiolus scab disease.

A virulent *P. marginata* isolate (No. IV) characterized by white irregular, raised, lobate, viscid, and contoured colonies was used in this work (1). Bacterial inoculum was prepared by growing the isolate for 48 hr, at 30 C, on glycerol agar plates (peptone, 5 g; beef extract, 3 g; glycerol, 20 ml; agar, 20 g; in 1,000 ml H_2O) and the resulting growth was scrubbed off in sterile water. The optical density of the bacterial suspension was 0.15 at 580 mμ, using Model 401 Lumetron colorimeter.

A single female of *M. javanica* with egg mass was obtained from a diseased tomato plant showing typical root knot galls. The nematode population was identified according to the system recommended by Chitwood (2) and Taylor et al. (16) and the host range reaction suggested by Sasser (15).

Healthy gladiolus corms, cultivar 'Snow Princess', were used. Corms were surface-sterilized in 0.1% $HgCl_2$ for 15 min, and planted in autoclaved sandy loam soil in sterile 20-cm diam pots, one corm per pot. Soil was infested 60 days after planting, at which time new corms were about to develop.

Treatments were: (i) Fifteen grams of blended 3-month-old galled tomato roots grown in soil infested with *M. javanica*; (ii) 50 ml of a bacterial cell suspension of *P. marginata* per pot. Fifteen grams of blended healthy tomato root macerates were added, 1 wk prior to the addition of the bacterial inoculum, to each pot to eliminate the possible influence of the presence of root fragments in the soil in increasing the inoculum potential of the bacterial pathogen; (iii) The same amounts per pot of both the nematode and the bacterium inocula in a combined soil infestation treatment. The nematode inoculum was added 1 wk prior to the addition of the bacterial inoculum; and (iv) Fifteen grams of healthy tomato root macerates per pot.

All the bacterial inoculum was added at the same time, and all tomato tissue, healthy and galled, was added 1 wk prior to the addition of the bacterial inoculum. Ten plants were used in each treatment and the experiment was replicated three times. Corms formed on plants of all treatments were collected 120 days after planting and examined for the occurrence of scab lesions.

Results indicate a definite associative role between *M. javanica* and *P. marginata* in causing severe scab lesions on the developing gladiolus corms (Table 1, Fig. 1). The presence of the root knot nematode, *M. javanica*, resulted in the production of root knot symptoms on the growing roots, but did not cause any symptoms on the developing corms. It appears, therefore, that the role of nematode in the association is either by providing a means of entry or by altering the physiology of the corm resulting in severe scab lesions. Such conclusion could be further evidenced by the fact that when the virulent strain of *P. marginata* was present alone in the soil, the numbers of gladiolus corms that showed scab lesions was about 25% of scabbed corms that formed when both the bacterium and the nematode were present in the soil.

A review of the available literature indicates that this is the first record of an interaction between these organisms.

TABLE 1. Number of scabbed and scab-free gladiolus corms in soils infested with *Pseudomonas marginata* alone or in association with *Meloidogyne javanica*

Treatment	Average No. of corms/10 plants	
	Free from scab	Scabbed
Nontreated control	29	---
M. javanica alone	22	---
P. marginata alone	18	8
M. javanica + *P. marginata*	5	23

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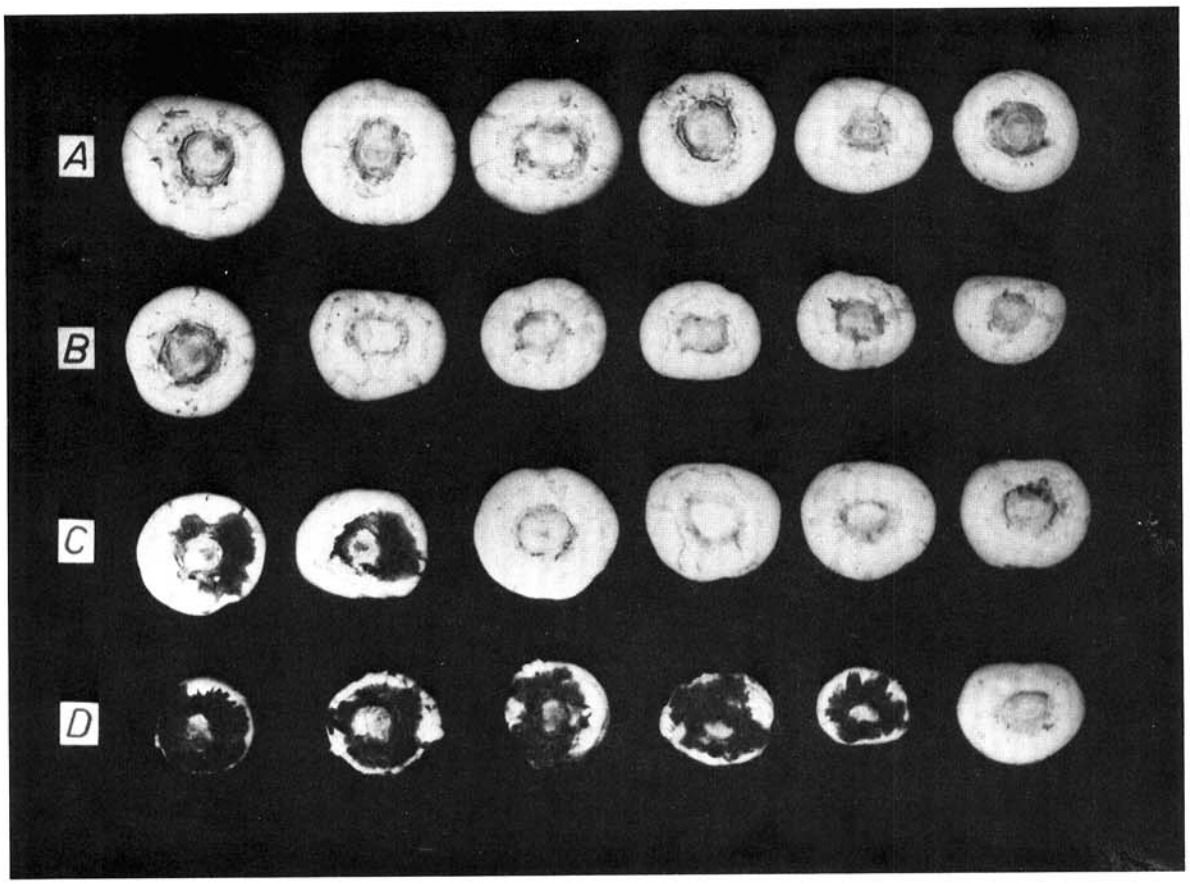

Fig. 1. Gladiolus corms grown in artificially infested soil with: **A)** Nontreated control. **B)** *Meloidogyne javanica* alone. **C)** *Pseudomonas marginata* alone. **D)** *M. javanica* and *P. marginata*.

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