

All India Co-ordinated Research Project on Betelvine
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INTERACTION OF *ROTYLENCHULUS RENIFORMIS* AND *PHYTOPHTHORA PALMIVORA* ON BETELVINE

by

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Summary. *Rotylenchulus reniformis* and *Phytophthora palmivora* were shown to interact synergistically on betelvine (*Piper betle*) cv. Karpoori. The incidence of wilt disease as measured in terms of root rot index was significantly higher when the nematode and fungus were inoculated concomitantly or sequentially. Vine mortality increased significantly both when nematode inoculation preceded fungal inoculation and when both pathogens were inoculated concomitantly.

Betelvine (*Piper betle* L.) is an important commercial crop which is grown in India for pharmaceutical purposes. The root-knot nematode *Meloidogyne incognita* and the reniform nematode *Rotylenchulus reniformis* commonly infest this crop and cause yield reduction (Sivakumar and Marimuthu, 1984). *Phytophthora palmivora* causes wilt of betelvine and its association with *M. incognita* has been shown to result in a disease complex (Jonathan *et al.*, 1996). However, the association with *R. reniformis* and *P. palmivora* on betelvine has not been investigated, although it has been studied in some other crops (Khader *et al.*, 1972; Kumar and Sivakumar, 1981). Therefore, the interaction of *R. reniformis* Linford *et Oliveira* and *P. palmivora* Butler in betelvine was investigated with reference to time of infection of the two pathogens.

Materials and methods

Uniformly sized, three-noded cuttings of betelvine cv. Karpoori were planted in pots containing

5 kg sterilized soil and kept in a mist chamber. Thirty days later, the pots were inoculated with fungus and/or nematodes as indicated in Table I. There were five replications of each treatment.

The nematode inoculum was obtained from a population maintained on papaya (*Carica papaya* L.) cv. Co3. Eggs from egg masses were hatched by incubation for 15 days at room temperature in the laboratory (Muralidharan and Sivakumar, 1975). The nematodes were inoculated at 5000/pot (approximately 50% of this population consisted of females). The fungus was isolated from a diseased betelvine plant and cultured on potato-dextrose agar (PDA) (Ricker and Ricker, 1936). One week old cultures maintained in Petri plates were flooded with sterile tap water and the fungal growth stirred with a sterile needle. The plates were incubated at 25 °C for 24 hrs. The sporangia produced were harvested and a suspension of 50 sporangia/ml water was inoculated at the rate of 50 ml/pot. Inoculations were made by carefully removing the soil in the rhizosphere and adding the homogenous suspensions of *R. reniformis* and/or *P. palmivora* sporangia.

TABLE I - Interaction of *Rotylenchulus reniformis* and *Phytophthora palmivora* in betelvine.

| Treatment | Shoot | | Root | | No. of leaves/ vine | Nematode population/ plant | Root-rot index (0-5 scale) | Mortality of vine (%) |
|----------------------------------|----------------|---------------|----------------|---------------|------------------------|-------------------------------|-------------------------------|--------------------------|
| | length (cm) | weight (g) | length (cm) | weight (g) | | | | |
| Nematode alone (N) | 159.5 | 96.5 | 36.2 | 15.3 | 201.2 | 56.3 (7.5) | 0.0 (0.7) | 0.0 (4.1) |
| Fungus alone (F) | 157.2 | 98.2 | 36.5 | 14.8 | 200.6 | 0.0 (0.7) | 2.6 (1.8) | 13.5 (22.0) |
| Concomitant inoculation of N + F | 148.5 | 90.3 | 31.3 | 13.2 | 194.2 | 14.2 (3.8) | 4.0 (2.1) | 31.2 (34.5) |
| N 20 days before F inoculation | 147.3 | 88.5 | 30.5 | 12.9 | 190.3 | 15.5 (4.0) | 4.2 (2.2) | 35.3 (36.7) |
| F 20 days before N inoculation | 150.3 | 91.3 | 32.0 | 13.5 | 196.2 | 13.8 (3.8) | 3.8 (2.1) | 24.5 (29.9) |
| Uninoculated control | 196.3 | 115.2 | 40.5 | 20.5 | 226.6 | 0.0 (0.7) | 0.0 (0.7) | 0.0 (4.1) |
| SEM | 2.8 | 1.9 | 1.5 | 1.1 | 2.3 | 0.2 | 0.05 | 0.8 |
| CD at 5% | 8.3 | 5.8 | 4.4 | 3.2 | 6.5 | 0.6 | 0.14 | 2.2 |

Figures in parentheses are $\sqrt{X + 0.5}$ transformed values and figures in parentheses for mortality of vine are $X + 0.5$ Arcsin transformed values; root rot index 0 = free from rotting, 1 = 1-15% rotting, 2 = 16-30% rotting, 3 = 31-45% rotting, 4 = 46-60% rotting, 5 = above 60% rotting.

Plants were uprooted 90 days after inoculation. Measurements of shoot and root length and weight were made. The number of leaves per vine and per cent mortality of vines were recorded. The root rot index was estimated on a 0-5 scale. The roots were stained with acid fuchsin-lactophenol and examined for the presence of nematodes.

Results and discussion

R. reniformis and *P. palmivora* individually caused significant reductions in plant growth parameters viz. shoot length, shoot weight, root length and root weight, and also reduced the

number of leaves per vine when compared with the uninoculated control. When both pathogens were inoculated concomitantly or sequentially, the reduction in shoot length and weight and root length and weight, was greater than with either pathogen alone. The pathogens in combination also significantly reduced the number of leaves per vine (Table I).

Roots in all nematode inoculated treatments were infested by *R. reniformis* females. Nematode only inoculated treatments recorded a mean population of 56.3 per plant. Significant reduction in nematode infestation was observed in concomitant and sequential inoculations of the two pathogens.

The root rot index was significantly higher

with concomitant and sequential inoculations than with the fungus alone. This suggested a synergistic interaction between *R. reniformis* and *P. palmivora* in betelvine.

Vine mortality was observed in concomitant and sequential inoculations of the two pathogens. Significant increase in vine mortality was noticed both in nematode inoculation preceding the fungus inoculation and concomitant inoculation of fungus and nematode. This indicates that *R. reniformis* can predispose the betelvine plants to *P. palmivora* and enhance the incidence of wilt disease.

The experiment was repeated after a year's interval with similar results.

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