INTERNATIONAL JOURNAL OF PLANT PROTECTION / VOLUME 6 | ISSUE 1 | APRIL, 2013 | 70-72

IJPP

RESEARCH ARTICLE

Interaction studies of *Fusarium oxysporum* f. sp. *cubense* with burrowing nematode (*Radopholus similis*)

R. SOMU[1], N. THAMMAIAH*[2], V. DEVAPPA[3], M. S. KULKARNI[1] AND G. S.K. SWAMY[4]

[1]Department of Horticultural Plant Pathology, K.R.C. College of Horticulture (U.H.S.) Arabhavi, BELGAUM (KARNATAKA) INDIA

[2]Department of Plant Pathology, AICRP on Tropical Fruits, K.R.C. College of Horticulture, Arabhavi, BELGAUM (KARNATAKA) INDIA

[3]Department of Plant Pathology, Horticultural Research Station, ARSIKERE (KARNATAKA) INDIA

[4]Department of Fruit Science, K.R.C. College of Horticulture (U.H.S.) Arabhavi, BELGAUM (KARNATAKA) INDIA

ARITCLE INFO

Received : 27.09.2012
Revised : 18.01.2013
Accepted : 08.02.2013

Key Words :
Fusarium oxysporum f. sp. *cubense*, *Radopholus similis*, Interaction

*Corresponding author:
nthammaiah@gmail.com

ABSTRACT

Investigations were undertaken in pot to assess a possible interaction between Panama wilt of banana caused by *Fusarium oxysporum* f. sp. *cubense* and burrowing nematode *Radopholus similis*. The disease incidence was highest in inoculation of burrowing nematode (*Radopholus similis*) followed by *Fusarium oxysporum* f. sp. *cubense* and inoculation of *Fusarium oxysporum* f. sp. *cubense* followed burrowing nematode (*Radopholus similis*) and simultaneous inoculation of *Fusarium oxysporum* f. sp. *cubense* and burrowing nematode (*Radopholus similis*). Plant growth parameters were least in simultaneous inoculation of *Fusarium oxysporum* f. sp. *cubense* and burrowing nematode (*Radopholus similis*).

How to view point the article : Somu, R., Thammaiah, N., Devappa, V., Kulkarni, M.S. and Swamy, G.S.K. (2013). Interaction studies of *Fusarium oxysporum* f. sp. *cubense* with burrowing nematode (*Radopholus similis*). *Internat. J. Plant Protec*., **6**(1) : 70-72.

INTRODUCTION

Banana and plantains (*Musa* spp.), the second largest fruit crop in the world, are important staple foods in tropical America, Asia and the Pacific. Banana is one of the most important fruit crops extensively grown in India. Among the various biotic factors affecting production, the burrowing nematode, *Radopholus similis* is considered the most economically important nematode disease of banana (Gowen, 1995). Sundararaju (1996) reported that the burrowing nematode causes severe root rotting, resulting in about 25-35 per cent reduction in yield.

Another important limiting factor in banana production is Panama wilt, caused by *Fusarium oxysporum* f. sp. *cubense* Snyder *et* Hansen. In India, the first reports of Panama wilt were in 1911 in West Bengal and 1956 in Tamil Nadu and many reports have been made subsequently. The main nematode found associated with this disease is *Radopholus similis*. Therefore, the present study was undertaken to assess the interaction between the wilt fungus, *F. oxysporum* f. sp. *cubense* (*Foc*) and burrowing nematode, *Radopholus similis*.

MATERIALS AND METHODS

A pot culture experiment was initiated at K.R.C. College of Horticulture, Arabhavi. There were six treatments replicated four times with Complete Randomized Design. A susceptible cultivar Ney Poovan (Yalakkibale) was planted in pots containing sterilized soil. Inoculation was done 25 days after planting with the following treatments :

– T_1- Inoculation of *Fusarium oxysporum* f. sp. *cubense* alone
– T_2 -Inoculation of burrowing nematode (*Radopholus similis*) alone
– T_3- Simultaneous inoculation of *Fusarium oxysporum* f.

sp. *cubense* + burrowing nematode (*Radopholus similis*).

– T_4-Inoculation of *Fusarium oxysporum* f. sp. *cubense* followed by nematode (*Radopholus similis*).

– T_5 -Inoculation of nematodes (*Radopholus similis*) followed by *Fusarium oxysporum* f. sp. *cubense*

– T_6 -Control (uninoculated)

Observations were recorded on plant growth parameters *viz.,* plant height, pseudostem girth, number of leaves, leaf area (m^2) and per cent disease incidence.

RESULTS AND DISCUSSION

Disease complex involving nematode and fungi have gained momentum in the recent years leading to considerable yield loss. The disease incidence was recorded at 180 days after planting and data are presented in Table 1.

The incidence of wilt was highest (65.00 %) in inoculation of nematode 15 days prior to *Fusarium oxysporum* f. sp. *cubense* followed by inoculation *Fusarium oxysporum* f. sp. *cubense* 15 days prior to nematode (55.00 %) and simultaneous inoculation of *Fusarium oxysporum* f. sp. *cubense* and nematode(50.00 %). Least incidence or no incidence was noticed in inoculation of nematode alone.

The data on interaction between *Fusarium oxysporum.* f. sp. *cubense* and burrowing nematode (*Radopholus similis*) are recorded in Table 2.

Significant reduction in plant height, pseudostem girth and leaf area was noticed in all the treatments as compared to uninoculated treatment.

Data present in Table 2 revealed that significant reduction in plant height, pseudostem girth and leaf area were observed in simultaneous inoculation of *Fusarium oxysporum* f. sp. *cubense* and burrowing nematode (*Radopholus similis*) followed by inoculation of *Fusarium oxysporum* f. sp. *cubense* alone and inoculation of *Radopholus similis* 15 days prior to inoculation of *Fusarium oxysporum* f. sp. *cubense* over untreated control.

However, simultaneous inoculation of *Fusarium oxysporum* f. sp. *cubense* and *Radopholus similis* showed greatest reduction with respect to plant height (43.40 cm), pseudostem girth (9.90 cm), leaf area (0.25 m^2) and number of leaves (5.95) followed by inoculation of *Fusarium oxysporum* f. sp. *cubense* alone showed plant height (46.80 cm), pseudostem girth (10.55 cm), leaf area (0.26 m^2) and number of leaves (6.10), inoculation of *Radopholus similis* 15 days prior to inoculation of *Fusarium oxysporum* f. sp. *cubense* showed plant height of 48.25 cm, pseudostem girth was 10.65 cm, leaf area was 0.28 m^2 and number of leaves (6.30), inoculation of *Radopholus similis* alone showed plant height of 51.55 cm, pseudostem girth (12.30 cm), leaf area (0.35 m^2) and number of

Table 1: Studies on interaction between *Fusarium oxysporum* f. sp. *cubense* with burrowing nematode (*Radopholus similis*)

Treatment	Incidence of wilt (%)
T_1: Inoculation of *Fusarium oxysporum* f.sp. *cubense* alone	35 .00 (5.94)
T_2: Inoculation of burrowing nematode (*Radopholus similis*) alone	0.00 (1.00)
T_3: Simultaneous inoculation of *Fusarium oxysporum* f.sp. *cubense* + burrowing nematode (*Radopholus similis*).	50.00 (7.10)
T_4: Inoculation of *Fusarium oxysporum* f.sp. *cubense* followed by nematode (*Radopholus similis*).	55.00 (7.45)
T_5:Inoculation of nematodes (*Radopholus similis*) followed by *Fusarium oxysporum* f.sp. *cubense*	65.00 (8.10)
T_6: Control	0.00 (1.00)
S.E.±	0.31
C.D. @ 1%	1.27

Figures in the parenthesis are the square root transformed values

Table 2: Studies on interaction between *Fusarium oxysporum* f. sp. *cubense* with burrowing nematode (*Radopholus similis*): Growth parameters

Treatments	Plant height (cm)		Pseudostem girth (cm)		Leaf area (m^2)		Number of leaves	
	120 *DAP	180 DAP	120 DAP	180 DAP	120 DAP	180 DAP	120 DAP	180 DAP
T_1	46.80	62.35	10.55	12.50	0.26	0.22	6.10	4.36
T_2	51.55	68.80	12.30	14.25	0.35	0.30	6.70	5.35
T_3	43.40	60.20	9.90	11.55	0.25	0.21	5.95	4.23
T_4	51.10	67.15	12.18	14.15	0.35	0.29	6.40	5.25
T_5	48.25	63.10	10.65	12.75	0.28	0.23	6.30	5.18
T_6	56.75	73.10	14.65	15.55	0.43	0.42	7.50	6.15
S.E. ±	1.65	1.52	0.42	0.44	0.01	0.01	0.11	0.12
C.D. @ 1%	6.74	6.18	1.72	1.81	0.04	0.04	0.46	0.50

*Days after planting

leaves (6.70) at 120 days after planting.

Similarly significant reduction in plant growth parameters were observed at 180 days after planting with respect to plant height (60.20 cm), pseudostem girth (11.55 cm), leaf area (0.21 m^2) and number of leaves (4.23) in simultaneous inoculation of *Fusarium oxysporum* f. sp. *cubense* and burrowing nematode (*Radopholus similis*) followed by inoculation of *Fusarium oxysporum* f. sp. *cubense* alone showed plant height (62.35 cm), pseudostem girth (12.50 cm), leaf area (0.22 m^2) and number of leaves (4.36), inoculation of *Radopholus similis* 15 days prior to inoculation of *Fusarium oxysporum* f. sp. *cubense* showed plant height (63.10 cm), pseudostem girth (12.75 cm), leaf area (0.23 m^2) and number of leaves (5.18), inoculation of *Fusarium oxysporum* f. sp. *cubense* 15 days prior to *Radopholus similis* showed plant height of 67.15 cm, pseudostem girth (14.15 cm), leaf area (0.29 m^2) and number of leaves (5.25), inoculation of *Radopholus similis* alone showed plant height of 68.80 cm, pseudostem girth (14.25 cm), leaf area (0.30 m^2) and number of leaves (5.35).

Nematode and fungi cause severe damage to banana. However, the effect on plant growth and wilt incidence increased when both pathogens were present together, increased incidence in the presence of nematode on banana was also reported by Ramanath and Dwivedi (1981) in chickpea, Patel *et al.* (2000), Singh *et al.* (1981) on French bean and Mahapatra and Swain (2001) in blackgram.

In the present study, the disease incidence was highest in inoculation of nematode (15 days prior) followed by *Fusarium oxysporum* f. sp. *cubense* followed by inoculation of *Fusarium oxysporum* f. sp. *cubense* followed by nematode and simultaneous inoculation of *Fusarium oxysporum* f. sp. *cubense* + burrowing nematode and no incidence was observed in inoculation of nematode alone. These findings are in agreement with the reports of Ramanath and Dwivedi (1981), where more than 56 per cent plants were wilted by combined infection of both nematode and fungus and only 32 per cent plants were wilted in fungus alone treatment. Singh *et al.* (1981) observed that simultaneous inoculation of *Meloidogyne incognita* and *Fusarium oxysporum* or inoculation of *Meloidogyne incognita* 10 days prior to fungus showed high wilt incidence. The incidence of wilt was highest in both the treatments (inoculation of *Fusarium oxysporum* f. sp. *cubense* followed by nematode and inoculation of nematodes followed by *Fusarium oxysporum* f. sp. *cubense*) for Ney Poovan (Anonymous, 2008).

The treatment of simultaneous inoculations of *Radopholus similis* and *Fusarium oxysporum* f. sp. *cubense* showed the greatest reductions in plant growth parameters as compared to other treatments. These findings are in conformity with those recorded by Patel *et al.* (2000), Mahapatra and Swain (2001), Haseeb *et al.* (2007) and Sundararaju and Thangavelu (2009) who suggested that the greater damage in simultaneous inoculation of fungus and nematode might be attributed to the prior invasion and wounds up by nematodes into the roots, thereby making the host more favourable for fungal infection and multiplication by offering a metabolically rich substrate and/or nematode might also modify the rhizosphere, thus favouring the fungal growth.

REFERENCES

Anonymous (2008). Biennial research report, Group discussion of All India Co-ordinated Research Project and ICAR AD-HOC schemes on tropical fruits, Tamil Nadu Agricultural University, Coimbatore, (T.N.) INDIA 373pp.

Gowen, S.R. (1995). The sources of nematode resistance, the possible mechanism and potential for nematode tolerance in *Musa*. pp. 45-49. In: New frontiers in resistance breeding for nematode, *Fusarium* and sigatoka. Proc.Workshop held in Kuala Lampur, Malaysia, 2-5 Oct. 1995 (Frisa, E.A., Horry, J.P. and De Waele, D., Eds.), INIBAP, Montpellier, FRANCE.

Haseeb, A., Amin, A. and Sharma, A. (2007). Disease complex in *Pisum sativum* involving *Meloidogyne incognita* and *Fusarium oxysporum* f. sp. *pisi*. *Ann. Pl. Prot. Sci.,* **15**(1) : 189-194.

Mahapatra, S.N. and Swain, P.K. (2001). Interaction between *Meloidogyne incognita* and *Fusarium oxysporum* on blackgram. *Ann. Pl. Prot. Sci.,* **9**(1) : 95-97.

Patel, B.A., Patel, D. J. and Patel, R. G. (2000). Interaction between *Meloidogyne incognita* and wilt inducing fungus, *Fusarium oxysporum* f. sp. *ciceri* on chickpea cv. Dahod yellow. *Indian J. Nematol.,* **30**(2) : 133-135.

Ramnath and Dwivedi, R.P. (1981). Effect of root-knot nematode on development of gram wilt caused by *Fusarium oxysporum* f. sp. *ciceri* and root rot by *Rhizoctonia* spp. *Indian J. Mycol. Pl. Pathol.,* **11** : 46-49.

Singh, D.B., Reddy, P.P. and Sharma, S.R. (1981). Effect of root-knot nematode, *Meloidogyne incognita* on Fusarium wilt of Frenchbean. *Indian J. Nematol.,* **11** : 84-85.

Sundararaju, P. and Thangavelu, R. (2009). Influence of *Pratylenchus coffeae* and *Meloidogyne incognita* on the Fusarium wilt complex of banana. *Indian J. Nematol.,* **39**(1) : 71-74.

Sundararaju, P. (1996). Seasonal fluctuations of *Radopholus similis* and *Pratylenchus coffeae* in certain cultivars of banana. *Infomusa,* **11**(1): 16-19.

****