Reference

Chellaiah, N. (1996). Effect of sowing method, intercropping and foliar nutrition on the productivity of summer irrigated cotton *(Gossypium hirsutum* L) Ph.D. Thesis, Tamil Nadu Agricultural University, Coimbatore.

Gode, D.B., Bobde, G.N. and Hiwaso, B.J. (1992). Intercropping in cotton. *J. Soils and Crops* 2(1):59-61.

Reddy, M.N. and Chatterjee, B.N. (1975). Mixed cropping of soybean with maize. *Indian J. Agron.* 20:341-345.

Reddy, M.S. and Willey, R.W. (1981). Growth and resources use studies in an intercrop of pearl millet / groundnut. *Field Crop Res.* 4 : 13-24.

Robinson, L., (1973) Study on the feasibility of growing crops in association with cotton MCU5, under varying levels of nitrogen. M.Sc., (Ag.) Thesis, Tamil Nadu Agricultural University, Coimbatore.

Singh, V. and Chauhan, S. (1981). Companion cropping in rainfed hybrid cotton. *Indian J. Agron.* 26:450-451.

Wankhade, S.T. (1994). Intercropping in asiatic cotton, *PKV. Res. J.* 18(1) : 43-44.

(Received : June 1997 ; Revised : November 2000)

Madras Agric. J., 87(1-3): 98 - 101 January - March 2000
https://doi.org/10.29321/MAJ.10.A00429

Interaction between *Macrophomina phaseolina* and *Heterodera cajani* in root disease complex of blackgram

T.K.S. LATHA AND V. NARASIMHAN
Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore - 641 003.

Abstract : Investigations were carried out on the root rot disease complex caused by the fungus *Macrophomina phaseoloina* (Tassi). Goid and the cyst nematode *Heterodera cajani* Koshy with reference to their interaction effect on root rot incidence, growth parameters and pod yield. When the cyst nematode was inoculated a week prior to the root rot pathogen, *Macrophomina phaseolina,* the onset of root rot disease was earlier by 15 days and the per cent disease incidence was 95 with maximum reduction in pod yield than when either of them was inoculated separately or simultaneously. *(Key Words : Root rot, Cyst nematode, Disease complex, Predisposition)*

Root rot is the most important soil borne disease of blackgram (*Vigna mungo* (L) Hepper) in India. Pigeonpea cyst nematode is also an important soil borne pest attacking many of the pulse crops including blackgram. Different parasites on the same plant interact which results in disease complex. In the presence of the nematode, the fungal incidence will be more as in the case of *Macrophomina phaseolina - Meloidogyne incognita* complex in cowpea (Devi and Goswami, 1992). Thus, major emphasis has been given to study the interaction effect of these organisms on root rot incidence and its damage on the crop growth parameters and yield.

Materials and Methods

Blackgram seeds (cv. T-9) were sown in 15 cm diameter pots with sterilized soil at 5 seeds / pot. Six treatments viz., fungal pathogen *(M. phaseolina)* alone inoculated, cyst nematode *(H. cajani)* alone inoculated, first and fungus inoculated 7 days later, nematode and fungus inoculated simultaneously and uninoculated control were laid out in a completely randomized block design under glass house condition. The pathogens were inoculated at the time of sowing.

The root rot incidence was observed at five days interval upto the crop maturity. The height of the plant, dry weights of root shoot and pod yield were measured at harvest.

Results and Discussion

The root rot incidence started appearing from 15 days after inoculation (DAI) of the fungal pathogen and reached the maximum at 60 (DAI). Inoculation of the cyst nematode first followed by the inoculation with the fungal pathogen seven days later recorded significantly the highest root rot

incidence (95 per cent) (Table 1). Inoculation of the fungus followed by the nematode a week later or simultaneous inoculation of both the organisms or fungus alone treatments recorded lesser incidence (80, 80 and 70 per cent respectively) that the above treatment. Untreated control and nematodes alone inoculated plants were free of rot till maturity. This trend was observed throughout the period of observation. Further, earliest root rot incidence (at 15 DAI) was observed only in the plants inoculated with the nematode first followed by the fungus seven days later (10 per cent) that the other treatments.

Height of the plant in uninoculated control was maximum (20.1 cm) (Table 2). This was followed by the treatment of simultaneous inoculation of both fungus and nematode (19.5 cm). In all the other treatments the height was minimum.

The dry weight of shoot was maximum (1.77 g) in uninoculated control. Minimum weight of shoot (0.88 g) was observed when the fungus alone was inoculated or when nematodes inoculated seven days prior to fungal inoculation (0.81 g) (Table 2). Dry weight of root was maximum (1.73 g) in control plants while it was minimum (0.36 g) in nematode inoculated seven days prior to fungus. In all other treatments also the root weight was comparatively lesser than control. The pod number was maximum in untreated control (63.3) and in nematode along (59.0) inoculated pots, while it was minimum in the pots where nematode was inoculated first followed by fungus (Table 3).

The results clearly revealed that when the cyst nematode was inoculated a week prior to fungal inoculation, the root rot infection appeared much earlier and also caused maximum incidence that when the fungal pathogen alone was inoculated (Table 1). This observation is in accordance with the findings of earlier workers as in the case of *M. phaseolina* and *Meloidogyne incognita* race-3 interaction on chickpea where, inoculation with fungus and nematode resulted in maximum root rot index (Siddiqui and Husain, 1991).

Earliest root rot infection (15 DAI) was seen in nematode inoculated a week prior to fungus inoculation. But, in the simultaneous inoculation of fungus and nematode or in fungus inoculation first followed by nematode inoculation a week later, the incidence started only at 20 DAI. In fungus alone inoculated pots, the infection started still later (25 DAI). This revealed the predisposition of the plant by the nematode to fungal infection. There are earlier evidences to show that the nematodes by causing injury to the root portion or weakening the root may have an easy access for the entry of the pathogen causing greater damage (Schindler *et al.*, 1960).

The height of the plant, dry weight of shoot and root significantly reduced in all treatments when compared to control. However, when both fungus and nematode were inoculated or fungus alone was inoculated this reduction was significant. This is natural that under stress conditions growth parameters were reduced. In the studies by Siddiqui and Husain (1991), considerable reduction in shoot weight was observed between *M. incognita* race 3 and *M. phaseolina* interaction in chickpea.

The reduction in yield was in accordance with the level of root rot incidence in different treatments. Similar reduction in yield due to interaction effects have been reported in *Verticillium dahliae* - *Pratylenchus penetrans* wilt complex in cotton (Rowe et al., 1985, Francl *et al.*, 1987, Mac Guidewin and Rouse, 1990).

Acknowledgment

The author thanks the Indian Council of Agricultural Research (ICAR), New Delhi for providing financial assistance in the form of Junior Research Fellowship.

References

Devi, T.P. and Goswami, B.K. (1992). Inter relationship or root-knot nematodes *Meloidogyne incognita* and *Macrophomina phaseolina* with cowpea. *Ann. Agric. Res.* **13** : 267-268.

Francl, L.J., Madden, L.V., Rowe, R.C., and Riedel. (1987). Potato yield loss prediction and discrimination using preplant population densities of *Verticillium dahliae* and *Pratylenchus penetrans*. *Phytopath.* 7: 579-584.

Mac Guidwin, A.E. and Rouse, D.I. (1990). Role of *Pratylenchus penetrans* in the potato early *dying* disease of Russet Burbank potato. *Phytopath.* 80 : 1077-1082.

Rowe, R.C., Riedel, R.M. and Martin, K.J. (1985). Synergistic interactions between *Verticillium dahliae* and *Pratylenchus penetrans* in potato early dying dissase. *Phytopath* 75: 412-418.

Schindler, A.F., Robert, N. Stewert, and Peter Semenuik. (1960). Synergistic fusarium-nematode interaction in carnations. *Phytopath.* 51 : 143-145.

Table 1. Interaction effect of root rot fungus and cyst nematode on root rot incidence

S. No.	Treatments	Root rot incidence* (%) (Days After Inoculation)									
		15	20	25	30	35	40	45	50	55	60
1.	Fungus alone	0.0^{a} (0.18)	0.0^{a} (0.18)	5.0^{b} (6.64)	10.0^{b} (13.28)	15.0^{b} (19.92)	20.0^{b} (23.09)	20.0^{b} (23.09)	45.0^{bc} (42.12)	60.0^{b} (51.05)	70.0^{b} (57.10)
2.	Nermatode alone	0.0^{a} (0.18)	0.0^{a} (0.18)	0.0^{a} (0.18)	0.0^{a} (0.18)	0.0^{a} (0.18)	0.0^{a} (0.18)	0.0^{a} (0.18)	0.0^{a} (0.18)$^{'}$	0.0^{a} (0.18)	0.0^{a} (0.18)
3.	Fungus first inoculated and nematode inoculated 7 days later	0.0^{a} (0.18)	5.0^{b} (6.64)	5.0^{b} (6.64)	5.0^{b} (6.64)	15.0^{b} (16.45)	35.0^{bc} (35.78)	35.0^{bc} (35.78)	50.0^{bc} (44.99)	65.0^{b} (53.94)	80.0^{b} (66.91)
4.	Nematode first inoculated and nematode inoculated 7 days later	10.0^{b} (13.28)	10.0^{c} (13.28)	15.0^{c} (19.92)	20.0^{c} (23.09)	30.0^{c} (32.89)	45.0^{c} (42.12)	50.0^{c} (44.99)	60.0^{c} (51.05)	85.0^{c} (73.55)	95.0^{c} (83.36)
5.	Both fungus and nematode inoculated simultaneously	0.0^{a} (0.18)	5.0^{b} (6.64)	10.0^{b} (13.28)	10.0^{b} (13.28)	10.0^{b} (13.28)	15.0^{bc} (19.92)	20.0^{bc} (23.09)	35.0^{bc} (35.78)	60.0^{b} (51.05)	80.0^{b} (66.91)
6.	Uninoculated control	0.0^{a} (0.18)	0.0^{a} (0.18)	0.0^{a} (0.18)	0.0^{a} (0.18)	0.0^{a} (0.18)	0.0^{a} (0.18)	0.0^{a} (0.18)	0.0^{a} (0.18)$^{'}$	0.0^{a} (0.18)	0.0^{a} (0.18)

* Mean of four replications

data in parantheses indicate are sine transformed values

In a coloumn, means followed by a same letter are not significiantly different at 5 % level by DMRT

Table 2. Interaction effect of root rot fungus and cyst nematode on height of the plant, dry weight of shoot and root rot maturity.

S. No.	Treatments	Plant ht. * (cm)	Shoot wt. * (g)	Root wt. * (g)
1.	Fungus alone	16.15[a]	0.883[a]	0.480[ab]
2.	Nematode alone	16.48[a]	1.098[a]	0.490[b]
3.	Fungus inoculated first and nematode inoculated 7 days later	16.40[a]	1.070[a]	0.408[ab]
4.	Nematode inoculated first and fungus inoculated 7 days later	16.25[a]	0.808[a]	0.358[a]
5.	Fungus and nematode inoculated simultaneously	19.50[b]	1.150[b]	0.413[ab]
6.	Uninoculated control	20.10[c]	1.765[c]	1.733[c]

* Mean of four replications
In a coloumn means followed by a common letter are not different significiantly at 5 % level by DMRT

Table 3. Interaction effect of root rot fungus and cyst nematode on pod yield.

S. No.	Treatments	Pod * (no.)	Total pod wt. / pot * (g)
1.	Fungus alone	24.3[b]	8.22[b]
2.	Nematode alone	59.0[c]	19.91[c]
3.	Fungus first inoculated and nematode inoculated 7 days later	23.0[b]	7.94[b]
4.	Nematode firstinoculated and fungus inoculated 7 days later	11.5[a]	3.97[a]
5.	Fungus and nematode inoculated simultaneously	24.8[b]	8.36[b]
6.	Uninoculated control	63.3[c]	24.42[d]

* Mean of four replications
In a coloumn means followed by a common letter are not different significiantly at 5 % level by DMRT

Siddiqui, Z.A., and Husain, S.I. (1991). Interaction of *Meloidogyne incognita* race-3 and *Macrophomina phaseolina* in a root-rot disease complex of chickpea. *Nematol. Medit.* **19** : 237-239.

(Received : November 1998 ; Revised : July 2000)

Madras Agric. J., 87(1-3): 101 - 104 January - March 2000

Soil fertility evalution of lower Vellar basin in Tamil Nadu

J. SOMASUNDARAM, K.K. MATHAN AND S. NATARAJAN
Department of Soil Science and Agricultrual Chemistry, Tamil Nadu Agricultural University, Coimbatore - 641 003.

Abstract : Both surface and subsurface soil samples representing Entisol, Alfisol and Inceptisol consisting 13 soil series were studied for the preparation of the soil fertility classification in the Lower Vellar basin area of Pudukottai district. 'd' (dry condition), 'b' (basic reaction), 'm' (magnesium deficiency); 'k' (potassium deficiency) and 'i' (Fe-P fixation) were the important soil condition modifiers for the study area. The study area reveals that 13 soil series under the scheme of fertility capability classification made possible to arrive 11 FCC units, comprising of 11 type / substrata type and 5 condition modifiers which serve as the basis for conducting fertility related experiments. *(Key Words : Fertility evaluation, FCC, Vellar basin)*

Fertility Capability Classification (FCC), a technical soil classification system based on soil properties known to affect crop response to fertilisation, should be useful in improving fertilizer