Interaction of a non-host plant (*Capsicum annuum* L.) and certain systemic nematicides in population decline of *Rotylenchulus reniformis*

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SUMMARY

Glasshouse studies showed that red pepper (*Capsicum annuum* L.) which is a non-host to *Rotylenchulus reniformis* Linford & Oliveira, 1940, is antagonistic to the nematode. The decline in population was more under red pepper than that under fallow. Application of carbofuran and aldicarb to red pepper at 100 mg a.i./plant enhanced the population decline.

In field, the population of *R. reniformis* was reduced by 19.86 and 79.55 % after one and four months, respectively, under red pepper. Spot application of carbofuran, aldicarb, phorate, disulfoton and CGA 12223 at 1 kg a.i./ha and phorate + disulfoton at 1/2 + 1/2 kg a.i./ha to red pepper, fifteen days after transplanting, brought about a population decline of 71.35-88.89 % and 98.13-99.77 % one and four months after application, respectively.

RÉSUMÉ

Interaction entre une plante non-hôte (Capsicum annuum *L.*) *et certains nématicides systémiques dans la décroissance des populations de* Rotylenchulus reniformis

Des études effectuées en serre ont montré que le piment rouge *(Capsicum annuum* L.), plante non-hôte de *Rotylenchulus reniformis* Linford & Oliveira, 1940, est antagoniste vis-à-vis de ce nématode. En effet, la décroissance de la population est plus forte sous une culture de piment que sous jachère. Le traitement au carbofuran et à l'aldicarbe (100 mg m.a. par plante) accroît le phénomène.

Au champ, les populations de *R. reniformis* sont réduites de 19,86 et 75,55 % après, respectivement, un et quatre mois de culture de piment. Des traitements locaux (carbofuran, aldicarbe, phorate, disulfoton et CGA 12223 à la dose de 1 kg m.a./ha ; phorate + disulfoton à 0,5 + 0,5 kg m.a./ha), appliqués quinze jours après transplantation, amènent une diminution de population de 71,30-88,89 % et 98,13-99,77 %, respectivement, un et quatre mois après l'application.

Investigations in glasshouse on the host-range of *Rotylenchulus reniformis* Linford & Oliveira, 1940, showed that red pepper, *Capsicum annuum* L., was a non-host to the nematode. Subsequently fourteen cultivars of red pepper were screened and all of them were found to be non-hosts to the nematode. Since existence of pathotypes in this species is known (Das Gupta & Seshadri, 1972), red pepper cv. K2 was tested against five different populations belonging to three pathotypes and found to be a non-host to all (Sivakumar, unpublished). This crop has been reported as a non-host for *R. reniformis* in U.S.A. also (Birchfield & Brister, 1962).

Studies were conducted in glasshouse and field on the joint action of certain systemic nema-

ticides and red pepper in population decline of *R. reniformis*.

Materials and methods

A glasshouse experiment in pot culture was conducted adopting a split-plot design, with three main treatments viz., red pepper (non-host), cotton (susceptible) and fallow (no plants) and three sub-treatments, viz., carbofuran [2,3-dihydro-2,2-dimethyl-7 benzofuranyl-methyl-carbamate] and aldicarb [2-methyl-2-(methylthio) propionaldehyde 0-(methylcarbamoyl) oxime] at 100 mg a.i. /pot and untreated.

Clay plots of 500 g capacity were filled with a red loamy soil from a monoculture of *R. reniformis* maintained on cotton with a mean population of 1 210 nematodes /400 g soil, consisting of larvae, immature females and adult males. The nematicides were applied at the time of transplanting three-weeks-old red pepper seedlings cv. K2, or sowing cotton *(Gossypium hirsutum)* cv. MCU 5. Soil population was determined 60 and 100 days after planting in five replicates drawn from each treatment. The entire quantity of soil contained in each pot was reduced by Cobb's sieving technique using 20, 40, 60, 100, 200 and 325 meshes /inch sieves and transferred to facial tissue paper spread on a 8 meshes/cm copper wire gauze support, which was then kept over a 10 cm Petri dish filled with water. This set up was allowed to stand for 72 hours and the nematodes thus collected were counted.

The field experiment was conducted during December-March 1977, in a black clay loam soil which was previously under eggplant *(Solanum melongena* L.*)*, a highly susceptible host. One-month-old red pepper cv. K2 seedlings were transplanted in plots consisting of five ridges spaced 60 cm apart, with six plants per row at intervals of 50 cm. A randomised block design with six nematicidal treatments and one untreated check, replicated four times, was adopted.

The nematicidal treatments consisted of phorate [0,0-diethyl S-(ethylthiomethyl) phosphorodithioate], disulfoton, [0,0-diethyl S-2-ethylthioethyl phosphorothioate], CGA 12223 [0,0-diethyl 0-isopropyl-1-5-chloro-1,2-4-triazolyl (3) phosphorothioate], aldicarb [2-methyl-2-(methylthio) propionaldehyde 0-(methylcar-

Table 1

Population decline of *R. reniformis* by interaction of red pepper and systemic nematicides in glasshouse

Treatments Nematicides	*Population/400 g soil*					
	60 days after planting			*100 days after planting*		
	Cotton	*Red pepper*	*Fallow*	*Cotton*	*Red pepper*	*Fallow*
Aldicarb	18	9	13	121	1	4
Carbofuran	35	5	13	264	1	3
Untreated	2 544	192	314	3 870	38	10

	Level of significance *	*LSD at 5% level*	*Level of significance* *	*LSD at 5% level*
Crops	P = 0.01	5.1	P = 0.01	45.9
Nematicides	P = 0.01	6.2	P = 0.05	320.6
Crops × Nematicides	P = 0.01	9.9	P = 0.05	455.5

* Level of significance by analysis of variance for split plot design (Steel & Torrie, 1960).

bamoyl) oxime] and carbofuran [2,3-dihydro-2,2-dimethyl-7-benzofuranyl-methylcarbamate] at 1 kg a.i. /ha, and phorate + disulfoton at 1 /2 + 1 /2 kg a.i. /ha, applied around the plants, at a depth of about 5 cm, 15 days after transplanting.

Soil population was assessed from samples drawn at 15-20 cm depth, on the day of application of nematicides and one and four months thereafter, as for the method described above.

The results of the glasshouse experiment were analysed by analysis of variance for split-plot design and that of the field experiment by Duncan's new multiple range test (Steel & Torrie, 1960).

Results

In glasshouse under pot culture, *R. reniformis* population showed decline 60 days after planting, under red pepper and fallow, with or without nematicides, while it increased under cotton without nematicides (Tab. 1). At this stage the population under red pepper was significantly lower when compared to fallowing. Application of aldicarb and carbofuran to susceptible cotton, non-host red pepper as well as fallow, reduced the nematode population significantly compared to the same treatments without nematicides, 60 days after planting. The interaction between red pepper, cotton and fallow and the two nematicides was highly significant at this stage.

Nematode population under cotton increased considerably 100 days after planting either with and without nematicides, while further decline was observed under red pepper and fallow. At this stage also the interaction between the factors studied, was highly significant (Tab. 1).

In the field trial the mean soil population at the time of application of the nematicides was 1 160 per 400 g of soil, and no statistically significant difference existed between the treatments. One month after application of nematicides the initial population decline was high in the nematicide-treated plots which ranged from 71.35-88.89% compared to the untreated with only 19.86%. The decline in population was low thereafter and reached 98.13-99.77%, four months after application (Tab. 2). The population decline in the untreated plots on the other hand was gradual and reached 79.55% at the end of four months.

Table 2

Effect of red pepper and systemic nematicides on the population decline of *R. reniformis* in field

Treatment	% *decline in population*	
	One month after application of nematicides	*Four months after application of nematicides*
Carbofuran	86.18 a	98.91 a
Aldicarb	71.60 a	99.61 a
CGA 12223	71.35 a	98.13 a
Phorate	82.75 a	99.29 a
Disulfoton	85.81 a	99.36 a
Phorate + Disulfoton	88.89 a	99.77 a
Untreated	19.86 b	79.55 b

Arcsin angles of % reduction in population analysed by Duncan's new multiple range test (Steel & Torrie, 1960). Column figures followed by different letters are significantly different from each other at 5% level.

Discussion

R. reniformis has been reported to live and maintain infectivity for six to twelve months in greenhouse, without addition of host or water (Radewald & Takeshita, 1964; Sivakumar, 1969). The rapid decline in population obtained with red pepper in the present study which is superior to fallowing either with or without nematicides indicates its high suitability as a non-host for rotation. The rapid decline in population brought about by this crop also shows its antagonistic action against the nematode. While the investigations clearly establish the interaction between red pepper and systemic nematicides in bringing about faster decline in the nematode population, does not permit any speculation on the mechanism involved.

In South India, where susceptible crops viz., finger-millet, vegetables and cotton are grown, inclusion of red pepper in rotation may drastically reduce the population. In farmer's practice which is in vogue for the last several decades red pepper is cultivated in between two susceptible crops.

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