P.latus. Previously, the predatory nature of this phytoseiied mite on the carmine spider mite *Tetranychus cinnabarinus* (Boisd) was reported by Rao *et al.* (1970).

The observations recorded in the field showed that the chilli mite developed much faster than the predatory mite in the initial stage during the favourable climatic conditions of continuous humid cloudy weather. A fortnight later, the predatory mites were able to build up which brought down the population of the chilli mite and 1-2 predatory mite/leaf, in the field checked the build up of the *P.latus*.

During the early stage of attack of *P.latus*, the mass multiplication and release of predatory mite once or twice will be advantgeous to keep this phytophagous mite under check.

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EFFECT OF SEED TREATMENT WITH *Trichoderma Viride* AND MOISTURE LEVELS ON ROOT ROT DISEASE IN GROUNDNUT

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ABSTRACT

Trichoderma seed treatment reduced the root rot caused by *Macrophomina phaseolina* in groundnut at different moisture levels with maximum disease at 40per cent moisture holding capacity. The population of *M.phaseolina* in the rhizosphere of groundnut plants was highest at the same moisture level. The rhizosphere population of the antagonist *Trichoderma viride* was favoured at moisture levels of 40 to 60 per cent. Significant reduction in disease was observed with increasing moisture levels. At 100 per cent MHC all the plants survived, without any disease. The root rot incidence increased with increase in plant age. Higher moisture levels were not favourable for the pathogen as well as the antagonist.

Soil moisture is one of the major factor, that affect the distribution, survival, proliferation and subsequent establishment of *Trichoderma viride* in soil and in the rhizosphere. Adjusting the soil moisture to ideal/optimum level for the antagonists indirectly enhanced it's multiplication in the rhizosphere region, which inturn offered protection against soil-borne pathogens. Studies were undertaken to assess the influence of moisture levels on root-rot disease of groundnut and the rhizosphere population of the pathogen *Macrophomina phaseolina* and antagonist *T.viride*.

MATERIALS AND METHODS

T.viride multiplied in sand-maize medium served as an inoculum. It was applied in the sick soil at the rate of 5 grams/kg of soil. Eight groundnut seeds were sown in each pot and moisture levels were adjusted to 20%, 40%, 60%, 80% and 100% (Keen and Raczkowski, 1921). The rhizosphere population of *T.viride* and *M.phaseolina* were assessed at 15 days intervals by serial dilution plate technique using selective medium for *Trichoderma* (Elad and Chet, 1983) and *M.phaseolina*. The root-rot incidence was recorded simultaneously.

RESULTS AND DISCUSSION

The results revealed that seed treatment with *T.viride* reduced the root rot disease incidence at all moisture levels. The disease incidence was maxium at 40 per cent MHC (13.9%) and a significant reduction was observed at higher moisture levels (Table 1). Such a reduction in disease incidence has been reported in groundnut (Sharma and Bhowmik, 1989).

The rhizosphere population of *T.viride* was high at 40-60 per cent MHC. There was also a significant increase in *T.viride* population in the rhizosphere of groundnut plants with increase in

Table 1. Effect of *Trichoderma viride* on root rot disease incidence at different mositure holding capacity

Treat ments (MHC (%)	Ger mina tion (%)	Root rot disease incidence (%)					Mean
		15 DAS	30 DAS	45 DAS	60 DAS	75 DAS	
20	83.4 (66.1)	2.2 (8.5)	8.8 (16.9)	13.2 (21.3)	17.7 (25.0)	19.8 (26.4)	12.4 (19.6)
40	86.7 (68.8)	4.2 (11.8)	10.5 (18.9)	16.8 (24.2)	18.9 (25.3)	18.9 (25.8)	13.9 (21.3)
60	91.6 (75.5)	2.0 (8.2)	8.0 (15.4)	12.0 (20.2)	14.0 (21.9)	14.7 (22.5)	10.2 (17.8)
80	94.9 (80.8)	0.0 (7.0)	2.0 (8.1)	3.9 (11.5)	3.9 (11.5)	3.9 (11.5)	2.7 (8.2)
100	94.9 (80.8)	0.0 (7.0)	0.0 (7.0)	0.0 (7.0)	0.0 (7.0)	0.0 (7.0)	0.0 (7.0)
Mean		1.7 (8.5)	5.9 (13.4)	9.1 (16.9)	10.9 (17.3)	7.5 (17.7)	-

Figures in parenthesis indicate mean angular transformed values.
MHC - Moisture Holding Capacity

age of the crop with maximum of 32.0 and 33.5 x 10^3 cfu/g of soil at 60 and 75th days respectively. Least population was recorded in rhizosphere of 15 day old plants. (Table 2).

The rhizosphere population of *M. phaseolina* was low at all the moisture levels, when *T.viride* was applied through seeds. The population showed a significant difference among the different moisture levels with maximum of 18.1 x 10^3 cfu/g of soil at 40 per cent MHC. The population of *M.phase olina* was high at 15 DAS and showed a decline with increase in the age of the plants (Table 3).

Table 3. Effect of *Trichoderma viride* on rhizosphere population of *M.phaseolina* at different mositure holding capacity

Sampling Intervals (Days)	Rhizosphere poplation of *M.phaseolina*-cfux 10^3/g of soil — Moisture holding capacity (%)					Mean
	20	40	60	80	100	
15	16.0	25.3	12.7	8.0	7.0	13.8
30	15.0	13.7	11.7	6.7	5.7	11.3
45	12.3	17.4	8.3	5.6	4.7	9.7
60	13.0	15.7	6.6	4.3	2.7	8.5
75	11.7	14.8	5.0	3.3	2.0	7.3
Mean	13.6	18.1	8.9	5.6	4.4	-

Table 2. Rhizosphere population of *Trichoderma viride* at different moisture holding capacity

Sampling Intervals (Days)	Rhizosphere population of *Trichoderma viride* (cfu x 10^3/g of soil) — Moisture holding capacity (%)					Mean
	20	40	60	80	100	
15	19.7	23.0	25.7	19.0	19.4	21.3
30	22.8	30.7	35.3	20.0	20.7	25.9
45	28.0	34.3	38.6	22.0	22.0	29.0
60	30.4	30.3	42.8	25.0	22.3	32.0
75	31.0	44.3	45.0	24.3	23.0	33.5
Mean	26.4	34.3	27.5	22.0	21.5	-

T.viride population was higher than that of *M. phaseolina* in the rhizosphere of groundnut at all the moisture levels tested with maximum at 40 and 60 per cent MHC (Table 2). The growth and sporulation of *T.viride* was found to be maximum at 50 per cent moisture level. Higher population of *M.phaseolina* at 40 and 20 per cent MHC resulted in higher root-rot incidence in groundnut. The disease incidence was reduced at 60 per cent MHC, which recorded a reduced population of *M.phaseolina* and a simultaneous increase in *T.viride* population. At still higher moisture levels of 80 and 100 per cent, the population of both *M.phaseolina* and *T.viride* were found to be low. This may probably be due to increased activity of bacteria and also near anerobic condition which are not favourable for the pathogen and antagonist.

The effectiveness of *Trichoderma* seed treatment can be achieved by their ability to multiply in the rhizosphere. *Trichoderma harzianum* did not establish in the rhizosphere of bean and pea seedlings (Ahamad and Baker, 1987). In this study, the population of *Trichoderma* in the rhizosphere of the groundnut plants was maximum at 75 days age. An increase in the rhizosphere population upto 100 fold was recorded, when the seeds of peas were treated with *T.hamatum* (Chet and Baker, 1980). The present study indicated that seed pelleting with *T.viride* significantly reduced the root rot incidence in groundnut.

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FIXATION OF ISOLATION DISTANCE FOR PRODUCTION OF OKRA SEEDS

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ABSTRACT

A study was made to refix the isolation distance requirement for okra (*Abelmoschus esculentus* L.) seed production. Red pigmentation character of CV'CO1 was used as marker. Plants of CV 'Pusa Sawani' were raised at different distances from the contaminant source (Plants of CV'CO1). Progenies of 'Pusa Sawani' plants were observed for the occurrence of pigmented plants. Out- crossing could be recorded only upto 30m in two trials. It is suggested that the isolation distance for okra seed production can be refixed as 30m for certified and 50m for foundation seed classes.

Genetic purity is the primary attribute of a quality seed. Maintaining isolation distance in space is a means of achieving high genetic purity in seeds. Okra (*Abelmoschus esculentus* L.) is an important vegetable crop grown extensively in our country. For seed production in this crop, an isolation distance of 400m for foundation seed class and 200m for certified seed class is recommended (Anon., 1971). The present study was conducted with the objective of elucidating information on percentage outcrossing at different distances of the seed crop from the contaminating source in okra.

MATERIALS AND METHODS

The study was conducted with okra CV 'Pusa Sawani' as seed crop and CV CO1 as contaminating source in the Vegetable Research Station, Palur.

Fixing marker character

Plants of okra CV 'Pusa Sawani' and CV 'CO 1' were raised during February, 1988 and the direct and reciprocal crosses were made. Crossed seeds were sown in June '88 for progeny observation.

Out-crossing study

First trial was laid out in November '88. Plants of CV 'CO1' were raised in the eastern end of the farm in an area of $40m^2$ plot. Plants of 'Pusa Sawani' were raised at every 10 m intervel upto 490m from the 'CO 1' plot. Each 'Pusa Sawani' plot consisted of 4 rows of 3 m length. Recommended package of practices were followed.

Matured pods were harvested in three pickings from the 'Pusa Sawani' plots. Whole quantity of seeds obtained from each plot was sown in April '89 for progeny evaluation. Number of seedlings showing red pigmentation was recorded, removed from the plot and seeds harvested from these progeny plants were again shown (500 seeds from each plot) in September'89 for observing the second generation progeny plants for red pigmentation.

Meanwhile, the trial was repeated with 'CO 1' plants on the western side and 'Pusa Sawani' plants at 10m interval upto 300m from 'CO 1' plot. In this trial also, three pickings of fruits were done in the 'Pusa Sawani' plots. Plot size and package of practices were the same as in the previous trial. Seeds were sown in September '89 for progeny evaluation (first generation).

RESULTS AND DISCUSSION:

Plants of okra CV'CO1' is characteristic of having red pigmentation on the stem, petiole and fruits. Crossing was done between these plants and the plants of CV 'Pusa Sawani' to ascertain whether the red pigmentation character can act as a marker. Monogenic control of pigmentation of calyx, corolla and fruit colour in okra has been reported. White fruit colour is dominant to green