

Studies on Chemical Control of Cotton Wilts

BY

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ABSTRACT

The nematode, *Hoplolaimus* sp. was found associated with the *Fusarium* and *Verticillium* wilts of cotton. Application of nematicides resulted in the reduction of both the wilts with corresponding increase in kapas yield.

INTRODUCTION

Since 1972 an increase in the incidence of soil-borne diseases on *hirsutum* and *barbadense* cottons has been reported around Coimbatore. Besides the wilt caused by *Verticillium dahliae* Kleb. which occurred over a wide area (Shanmugam *et al.*, 1973), another wilt caused by *Fusarium oxysporum* Schl. was noticed on a large scale on MCU. 5 in parts of Sarkar-samakulam and Perianaickenpalayam blocks during 1973-74. Preliminary investigations revealed the association of nematodes in the soils from wilt infested areas and therefore studies were taken up to evaluate the efficacy of nematicides along with fungicides in controlling these wilts besides for assessing the role of these nematodes in the wilt syndrome.

MATERIALS AND METHODS

The fungi, *V. dahliae* and *F. oxysporum* were isolated from roots of wilted plants and maintained on potato-dextrose agar. They were grown in

Czapex-Dox medium for 7 days and a heavy spore suspension was obtained for inoculation. The nematodes from the infested soils were extracted by the sugar floatation method of Gooris and D'Herde (1972). Pathogenicity tests were conducted on 40 day-old MCU. 5 plants raised in pots; by applying per plant 50 ml of fungus spore suspension alone, 200 numbers of nematodes alone and the mixture of both at the root region. The trial against *Fusarium* wilt was conducted during the winter season of 1973-74 at Kottapalayam in a wilt infested field with the following treatments *viz.*, (1) D. D. (1, 3 dichloropropene and 1-2-dichloropropane mixture) at 280 litres/ha a month before sowing, (2) Nemagon (1,2-dibromo-3-chloro-propane) at 36 litres/ha a month before sowing, (3) Dasanit (Fen-sulfothion) at 1 g/plant a month after sowing, (4) wet ceresan 0.01 per cent (Methoxy ethyl mercury chloride), (5) Benlate (Methyl-1- (butyl carbonyl) 2-benzimidazole carbamate) 0.05 per cent. D. D. was injected in the soil and Nemagon was drenched uniformly in

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the plots and covered with a film of water. Dasanit was applied at the base of the plants covered with earth and then irrigated. Benlate and Wet cerasan were drenched in the soil, thrice on the 3rd, 4th and 5th month stages of the crop at the rate of 12,500 lit./ha. In the trial against *Fusarium* wilt, the number of wilted plants were counted and percentage wilt was arrived at. The nematode population in the plots was estimated before and after treatments.

The trial against *Verticillium* wilt was conducted during winter season of 1974-75 at Narasimhanaickenpalayam heavily infested by *Verticillium* wilt. The treatments were (1) Benlate 0.025 per cent, (2) Bavistin (2-Methoxy carbonyl) benzimidazole) 0.025 per cent, (3) Vitavax-captan (2, 3, Dihydro-5-carboxinilo-6-methyl-1, 4-oxathiin+N-trichlormethyl-thio-4-cyclohexane-1-2, dicarboximide) 0.05 per cent, (4) Brassicol (Penta chloronitrobenzene) 0.05 per cent, (5) wet cerasan 0.05 per cent, (6) Dasanit 1 g per plant, (7) Nemagon 18 litres per ha, (8) Kocide (Cuppric hydroxide) 0.2 per cent and (9) control (no treatment). Three rounds of drenching were given with the fungicides, the first commencing 45 days after sowing. Nemagon and Dasanit were applied only once at 45th day stage of the crop. The wilt index was arrived at after rating the various symptoms of wilt like yellowing of leaf, interveinal necrosis and wilting in a scale of reaction ranging from low = 3, medium = 6, heavy = 8, and very heavy = 10 and the total of

the ratings of 30 plants at random give the wilt index for the treatment.

RESULTS AND DISCUSSION

Three species of nematodes *Viz.*, *Rotylenchulus* sp., *Pratylenchus* sp. and *Hoplolaimus* sp. were found associated with the soil infested both by *V. dahliae* and *F. oxysporum*, out of which *Hoplolaimus* sp. was preponderant. On testing the interaction of *Hoplolaimus* sp. and the two pathogens, by inoculating alone as well as simultaneously, wilt was more pronounced and quick, in combined inoculation than alone (Table I).

TABLE I. Fungus-nematode interaction on cotton wilts

Treatment	Wilt	Days for total wilting
Hoplolaimus alone	—	Only stunting
Verticillium alone	++	35
Fusarium alone	++	40
Hoplolaimus + Fusarium	++++	25
Hoplolaimus + Verticillium	+++++	15

There are many reports about the role of nematodes in increasing severity of wilt diseases. Pegg (1974) reported that infection by the nematodes *Pratylenchus penetrans* and *P. minyus* make cotton plants more susceptible to *Verticillium* wilts. Yang *et al.* (1973) reported that *Fusarium* wilt was more severe in cotton plants in association with *Meloidogyne incognita* and *Belonolaimus longicaudatus*.

The data from the soil treatment trial against *Fusarium* wilt and *Verticillium* wilt are presented in Tables II and III.

TABLE II. Efficacy of nematicides and fungicides in the control of *Fusarium* wilt of cotton

Treatment	population of <i>Hoplostaimus</i> sp.		% Wilt incidence	Yield of kapas (Q/ha)
	Before treatment	After treatment		
D.D.	270	131	7.2	8.25
Nemagon	300	144	10.25	7.92
Dasanit	235	0	6.02	5.80
Wet cerasan	310	450	15.42	4.89
Benlate	235	368	10.47	5.13
Control	440	575	16.82	4.52

TABLE III. Efficacy of nematicides and fungicides in the control of *Verticillium* wilt of cotton

Treatment	Mean wilt index	Yield of kapas (Q/ha)
Benlate	215.0	7.6
Bavistin	191.6	6.6
Vitavax-Captan	218.6	7.6
Brassicol	221.3	10.8
Wet cerasan	209.3	11.2
Dasanit	205.3	9.2
Nemagon	179.6	15.6
Kocide	199.6	11.6
Control	210.0	8.8
C. D. (P = 0.05)	N.S.	4.5

It was found that soil application of nematicides has resulted in the reduction of *Fusarium* wilt with corresponding increase in kapas yield. The disease incidence in *Verticillium* wilt though heavy was not uniform. Least incidence of wilt was noticed in Nemagon with

increase in kapas yield by 77.2 per cent over the untreated control. As regards the efficacy of fungicides only benlate proved to be fairly effective against *Fusarium* wilt.

The efficacy of soil fumigation in controlling cotton wilts has been reported by many workers. Ebbel (1971) reported that wilt of cotton was effectively controlled in Tanzania by soil fumigation with nemagon which also recorded more than 75 per cent increase in yield. Wilhelm *et al.* (1972) reported outstanding control of *Verticillium* wilt of cotton with methyl bromide-chloropicrin fumigation. Thus the present studies indicate that cotton wilt in Coimbatore is a problem of nematode-fungus complex which can be controlled by fumigation with nematicides.

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