

SURVEY AND CONTROL OF PHYTOPARASITIC NEMATODES OF TURFGRASSES IN PAKISTAN

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A survey was conducted to evaluate the losses caused by nematodes associated with turfgrasses. For the eradication of phytoparasitic nematodes, an experiment was conducted in randomized complete block design, in the experimental field, Applied Biology and Marine Resources Research Centre, PCSIR Laboratories Complex, Karachi. The population of *Helicotylenchus multicinctus*, (Cobb, 1893) Golden, 1956, was significantly reduced in the plots treated with Tenekil followed by DBCP and Carbofuran. No phytotoxicity was observed. Sprigs treated with Tenekil grew vigorously as compared to control. The population was reduced below alarming level as compared to control.

Key words: Tenekil, DBCP carbofuran, *H. multicinctus*.

Introduction

In Pakistan, limited attention was given to the studies of nematodes of grasses though they were recognised as important plant pests in most of the cash crops and ornamental plants. The favourable climatic conditions and soil types provided healthy environmental conditions for their activity and the reproduction of majority of the phytoparasitic nematodes. The major limitation for cultivation of turfgrasses (*Cynodon dactylon* (L.) is the destruction of roots by phytoparasitic nematodes [1,2,12-16] which caused root pruning, premature wilting, chlorosis and dying out in places.

These studies were undertaken to identify phytoparasitic nematodes associated with turfgrasses and to determine their population, frequency of distribution and to develop cheap and effective measures for their control.

Materials and Methods

In order to study the association of phytoparasitic nematodes with turfgrasses, several hundred soil samples have been investigated at regular intervals for a year. Data in Table 1 show the list of the nematodes recovered from the soil samples. A plot of land measuring 15 x 10 meters was selected at the experimental field, PCSIR Laboratories Complex, Karachi. After amending the soil with farmyard manure and preparing the bed, the land was divided into two rows and eight columns in a randomized complete block design for the four treatments. *Tenekil^R is an indigenous insecticide/nematicide developed by PCSIR Laboratories Complex, Karachi and is being used for controlling various phyto-parasitic nematodes in Pakistan. It is a polychlorinated petroleum hydrocarbon (95% E.C.) with low residual effect; low mammalian toxicity, oral LD 50

= 4245 and dermal LD 50 = 9000/kg [3]. Carbofuran 3G (2,3-dihydro-2,2-dimethyl-benzo furan-7-ylmethyl carbamate) and DBCP (1,2-dibromo-3-chloropropane) were taken as standard nematicides for the comparison and control. Each treatment was replicated four times. A 25 cm strip on all 4 sides of the plot served as guard spaces which were kept grass-free throughout the experiment.

Random soil samples were taken from naturally infested soil in polythene bags for the pre-treatment counts. The population of other parasitic nematodes was below the threshold, but the population of *Helicotylenchus multicinctus* was above the alarming level i.e. 450 nematodes per 50 c.c. of soil [6,8]. After this, Tenekil was applied at a rate of 5 ml/plot (6 litre/acre) whereas DBCP was applied at a rate of 5 ml/plot (10 litre/acre) and carbofuran at 5 g/plot (4 kg/acre). After treatments the plots were irrigated.

Two weeks old seedlings of grasses (*Cynodon dactylon* (L.)), already grown in nematode free pots were transplanted to the microplots after one week of treatment. All plots were irrigated separately at regular intervals. The experiment was terminated after 16 weeks. Soil samples were taken from each plot. Weight of the root and shoot was recorded (Table 2).

Extraction of nematodes was done by the method of Oostenbrink, [4] with slight modification. Four counts of 5 ml aliquots of 50 ml of soil samples were examined. The data were analysed statistically by least significant difference test (LSD)

Results and Discussion

Eight genera of phytoparasitic nematodes have been recovered with turfgrasses from various nurseries, homes, industrial lawns, golf-courses and lawns of PCSIR Laboratories Complex, Karachi. The nematodes isolated from the soil samples were *Helicotylenchus multicinctus*, *H. microdorus*,

*Tenekil is a product of PCSIR Laboratories Complex, Karachi, Registration No. Pak/APO/31/79, PP - Reg. -1

H. martini, *Aphelenchus avenae*, *Tylenchulus semipenetrans*, *Pratylenchus coffeae*, *P. penetrans*, *P. similis*, *Hoplolaimus indicus*, *Meloidogyne incognita*, *Heterodera avenae*, *H. schachtii*, *Ditylenchus goldeni*. Genera of *Helicotylenchus*, *Aphelenchus* and *Tylenchulus* were mostly prevalent in more than 50 - 75% of the soil samples.

The population of *Helicotylenchus multicinctus* (Cobb, 1893) Golden, 1956 on infected roots of *Cynodon dactylon* (L.) was significantly reduced in treated microplots in comparison to control at the level of $P=0.05$ (Table 2). Tenekil was significantly effective followed by DBCP and Carbofuran. Nematode counts varied from 10.71 - 14.4% of the controls in Tenekil treated plots, 25 - 30% in DBCP treated plots and 30 - 33.2% in Carbofuran treated plots. Average weight of the

TABLE 1. NEMATODES ASSOCIATED WITH TURFGRASSES IN PAKISTAN.

No. Nematodes	Population of nematodes/50 ml of soil			
	Mean	STD	Range	Frequency of infection
1. <i>Helicotylenchus multicinctus</i>	75 ±	7.07	70 - 80	+++
2. <i>H. microdorus</i>	70 ±	7.07	65 - 75	++
3. <i>H. martini</i>	65 ±	7.07	60 - 70	++
4. <i>Aphelenchus avenae</i>	55.0 ±	7.07	50 - 60	++
5. <i>Tylenchulus semipenetrans</i>	50.0 ±	7.07	45 - 55	++
6. <i>Pratylenchus coffeae</i>	23 ±	4.04	20 - 26	+
7. <i>P. penetrans</i>	22.5 ±	10.6	15 - 30	+
8. <i>P. similis</i>	23.5 ±	4.9	20 - 27	+
9. <i>Hoplolaimus indicus</i>	35 ±	7.07	30 - 40	+
10. <i>Meloidogyne incognita</i>	12.5 ±	3.53	10 - 15	+
11. <i>Heterodera avenae</i>	12.5 ±	3.53	10 - 15	+
12. <i>H. schachtii</i>	7.5 ±	3.53	5 - 10	+
13. <i>Ditylenchus goldeni</i>	35.0 ±	7.07	30 - 40	+
14. * <i>Longidorus elongatus</i>				
15. <i>Discolaimus major</i>				
16. <i>Rhabditophanes</i> spp.				
17. <i>Eudorylaimus subjunctus</i>				
18. <i>Thornenema shahi</i>				
19. <i>Cephalobus persignis</i>				
20. <i>Wilsonema promissum</i>				
21. <i>Monochromadora</i> spp.				
22. <i>Diploscapter</i> spp.				
23. <i>Dorylaimus</i> spp.				
24. <i>Mylonchulus nainitalensis</i>				
25. <i>Aporcelaimellus capitatus</i>				
26. <i>Acrobeles enoploides</i>				

Note: +++ = indicate 75% infection of the nematode in the soil samples of the grasses. ++ = 50% infection, + = below 45% infection, * = Statistical analysis of free-living nematodes was not performed.

TABLE 2. EFFECT OF TENEKIL, DBCP AND CARBOFURAN ON THE NUMBER OF NEMATODES (WEIGHT OF ROOTS AND SHOOTS AFTER 16 WEEKS OF TREATMENT).

Nematodes species	Number of nematodes per 50 ml soil (%age values/control)			
	Tenekil	DBCP	Carbofuran	Control
(a) <i>Helicotylenchus multicinctus</i>	30 (10.71)	70 (25.00)	84 (30.00)	280
	35 (13.46)	78 (30.00)	80 (30.76)	260
	38 (13.10)	65 (22.41)	87 (30.00)	290
	36 (14.4)	60 (24.00)	83 (33.20)	250
Total:	139 (12.87)	273 (25.27)	334 (30.92)	1080

LSD for population reduction of *H. multicinctus* at $P=0.05=149.91$; $P=0.01=269.08$

(b) Mean clipping root and shoot weights(g) of *Cynodon dactylon*(L)

	41.0	33.5	32.5	31.5
	44.0	36.5	33.5	30.5
	43.0	34.5	35.5	31.5
	42.0	37.0	36.5	32.5
Total:	170.0	141.0	138.0	126.0

LSD = Least significant difference test; P = Probability

whole plant was 43 g in Tenekil, 35 g in DBCP, 34.5 g in carbofuran and 31.5 g in control.

Springs treated with Tenekil grew vigorously in comparison to control. A noticeable growth response was observed during experimental period. The response was characterised by the reduction of population threshold of *H. multicinctus*.

Naqvi *et al.* [5] reported nematicidal potentialities of Tenekil. Khan *et al.* [6] have used Tenekil for providing a protective coating on banana rhizomes against plant parasitic nematodes. Qamar *et al.* [7] reported the effectiveness of Tenekil against plant parasitic nematodes of chillies. Recently Khan *et al.* [8,9] used Tenekil for the control of parasitic nematodes attacking chillies and Okra [10] in Pakistan. Gul *et al.* [11] also observed good control of *Meloidogyne javanica* (Treub, 1885) Chitwood, 1949 on tobacco by using different chemicals.

The significant values of Tenekil suggested that it is a good nematicide with low phytotoxicity. The compound is indigenous, cheap and easily available. Tenekil makes a better choice in controlling plant parasitic nematodes and several soil-borne insects pests with low phytotoxicity.

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