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NEMATODES ASSOCIATED WITH NURSERIES IN KARACHI
Part II. Croton *(Codiaeum variegatum* (L) A.H.L. Juss

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One hundred plant nurseries situated in Karachi were surveyed for nematode infestation in Croton (*Codiaeum variegatum*). *Pratylenchus coffeae, P. pratensis, Tylenchorhynchus martini, T. annulatus, T. trilineatus, Hoplolaimus galeatus, H. californicus, Helicotylenchus multicinctus, H. exallus, Rotylenchulus reniformis, Basirolaimus indicus, Xiphinema americanum, Cephalobus persignis, Eudorylaimus* sp., *Aporcelaimellus obscurus* and *Mesodorylaimus bastiani* were found associated with Croton. Lesion nematodes (*Pratylenchus coffeae, P. pratensis* and *Tylenchorhynchus martini, T. annulatus*), and spiral nematodes (*Helicotylenchus exallus*) were found in higher frequency. *Helicotylenchus californicus, H. multicinctus* and *Xiphinema americanum* are first time reported from Pakistan.

Key words: Croton, Lesion nematodes, Spiral nematodes, Nurseries.

Introduction

Croton (*Codiaeum variegatum*) is an ornamental plant which is quite popular among hobbyist nurserymen the world over. Though several disease causing organisms have been reported in Croton, role of parasitic nematodes associated with this plant is still obscure. Timcheko [1] noted mixed infection of *Heterodera cacti* and *Meloidogyne incognita* on Croton. Kaplan and Macgowan [2] reported *Pratylenchus coffeae* around the roots of *Codiaeum variegatum*. In Pakistan except Kafi [3], there is no mention of nematodes attacking croton. Some important plant parsitic nematodes i.e. *Pratylenchus coffeae* (Zimmerman, 1898) Filipjev and Schuurmans Stekhoven [12] *P. pratensis* (DeMan, 1880) Filipjev 1936, *Tylenchorhynchus martini* Fielding, 1956, *T. annulatus* (Cassidy, 1930) Golden [7], *T. trilineatus* Timm [10], *Hoplolaimus galeatus* (Cobb 1813) Golden [6], *H. exallus*, Sher [8], *Rotylenchulus reniformis* Linford and Oliveira [5], *Basirolaimus indicus* (Sher 1963) Shamsi [9] were reported from Croton (*Codiaeum variegatum*).

In the favourable environments which are made for the nursery plants, nematodes multiply and remultiply as they have abundant food and moisture. To aggravate the losses, Pathogenic fungi and bacteria also interact with nematodes. The cumulative effect results in more plant destruction. Thus the nurseries which are the store house of planting stock, also become store-houses of nematodes, if not properly maintained. The planting stock from such nurseries are the main source of dissemination within and outside the country.

Control of nematodes in nurseries mainly involves preventive steps, although chemical treatment is also desirable in certain situations. However, before anything else faunistic studies of nurseries have to be done. It is for this purpose that survey of one hundred nurseries in and around Karachi was done [4]. This paper is the second in a series and deals with the nematodes found associated with croton.

Materials and Methods

One hundred plant nurseries situated in and around Karachi were surveyed for nematode investigation. Soil samples and roots of croton were collected in polythene bags at a depth of 12-15 cms. near the plant roots. The samples were carefully handled, brought to the laboratory and kept at a temperature 5-6° in incubator. They were analysed by improved Baermann method. The soil in the bags was thoroughly mixed for homogenous distribution of nematodes. Fifty c.c. of soil was taken into a beaker which was tapped 10 times on the table for accurate measurement. More soil was added to the space formed. The soil was then spread over the tissue paper supported by 16 cm dia separating sieve. The separating sieve was placed over 22 cm dia stainless steel funnel. To the lower opening of the funnel, a small piece of transparent rubber tubing was fitted which was closed with a pinch cock. Water was poured carefully between the space of funnel and sieve till it touched the surface of the soil on the tissue paper. After 48 hr; 20 ml aliquot was taken in a tube by releasing the pich cock. The nematodes were counted under stereoscopic binocular and the mean of the four replicates was taken as a number of nematodes per 50 ml of soil. The nematodes were identified under stereoscope binocular in freshly killed condition. To deal with endoparasitic nematodes the roots of the plants were soaked in water and teased by means of a knife and sharp needle identified like other nematodes.

Results and Discussion

Important plant parasitic nematodes, *Tylenchorhynchus martini* Fielding, 1956, *T. annulatus* (Cassidy, 1930) Golden, 1971; *T. trilineatus* Timm [10]; *Pratylenchus coffeae*

(Zimmerman 1898) Filipjev and Schuurmans, Stekhoven, 1941; *P. pratensis* (DeMan 1880) Filipjev 1936; *Helicotylenchus multicinctus* (Cobb 1893) Golden [6]; *H. exallus* Sher [8]; *Hoplolaimus californicus* Sher, [8], *H. galeatus* (Cobb. 1913) Sher, 1961, *Basirolaimus indicus* (Sher, 1963) Shamsi, 1979. *Xiphinema americanum* Cobb, 1913 and *Rotylenchulus reniformis* Linford and Oliveira [5], have been reported from croton causing injury to the roots of this plant (Kafi [3,10] (Fig 2). Beside these plant parasitic nematodes some predator and saprophytic nematodes *viz Eudorylaimus* sp. Andrassy [11] 1959, *Aporcelaimellus* sp. (Thorne and Swenger, 1963) Heyns [13] 1965; *Mesodorylaimus bastiani* (Butschli, 1873) Andrassy [11]; *Cephalobus persignis* Bastian, 1865 were recovered. The plant-parasitic species formed a large percentage of the total nematode population around croton roots (Fig 1).

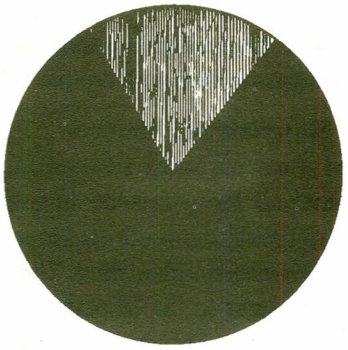

Figure 1. Graphic representation of Nurseries effected by plant parasitic and saprophytic nematodes found around the root of croton

Percentage of Nurseries effected by ectoparasitic and endoparasitic nematodes 81.4%

Percentage of Nurseries effected by saprophytic nematodes 81.6%

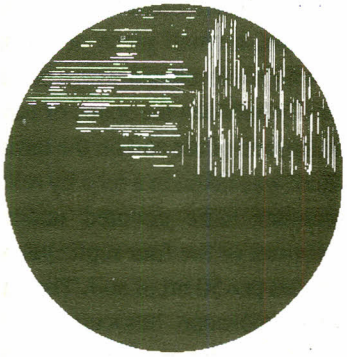

Fig 2. Graphic representation of nematodes found around the root of croton

Ectoparasitic nematode: 57.7%

Endoparasitic nematode: 21.7%

Saprophytic nematode: 20.6%

Moreover the population level of endoparasitic nematodes i.e. *Pratylenchus coffeae, P. pratensis* and ectoparasitic nematodes i.e. *Helicotylenchus exallus, Tylenchorhynchus martini, T. annulatus* was high i.e. 73, 68, 59, 52 and 47 per 50 ml of soil respectively. Presence of such a high frequency of nematodes in the critical growth period of plants is of greater significance as they may cause serious damage to the plants. At this stage the plant can not afford to lose any amount of root. It means the plant can not remain healthy-throughout its life, if the roots are damaged by any pest during the early stage of life. Climatic conditions in nurseries are more favourable for nematode multiplication. The roots of the plants in pots have greater chances to be attacked very soon by the plant parasitic nematodes as they are easily accessible by the parasites.

The symptoms produced by the nematodes on croton - unthrifty development, chlorosis etc. are complex and nursery (Fig 1) owners take them wrongly and attribute them to other agencies. This way not only are they unable to protect their plants, but they suffer additionally due to the loss of chemicals, and labour they apply. It is, therefore, imperative that the nursery owners should become aware of nematodes and the symptoms produced by them. This paper would also be interest to quarantine personnel who are assigned the duty to check the dissemination of plant diseases across the national frontiers.

TABLE 1.

S r. No.	Nematodes	Population range nematode/50 cm	Locality
1.	*Pratylenchus coffeae* (Zimmerman 1898 Filipjev and Schuurmans Stekhoven, 1941	42-73	7,13.14,19,23,26,27, 28,31,34,36,37,39,42 47,48,50,53,57,59,68, 72,76,78,88,92.
2.	*P. pratensis* (DeMan, 1880) Filpjev, 1936	29-68	5,6,19,26,27,29,33,37 41,43,48,49,52,58,60, 61,62,67,76.
3.	*Tylenchorhynchus martini* Fielding, 1956	35-52	3,4,5,9,11, 16,20,23,25 29,36,37,38,47,51,53, 57,58,63,64,65,67,68, 71,74,77,79,82,85,87, 88,89,93, 94,97,100.
4.	*T. annulatus* (Cassidy, 1930) Golden, 1971.	27-47	1,2,6,8,11,12,14,21,22 26,29,30,32,35,36,39, 49,52,57,60,61,67,73, 79,87,89,90,91,92,97, 99,100.

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(Tables continued)

5.	*T. trilineatus* Timm, 1963	26-29	11,21,27,28,35,37,41, 44,47,49,50,51,53,57, 59,62,65,67,69,72,73, 74,75,77,83,86,87,89, 92,98,99.
6.	*Hoplolaimus galeatus* (Cobb, 1913) Sher,1961	23-27	7,13,17,19,20,37,39, 46,49,57,62,68,78,81, 82,87,92.
7.	*H. californicus* Sher, 1966	12-26	13;14,17,18,20,24,28, 30,33,48,53,54,60,64, 70,78,80,82, 84,93.
8.	*Helicotylenchus multicinctus* (Cobb, 1893) Golden 1956.	32-41	1,5,10,13,15,23,24,25, 31,37,39,59,60,67,68, 69,70,74,77,79,82,83, 86,100.
9.	*H. exallus*. Sher, 1966.	38-59	8,12,13,16,17,28,33,39 42,50,63,67,73,85,92, 97.
10.	*Rotylenchulus reniformis* Linford and . Oliveira, 1940	9-12	9,21,37,46,56,76,96.
11.	*Xiphinema americanum* Cobb, 1913.	13-17	7,17,37,40,45,55,66,81
12.	*Basirolaimus indicus* (Sher 1963) Shamsi, 1979.	17-23 95.	18,37,46,49,52,55,84,
13.	*Cephalobus persignis* Bastian, 1865	21-40	9,16,25,40,43,45,46,52 55,84,87,89,95,96,97, 100.
14.	*Eudorylaimus* sp. Andrassy, 1959.	26-31	8,16,21,27,39,47,52,61 62,67,70,77,98.
15.	*porcelaimellus obscurus* (Thorne & Swanger 1936).	16-22	3,12,27,36,40,42,49,53 62,79,80,85,87.
16.	*Mesodorylaimus bastiani* (Butschli, 1873) Andrassy, 1959.	19-27	5,11,19,31,33,40,46,59 61,72,74,78,82,100.

APPENDIX

NURSERIES IN KARACHI AND ADJOINING AREAS WHERE SAMPLES OF SOIL AND ROOTS OF CROTON *(codiaeum variegatum)* WERE COLLECTED.

S. No. Name and address of the nursery

1. Chamanzar Nursery near Bhatti Park, University Road, Karachi.

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2. Silver Nursery, near Bhatti Park, University Road, Karachi
3. Gulnab Nursery, University Road, Karachi.
4. Platinum Nursery, University Road, Karachi.
5. Shalamar Nursery, University Road, Karachi.
6. KMC Nursery , Safary Park, University Road, Karachi.
7. Ghauspak Nursery, near Malir Bridge, Karachi.
8. Karachi Nursery, Karsaz, Karachi.
9. Karsaz Nursery, opposite National Stadium, Karachi.
10. Taj Mahal Nursery, University Road, Karachi.
11. Platinum Nursery (Gurumandir Branch) Gurumandir, Karachi.
12. Noor Nursery, Shara-e-Faisal, Karachi.
13. Gulab International Plant Nursery, P.A.F. Shahra-e-Faisal, Karachi.
14. Plant Centre, near Zehri House, Karachi.
15. Plant Quarantine Office, Habib Square, M.A. Jinnah Road, Karachi.
16. Plant Nursery, Gharibabad, near Liaqatabad Bridge, Karachi.
17. Tropical Nurseries of Pakistan, near Liaqatabad, Bridge, Karachi.
18. Gulbahar Nursery, Landhi No.3, Karachi.
19. Plant Quarantine Office, Karachi Airport, Karachi.
20 Lalazar Nursery, Main Clifton Road, Karachi.
21 Mushtaq Nursery, Govt. MCH Centre, Nazimabad No. 2, Karachi.
22. KMC Nursery, near Nazimabad Bridge, Karachi.
23. Agha Khan Medical College Nursery, Karachi.
24. Chaudry Nursery, 51-4/B, Block 13-A, Gulshan-e-Iqbal, Karachi.
25. Gulnar Nursery, Korangi No. 5, Karachi.
26. Sailor's Nursery, Commercial Area, Defence Housing Society, Karachi.
27. Khurram Nursery, near Sabzi Mandi, University Road, Karachi.
28. Mehran Nursery, North Nazimabad, Scheme No. II, Karachi.
29. KDA Nursery, North Nazimabad, Scheme No. II, Karachi.
30. New Mehran Nursery, near CSD Canteen, Kalapul, Karachi.
31. Suny View, Defence Housing Society, 46 Commercial Avenue, Karachi.
32. Pak Arab Nursery, Phase IV/9, First Gizri Street, Defence Housing Society , Karachi.
33. Madni Nursery, Block 2, Gulshan-e- Iqbal, Karachi.
34. Madina Nursery, Gulshan-e-Mustafa, Karachi.

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(Appendix continued...)

35. Sind Nursery, Gulshan-e-Mustafa, Karachi.
36. Farooq Nursery, Dastagir No. 8, Federal B. Area, Karachi.
37. Hakim Nursery, Plot A184, F.B. Area, Block-5, Karachi.
38. Salim Nursery, F.B. Area, Plot A/184, Block 5, Karachi.
39. Sarwar Nursery, F.B. Area, Block-5, Karachi.
40. Green Nursery, Plot D-24, Block 4, Federal B. Area, Karachi.
41. Gulnaz Nursery, Plot-2, Gulshan-e- Iqbal, Karachi.
42. Nazir Nursery, Labour Square, Mian New Karachi Road, Karachi.
43. Hussain Nursery, Block 5C-2, North Karachi.
44. Moin Nursery, Block N, North Nazimabad, Karachi.
45. Shakoor Nursery, 85/F, North Nazimabad, Karachi.
46. Mohammad Khan Nursery, Nagan Chorangi, North Karachi.
47. Shan-e-Kiran Nursery, Plot No 121, B-15, Main North Karachi Road, Karachi.
48. Modern Plant Nursery, Plot No 16-F, Gulshan-e- Iqbal, Karachi.
49. Fateh Nursery, Rashid Minhas Road, near Railway Gate, Karachi.
50. KMC Nursery, Gutter Baghicha, Block-4, Old Golimar, Karachi.
51. Turnab Nursery, Banaras Road, North Nazimabad, Karachi.
52. Karachi Nursery, (Branch), Shara-e-Faisal Road, Karachi.
53. Raziq Nursery, Korangi No. 6, Karachi.
54. Musharraf Nursery, Landhi No 6, Karachi.
55. Rafatullah Nursery, Plot No. 191/4-B, Federal B. Area, Karachi.
56. Baba Nursery, Kausar Niazi Colony, Federal B. Area, Karachi.
57. Khurram Nursery, Clifton Road, Karachi.
58. New Mehran Nursery, University Road, Karachi.
59. Golden Nursery, Golden Town Malir, Karahci.
60. Mairaj Nursery, Block N, North Nazimabad, Karachi.
61 Rah-e-Chaman Nursery, Sakhi Hassan, near Police Station, Karachi.
62. Gulab Mahboob Nursery, Nagan Chorangi, Karachi.
63. Alam Nursery, New Karachi, Karachi.
64. Hassan Nursery, Sector 4, New Abadi, New Karachi.
65. Shan-e-Kiran Nursery, Plot No. 121, Buffer Zone, near Bridge, Karachi.
66 .New Sind Nursery, near Moti Mahal, Rashid Minhas Road, Karachi.
67. Banaras Nursery, Metro Road, Banaras Colony, Karachi.
68. Mehran Nursery, Abdullah College Road, North Nazimabad, Karachi.

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69. Sadabahar Nursery, ST-7, Block A, North Nazimabad, Karachi.
70. Yousaf Khan Nursery ,near LalKothi, North Nazimabad,Karachi.
71. Plant Quarantine Office, Airport, Karachi.
72. Malik Nursery, 36-B, Landhi, Karachi.
73. Aziz Nursery, Babar Market, Landhi, Karachi.
74. Amin Nursery, Korangi No. 3, Karachi.
75. Qadir Nursery, Future Colony, Landhi, Karachi.
76. Nizam Nursery, Block -1, Plot No. 450, Gulshan-e-Iqbal, Karachi.
77. Marine Nursery, Block-1, Gulshan -e-Iqbal, Karachi.
78. Rehmat Nursery, Block-2, Gulshan -e-Iqbal, Karachi.
79. Sabzazar Nursery, Gharibabad, Karachi.
80. Golden Nursery ,Block 1, Gharibabad, Karachi.
81. Mujib Nursery, Block 1, Gharibabad, Karachi.
82. Al-Faisal Nursery, Wireless Gate, Drigh Road, Karachi.
83. Printing Press Nursery, Malir Halt, Karachi.
84. Mumtaz Nursery, 4-D, Plot No. 1, Landhi No. 6, Karachi.
85. Gulistan-e-Qudrat Nursery, Korangi No. 4, Karachi.
86. Ghaus Nursery, near Malir Mander, Karachi.
87. Raza Nursery, Korangi No. 4, Karachi.
88. Imtiaz Nursery, 904/G, Korangi No. 4, Karachi.
89. Farooq-e-Azam Nursery, Sector 50, Korangi, Karachi.
90. Unique Nursery, near Wajid Square, Gulshan-e-Iqbal, Karachi.
91. Markaz-e-Latif Nursery, Delhi Colony, Gizri, Karachi.
92. Qamar Nursery, Gizri Road, Karachi.
93. Plant Corner Nursery, Blouch Colony, Karachi.
94. Nursery Squibb, Landhi Industrial Area, Karachi.
95. Plant Nursery, Karachi University, Karachi.
96. Javaid Nursery, Malir Halt, Karachi.
97. Razi Nursery , Landhi 89 Stop, Karachi.
98. Nafees Plant Nursery, near Machine Tool Factory, Karachi.
99. Sattar Nursery, Nasir Colony, Korangi, Karachi.
100. KMC Nursery, Korangi No. 4, Karachi.

*Address of the nurseries are mentioned to provide upto record of the work done.

References

1. L.S. Timchenko, *Parasitic Nematodes of Ornamental Plants*, Byulleton Vsesoyuznogo Instituta Gel mintologii im. K.I. Shryabina No. 31, 52-54 (Ru, en, 4 ref.) Cen Republican Botanic Gdns. Acad. of Sci. of the Ukrainian SSR, Kien. USSR (1981).
2. D.T. Kaplan, J.B. Macgowan, Nematropic, **12** (2), 165 (1982).
3. A. Kafi, Plant Parasitic Nematodes in Pakistan, Tech. Bull. 32, FAO (1963).
4. M. Saeed, S.A. Khan, H.A. Khan and F. Qamar, Pak j. sci.

ind. res. **31**, 729 (1988).
5. M.B. Linford and J.M. Oliveira, Proce. Helminth. Soc. Wash. ,**7**, 35 (1940).
6. A.M. Golden, Maryland Agr. Exp. Stn. Bull., **A 85**, 28 (1956).
7. A.M. Golden , (eds). B.M. Zuckerman, W.F. Mai and R.A. Rhode (New York London, Academic Press., Inc., 1971).
8. S.A. Sher, Nematologica, **127**, 1 (1966).
9. M.A. Shamsi, Nematol. Medit. **7**, 15 (1979).
10. R.W. Timm, Nematologica, **9**, 262 (1963).
11. I. Andrassy, Acta Zool. Hung., **6**, 1 (1959).
12. I.N. Filipjev and I.A. Schuurmans Stekhoven, *Manual of Agricultural Helminthology* (EJ Brill, the Netherlands, 1941), pp. 878.
13. Heyns, Ent. Men. Deptt. Agric. Univ. S. Africa, **10**, 51 (1965).