PATHOGENIC POTENTIAL OF *HELICOTYLENCHUS VARICAUDATUS* AND *PARATYLENCHUS CURVITATUS* ON *DIANTHUS CARYOPHILLUS*

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Summary. *Paratylenchus curvitatus* suppressed plant height, stem sturdiness, root length and to a little extent flower size on carnation at the initial inoculum level of 500 individuals per pot; severity of the damage increased with the corresponding increase of the inoculum level. *Helicotylenchus varicaudatus* reduced plant height only. *P. curvitatus* also delayed significantly flowering.

Carnation is an economically important flower crop in northern India. Preliminary surveys have indicated that several plant parasitic nematodes may be associated with this crop (Khanna and Khan, 1990). *Helicotylenchus varicaudatus* and *Paratylenchus curvitatus* were found in 69 and 20%, respectively, of the sample analysed. *P. curvitatus* often occurred in very high populations, suggesting possible pathogenic potential (Khanna and Jyot, 1999).

Studies were, therefore, conducted to assess the pathogenic potential of these two nematode species on commercially grown carnation.

MATERIALS AND METHODS

Experiments were conducted in a glasshouse where the average temperature ranged between 16 and 26 °C. Thirty days old seedlings of carnation, *Dianthus caryophillus* L. cv. Red Corso were inoculated with three inoculum levels (100, 500 and 1000 individuals) of either *H. varicaudatus* Yuen or *P. curvitatus* Von der Linde in pots filled with 600 g of autoclaved pot mixture (fine soil, sand and FYM sieved and mixed in the ratio of 1:1:1). For inoculation, the required number of nematodes was poured on the feeder roots in water suspension; roots were then immediately covered with the sterilized soil mixture. Light watering followed the inoculation. Water only was used for the control plants. To ascertain the significance of any unknown factor/s that may limit the plant growth and development, the nematode extraction water, which did not contain nematodes, was used as an associated control. There were five plants for each treatment.

Various plant parameters such as days to first flowering, flower diameter, stem length, stem sturdiness, root weight, root length (Table I) and final nematode population were recorded. Flowering time, flower diameter and stem sturdiness were recorded at flower emergence, but root and stem length and weight and final nematode population were recorded at the time of termination (180 days of planting) when flowering development had stopped in most of the plants. The data were statistically analysed.

RESULTS AND DISCUSSION

The impact of the nematode infestation on plant

Table I. Effect of *Helicotylenchus varicaudatus* and *Paratylenchus curvitatus* on stem, root and floral parameters of carnation[1].

Inoculum (nematodes/pot)	Mean stem length (cm)		Mean stem sturdiness		Mean root length (cm)		Mean root weight (g)		Days to flower		Mean floral diameter (cm)	
	H.	P.	H.	P.	H.	P.	H.	P.	H.	P.	H.	P.
0	49.4	46.7	9.8 (3.280)*	9.0 (3.154)*	17.5	16.2	7.3	6.7	144	141	6.6	6.8
0 (Extraction water)	49.9	46.2	9.6 (3.183)	9.2 (3.183)	17.2	16.5	6.8	6.1	144	140	6.7	6.8
100	45.7	45.2	11.2 (3.484)	8.8 (3.125)	16.4	15.7	7.3	6.1	145	142	6.6	6.6
500	39.1	30.6	14.8 (3.958)	17.6 (4.273)	14.8	13.2	6.8	5.2	145	151	6.5	6.4
1000	28.9	22.8	14.2 (3.893)	27.2 (5.284)	13.8	6.7	5.7	3.0	147	174	6.6	5.8
CD (P = 0.05)	2.71	2.67	(0.204)	(0.159)	1.47	1.48	1.16	0.88	3.12	3.40	NS	0.60

[1] H. = *Helicotylencus varicaudatus*; P. = *Paratylenchus curvitatus*.

*Values in parentheses are square-root.

Table II. Reproductive potential and multiplication rate of *H. varicaudatus* and *P. curvitatus* on carnation.

Inoculum	Final nematode population		Rf = Pf/Pi**	
(nematodes/pot)	*H. varicaudatus*	*P. curvitatus*	*H. varicaudatus*	*P. curvitatus*
0	0 (0.000)*	0 (0.000)*	0	0
0 (extraction water)	0 (0.000)	0 (0.000)	0	0
100	2603 (3.36)	5019 (3.663)	26.06	50.19
500	5280 (3.68)	7454 (3.856)	10.56	14.90
1000	8000 (3.67)	836 (2.843)	8.00	0.83
CD (P = 0.05)	(0.121)	(0.061)		

*Values in the parentheses are log (x + 1); **Rf = Reproduction factor; Pf/Pi = Final population/initial population.

growth was visible after 60 days from inoculations. Plant growth was suppressed by population levels of 500 and 1000 of *P. curvitatus* and 1000 *H. varicaudatus* per pot, respectively (Table I). *P. curvitatus* reduced the stem sturdiness (angle of deviation <15°) which is one of the most important characters attributing to the commercial value of flowers. Flowers with firm stems with an angle of deviation less than 15° are categorized as 'A' grade qualitatively and fetch the highest price in commercial markets. *P. curvitatus* also reduced root length and delayed flowering by up to four weeks. The flower size was significantly reduced at the highest infestation level of 1000 nematodes per pot. *H. varicaudatus* was not as pathogenic as *P. curvitatus* and its effect on stem sturdiness, root length and flowering was not significant. Root weight was not affected significantly by any of the nematodes.

Final nematode population increased with an increase in inoculum levels, except in *P. curvitatus* where a reduced nematode population was observed at the highest initial inoculum (Table II). The decline in nematode population could be attributed to non availability of food in already diseased root tissue for a huge population that would have multiplied in due course and it eventually led to the mortality of most of the nematodes. However, the rate of multiplication was inversely proportional to the initial nematode levels.

Plants affected by *P. curvitatus* were stunted, with lower leaves turning yellow followed by upper younger leaves. Floral stalks of such plants were weak leading to poor quality of flowers. Plants in soils infected with *H. varicaudatus* were stunted and with leaf yellowing to a some extent.

This study indicates that *P. curvitatus* and *H. varicaudatus* pose a potential threat to profitable cultivation of carnation in the infested areas. Another species, *P. dianthus*, has been reported to retard growth of carnation in the USA (Jenkins and Taylor, 1956).

LITERATURE CITED

Jenkins W.R. and Taylor D.P., 1956. *Paratylenchus dianthus* n.sp. (Nematoda, Criconematidae), a parasite of carnation. *Proceedings of the Helminthological Society of Washington, 23*: 124-127.

Khanna A.S. and Jyot J., 1999. Nematode fauna associated with carnation. *Journal of Pest Management and Economic Zoology, 7*: 79-83.

Khanna A.S. and Khan M.L., 1990. Nematodes associated with ornamental plants in India. *International Nematology Network Newsletter, 7*: 28-29.

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