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## Incidence of important plant parasitic nematode in wheat and barley in Haryana

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### Abstract

A survey was undertaken to determine the frequency and abundance of plant-parasitic nematodes associated with wheat (*Triticum aestivum*) in Haryana. During 2017 and 2018, in total 113 composite soil samples collected from Hisar and Fatehabad districts. Nematodes were extracted by Cobb's Sieving and Decanting Technique followed by Modified Baermann's Funnel Technique, identified to generic level and quantified. More than five genera of plant-parasitic nematodes were identified along with various type of free-living nematodes. *Heterodera avenae* was found in 32.3 % of the fields sampled during 2017 and 39.5 % during 2018. *Pratylenchus* sp. was identified in 38.4 % the fields sampled during 2017 and 35.4 during 2018.

**Keywords:** Survey, *Heterodera avenae*, *Pratylenchus* sp. and Haryana

### Introduction

Haryana is a landlocked state in northern India. It is between 27°39' to 30°35' N latitude and between 74°28' and 77°36' E longitude. The altitude of Haryana varies between 700 and 3600 ft mean sea level. Nematodes are roundworms with complex organ systems. They dwell in all type of habitats on earth. Most species are beneficial to agriculture by contributing to decomposition of organic matter and nutrient cycling, and they are important in the soil food web. Nematodes are also highly successful parasites of plants and animals. Most plant-parasitic nematodes live in the soil and are so small in the size that they can be seen only with the help of a microscope. A number of plant parasitic nematodes can be extracted from soil supporting vegetative life anywhere. More than 2,000 species are plant parasitic out of the 20,000 identified nematode species. The plant-parasitic species cause estimated annual crop losses of \$78 billion worldwide. About 90 species of plant parasitic nematodes have been reported to be associated with wheat crop (Nicol *et al.*, 2008) [5]. Those of economic importance include cereal cyst nematode, root lesion nematode, root knot nematode; wheat seed gall nematode and stem nematode (Bockus *et al.*, 2009) [1]. Cereal cyst nematode is the most important and the most studied plant-parasitic nematode on wheat (Toktay *et al.*, 2013) [9]. Due to this, nematode losses up to 100% has been reported in India (Van Berkum and Seshadri, 1970) [10]. The annual loss caused in wheat has been estimated to the tune of Rs. 66 crores in Haryana alone (Kanwar *et al.*, 2007) [4]. The present studies were planned with the objectives to map out the incidence of *Heterodera avenae* and also to record other plant parasitic nematodes associated with wheat crop in Haryana.

### Materials and methods

For recording incidence of important plant parasitic nematode in wheat and barley, two districts of Haryana namely Hisar and Fatehabad. The survey was conducted during Feb 2017 and Feb 2018. Most of the samples were taken from wheat crop.

### Sampling for cereal cyst nematodes

Plant parasitic nematodes are generally concentrated in 15-20 cm of upper layer of soil. However, in case of cereal cyst nematodes were taken to a depth of 20-25cm. Most of the cysts are located within the upper 10-20 cm of soil. We had collected 5-10 sub samples from every field. We mixed these sub samples to make composite samples of 500 g from each field. About 50 g of roots were also collected with soil samples for direct examination of cysts on roots. Female of cereal cyst nematode has sedentary so their extraction requires a special procedure based on buoyancy and sieving.

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This requires an additional diagnostic service to that which extracts the vermiform stages needed for most nematodes (including lesion nematodes). Detection of cereal cyst nematodes has often more successful when soil samples has collected at 100-110 days old or after cereal crops mature and sampling has focused within areas where patches of stunted plants occurred.

#### Extraction of cysts and nematode from soil samples

Nematodes and cysts were extracted using Cobb's decanting and sieving method (Cobb, 1918) [2] which is based on the principle that the soil particles and nematodes settle at different rates due to differences in their specific gravity and different sized nematodes are retained on sieves of different pore sizes while cysts will retain on 60-mesh sieve. After that, the 300-mesh sieve suspension was transferred to Modified Biermann's Funnel Technique for extracting nematode in clear suspension. Once we have extracted the nematode from soil samples, basic diagnostic services generally include counting all plant-parasitic nematodes detected in each sample and identifying most of the plant-parasitic nematodes up to genus level. Cysts count was done under stereoscopic microscope, various genera were identified, and their frequency of occurrence and density range was recorded.

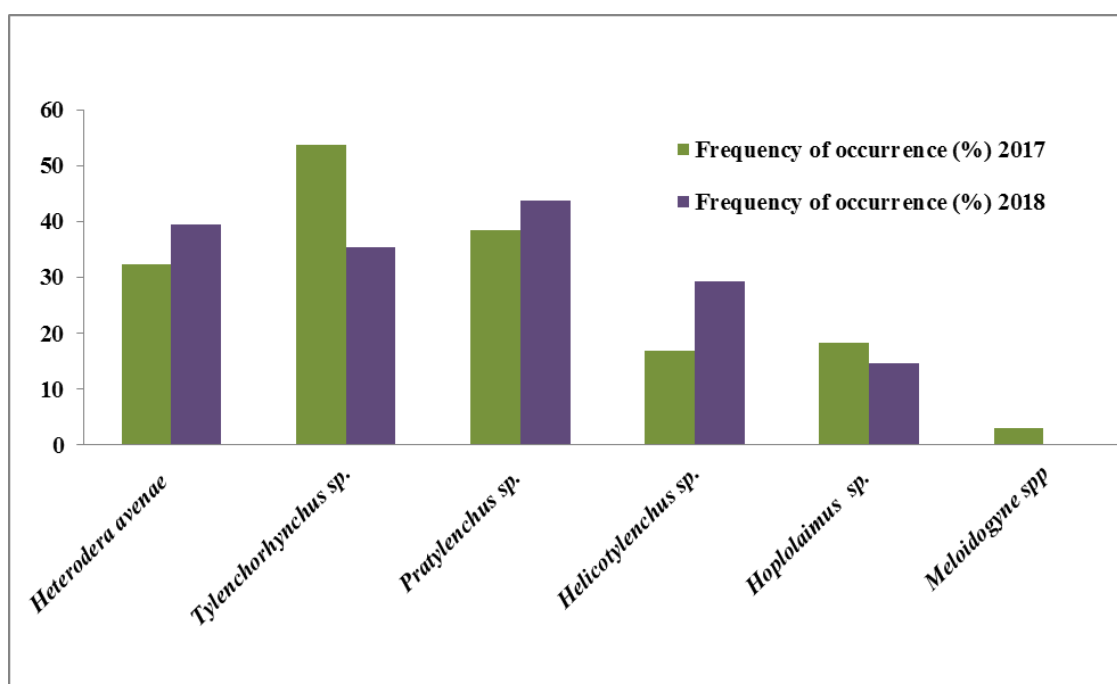
#### Results

The survey was conducted in two districts namely Hisar and Fatehabad for two years (2017 and 2018). The results presented in Table 1 and Fig. 1 revealed that plant parasitic nematodes were present in all the soil and root samples

collected. Among nematodes, the species belonging to the genera *Heterodera*, *Meloidogyne*, *Tylenchorhynchus*, *Hirschmanniella*, *Helicotylenchus* and *Hoplolaimus* were the major nematodes associated with wheat in the state. During 2017 Cereal cyst nematode was reported in 32.3 % (21/65) samples. It was reported in samples of Jagaan, Asranwa, Mahalsara, Kohli, Khairampur, Sadalpur, Chuli, Adampur, Siswal & Bhodiya bishnoyan in Hisar (10/35); Mehuwala, Dharnia , Bhattu, Dhabi, Dhingsara, Bhodiya khera, Sulikhera, Kirdhan, Gadli, Fatehabad, Kumhariyan in Fatehabad (11/30). Number of cysts ranged from 2-28 per 200 cc soil. During 2018, crop health monitoring survey for nematodes was done in the village namely Balsamand, Agroha, Mangali, Ratia, Kohli, Kharakheri, Bhodia Khera, Dhingsara, Bathu, Shekhupura, Dadoli and Dharnia of Hisar and Fatehabad district. Cereal cyst nematode was reported in 39.5 % (19/48) samples. Number of cysts ranged from 1-26 per 200 cc soil. Other plant parasitic nematodes present in 200 cc soil samples were *Pratylenchus* sp., *Tylenchorhynchus* sp., *Hoplolaimus* sp., *Helicotylenchus* sp. and root-knot nematode. The highest frequency of occurrence (53.8% and 43.7%) was observed in case of *Tylenchorhynchus* sp in both the years followed by *Pratylenchus* sp (39.5%) in 2017 and Cereal Cyst nematode (39.5%) in 2018. The lowest frequency of occurrence was observed in case of root-knot nematode (3.0%) during 2017 followed by *Helicotylenchus* sp. (14.6%) in 2018. The maximum range under density was observed in case of *Tylenchorhynchus* sp (15-300) followed by *Heterodera avenae* (3-57) and *Hoplolaimus* sp (1-50).

**Table 1:** Community analysis of plant parasitic nematodes associated with wheat in Hisar and Fatehabad districts during 2017-18

Nematode species	Frequency of occurrence (%) 2017	Frequency of occurrence (%) 2018	Density range per 200 cc soil during 2017	Density range 200 cc soil during 2018
<i>Heterodera avenae</i>	32.3	39.5	2-28	3-57
<i>Tylenchorhynchus</i> sp.	53.8	43.7	15-300	19-280
<i>Pratylenchus</i> sp	38.4	35.4	5-40	5-35
<i>Helicotylenchus</i> sp.	16.9	14.6	2-20	4-17
<i>Hoplolaimus</i> sp.	18.4	29.2	2-35	1-50
<i>Meloidogyne</i> spp	3.0	-	5-20	-



**Fig 1:** Community analysis of plant parasitic nematodes associated with wheat in Hisar and Fatehabad district during 2017 and 2018

## Discussion

During our survey, we find out 5-6 genera which were constantly associated with wheat in both districts and in both the years. In Haryana, the most important is cereal cyst nematode followed by lesion nematode and stunt nematodes. Cereal cyst nematode occurs in wheat from a moderate condition to highly susceptible conditions with yellowing, wilting and stunted growth in patches. As wheat is grown in monoculture in various part which support the nematode population in the field and after 3-4 years that field is not able to bear the attack of this pest and yields losses are very drastic.

Cereal cyst nematode was recorded from 40 soil samples out of 113 with range from 1 to 28 per 200 cc soil during both years. Its density range varies from 2 to 57 per 200 cc soil. The lesion nematode has potentially important nematode as they attack wheat in India and in many other parts of the wheat-growing region; it was recorded both the time with frequency of occurrence 38.4% during 2017 and 35.4% during 2018. *Hoplolaimus indicus*, *Tylenchorhynchus vulgaris* and *Pratylenchus* spp. were polyphagous and attack rice and wheat as well as other crops grown in rice and wheat based cropping systems. *Tylenchorhynchus* spp., which was polyphagous nematode and cause poor growth of wheat in North America and India (Griffin, 1984)<sup>[3]</sup> and considered potentially important pathogens of wheat (Swarup & Sosa-Moss, 1990)<sup>[8]</sup> was recorded from almost all the samples collected during both the years. The population ranged between 15-300 and 19-280 nematodes/200cc of soil with 53.8 % and 43.7 % frequency of occurrence during 2017 and 2018 respectively. Sharma *et al.* (2001)<sup>[7]</sup> reported species of *Heterodera*, *Helicotylenchus*, *Pratylenchus* and *Meloidogyne* as the major plant-parasitic nematodes on wheat in upland production areas. In addition, *Meloidogyne incognita* has also been reported attacking wheat in present studies. It was a known field problem on wheat in north-western India (Swarup and Sosa-Moss, 1990)<sup>[8]</sup>. According to Sharma and Rahman, (1998)<sup>[6]</sup> species of *Tylenchorhynchus* may damage the wheat crop as its populations increase significantly during the crop season. Including the existing genera there may be some more, which can be figured out after surveying the each part of state and country so that we can adopt the various management tactics to manage these time pests in wheat to increase the production and productivity.

## References

1. Bockus WW, Bowden RL, Hunger RM, Morrill WL, Murray TD, Smiley RW. Compendium of wheat, CAB International, Wallingford, UK, 2009, pp. 480.
2. Cobb NA. Estimating the nematode population of the soil, with special reference to the sugar-beet and root-gall nemas, *Heterodera schachtii* Schmidt and *Heterodera radicicola* (Greef) Müller, and with a description of *Tylencholaimus aequalis* n. sp. USDA Agriculture Technology Circular, Washington, DC, USA, 1918.
3. Griffin GD. Nematode parasites of alfalfa, cereals and grasses. In: Nickle WR. (Ed.). Plant and Insect Nematodes. New York & Basel, Marcel Dekker, Inc, 1984, 243-321.
4. Kanwar RS, Dabur KR, Nandal SN. Reaction of *Heterodera avenae* resistant varieties of wheat and barley against rice root-knot nematode (*Meloidogyne graminicola*). Indian J. Nematol. 2007; 36:285-86.

5. Nicol JM, Sahin E, Wallwork H. Identification of multiple root disease resistant wheat germplasm against cereal nematodes and dryland root rot and their validation in regions of economic importance. Proc 11<sup>th</sup> International wheat genetics symp, Brisbane, Queensland, Australia, 2008, 91-98.
6. Sharma SB, Rahaman PF. Nematode pests in rice and wheat cropping systems in the Indo-Gangatic plain. In: India Rice-Wheat Consortium paper series (Eds. Sharma, S.B., Johasan, C. and Midha, S.E.), New Delhi, India, 1998, p. 12.
7. Sharma SB, Pande S, Saha M, Kaushal KK, Lal M. Plant parasitic nematodes associated with rice and wheat based cropping systems in Nepal. Indian J Nematol. 2001; 11:35-38.
8. Swarup G, Sosa-Moss C. Nematode parasites of cereals. In: Luc M, Sikora RA, Bridge J. (Eds). Plant Parasitic Nematodes in Subtropical and Tropical Agriculture. Wallingford, UK, CAB International, 1990, 109-136.
9. Toktay H, Imren M, Bozbuga R, Orakc GL, Dababat A, Elekcioglu H. Pathotype characterization of the cereal cyst nematode *Heterodera filipjevi* (Madzhidov, 1981) Stelter in Turkey. Turkish Entomol. Derg. 2013; 37:213-19.
10. Van Berkum JA, Seshadri AR. Some important nematode problems in India. Proc. 10th Int. Nematol. Symp, Pescara, Italy, 1970, 136-137.