



Short Communication

Distribution of Cyst Nematodes in Gilgit-Baltistan, Pakistan

Sagir Hussain*, Qamar Abbas, Abdur Razzaq and Sher Wali Khan

Department of Biological Sciences, Karakoram International University, Gilgit, Pakistan.

Abstract | Cyst nematode, the *Heterodera* Schmidt (1871) is one of the most widely distributed and economically important plant parasitic nematode genus. During the present investigation of plant-parasitic nematode fauna from Gilgit-Baltistan, Pakistan, four cyst nematode species viz., *Heterodera avenae* Wollenweber, 1924; *H. mani* Mathews, 1971; *H. schachtii* Schmidt, 1871 and *H. zaeae* Koshy, Swarup and Sethi, 1971 were detected from all four districts.

Received | May 27, 2021; **Accepted** | June 24, 2021; **Published** | July 08, 2021

***Correspondence** | Sagir Hussain, Department of Biological Sciences, Karakoram International University, Gilgit, Pakistan; **Email:** sagirhussain72nnrc@gmail.com

Citation | Hussain, S., Abbas, Q., Razzaq, A. and Khan, S.W., 2021. Distribution of cyst nematodes in Gilgit-Baltistan, Pakistan. *Pakistan Journal of Nematology*, 39(1): 65-67.

DOI | <https://dx.doi.org/10.17582/journal.pjn/2021.39.1.65.67>

Keywords | Cyst, Nematode, Gilgit, Baltistan, Distribution

Introduction

Genus *Heterodera* Schmidt (1871) as a member of cyst forming nematodes is one of the most widely distributed and economically important plant parasitic nematode. During the present investigation of plant parasitic nematode fauna from Gilgit-Baltistan, Pakistan, four cyst nematode species viz., *Heterodera avenae* Wollenweber, 1924; *H. mani* Mathews, 1971; *H. schachtii* Schmidt, 1871 and *H. zaeae* Koshy et al., 1971 were detected from all four districts of Gilgit-Baltistan.

For the extraction of cyst nematodes (*Heterodera* spp.) Cobb's sieving and decanting technique (Cobb, 1918) was followed using different mesh sieve sizes. The deposit of 100 mesh sieve was used for the collection of cyst nematodes. Identification of cyst nematodes up to species level was made according to methods given by Hesling, 1978 using the general shape of the cyst, the structure, size of the vulva, vulval cone, fenestration and body wall. Golden (1978) method was used for the preparation of cyst vulval cone mounts. For the diagnosis of male and juveniles method of Wouts and

Baldwin (1998) was followed.

The most frequently encountered species of cyst in the region was *Heterodera zaeae*, which is the major pest of maize, also called maize or corn cyst nematode. It was encountered from all four districts of Gilgit-Baltistan. Frequency of distribution of *H. zaeae* was comparatively high as compared to other cyst species. During survey it was observed that *H. zaeae* was widely distributed on potato growing areas of all four districts than on maize.

Heterodera mani was the second *Heterodera* species found from two districts viz., district Hunza and district Nager. *Heterodera schachtii* was found associated with potato and chickpea from two districts Nager and Hunza. The least frequently distributed species of the genus *Heterodera* was *Heterodera avenae*. It was found from only one district Hunza (village Ganish) from pear and potato (Table 1).

Cluster analysis and similarity indices of genus Heterodera species form different districts of Gilgit-Baltistan

The dendrogram of cluster analysis among the species

Table 1: New host records of cyst nematodes from different districts of Gilgit-Baltistan.

Cyst Nematode	Host	Location
District Ghizer		
<i>Heterodera zaeae</i>	<i>Solanum tuberosum</i> L.	Barkulti and Hundur
District Gilgit		
<i>Heterodera zaeae</i>	<i>Solanum tuberosum</i> L.	Bagrot, Danyor, Naltar Bala, Naltar Paine and Sultanabad
District Hunza		
<i>Heterodera zaeae</i>	<i>Solanum tuberosum</i> L. <i>Zea mays</i> L.	Galmit, Hussainabad, Hussaini, Khanabad, Khyber and Passu
<i>Heterodera mani</i>	<i>Solanum tuberosum</i> L. <i>Cicer arietinum</i> L.	Ghalapan, Kamarich, and Khudabad
<i>Heterodera avenae</i>	<i>Solanum tuberosum</i> L. <i>Pyrus comminis</i> L.	Ganish
<i>Heterodera schachtii</i>	<i>Solanum tuberosum</i> L. <i>Cicer arietinum</i> L.	Khudabad
District Nager		
<i>Heterodera zaeae</i>	<i>Solanum tuberosum</i> L. <i>Zea mays</i> L.	Askurdas, Chaprote, Hopey, Jafarabad, Minapin, Shayar and Sumayar
<i>Heterodera mani</i>	<i>Solanum tuberosum</i> L. <i>Allium cepa</i> L.	Hoper and Nager Khas
<i>Heterodera schachtii</i>	<i>Solanum tuberosum</i> L.	Hoper

of genus *Heterodera* of surveyed areas of Gilgit-Baltistan showed the two clades. In clade I *Heterodera avenae* and *Heterodera zea* are in same clade. In clade II *Heterodera schachtii* and *Heterodera mani* are in same clades have similar nematode population (Figure 1). Cluster analysis was made by using PAST 3 software. The similarity indices of identified species of genus *Heterodera* from different districts of Gilgit-Baltistan shown in Figure 2.

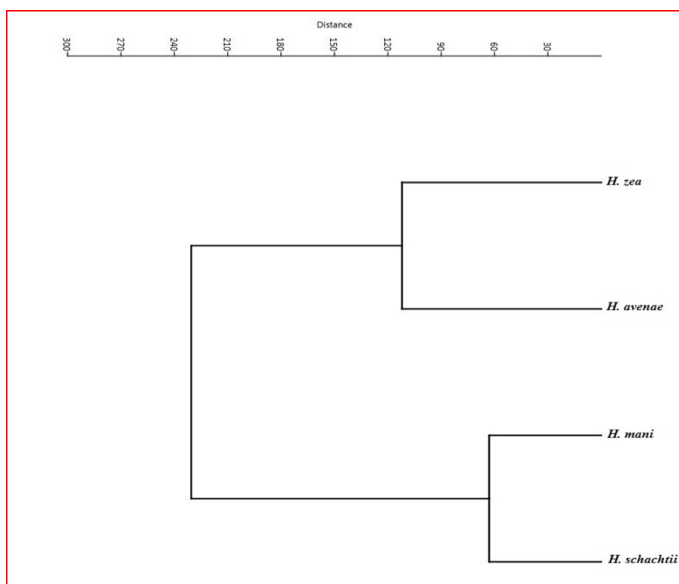


Figure 1: The dendrogram of cluster analysis of 4 species of genus *Heterodera* from surveyed areas of Gilgit-Baltistan.

Species	<i>H. zaeae</i>	<i>H. avenae</i>	<i>H. mani</i>	<i>H. schachtii</i>
<i>H. zaeae</i>	0	318.00157	255.00784	112.04017
<i>H. avenae</i>	318.00157	0	63.007936	206.00971
<i>H. mani</i>	255.00784	63.007936	0	143.0035
<i>H. schachtii</i>	112.04017	206.00971	143.0035	0

Figure 2: The similarity indices of identified species of genus *Heterodera* from different districts of Gilgit-Baltistan.

Novelty Statement

During the present investigation of plant-parasitic nematode fauna from Gilgit-Baltistan, Pakistan, four cyst nematode species viz., *Heterodera avenae* Wollenweber, 1924; *H. mani* Mathews, 1971; *H. schachtii* Schmidt, 1871 and *H. zaeae* Koshy, Swarup and Sethi, 1971 were detected from all four districts

Author’s Contribution

Sagir Hussain: Did Survey, Processing, Identification, Drawing and wrote manuscript.

Qamar Abbas: Wrote manuscript.

Abdul Razaq: reviewed the paper, contributed in data collection and compiling of data.

Sher Wali Khan: Identification of the host plants of the study area

Conflict of interest

The authors have declared no conflict of interest.

References

- Cobb, N. A. 1918. Estimating the nema population of the soil, with special reference to the sugar-beet and root-gall nemas, *Heterodera schachtii* Schmidt and *Heterodera radicum* (Greef) Muller, and with a description of *Tylencholaimus aequalis* n. sp. USDA, Agr. Tech. Circ. 1. 47 pp
- Golden, A.M., 1978. *Printed notes on methodology*. Nematology Lab. PPI.USDA, Beltsville, Maryland, USA. pp. 2.
- Hesling, J.J., 1978. Cyst nematodes: morphology and identification of *Heterodera*, *Globodera* and *Punctodera*. In: *Plant Nematology*. Southey, J.F. Reference Book, Ministry of Agriculture Fisheries and Food, London, pp. 125-155.
- Koshy, P.K., Swarup, G. and Sethi, C.L., 1971. Distribution of *Heterodera zea* n. sp. (Nematoda: Heteroderidae), a cyst forming nematode on *Zea mays*. *Nematologica*, 16: 511-516. <https://doi.org/10.1163/187529270X00694>
- Mathews, H.J.P., 1971. Two new species of cyst nematode, *Heterodera mani* n. sp. and *H. iri* n. sp., from Northern Ireland. *Nematologica*, 17: 553-565. <https://doi.org/10.1163/187529271X00279>
- Schmidt, A., 1871. Über den Ruben-Nematoden (*Heterodera schachtii* A. S.). *Z. Zool. Zoolversein*, 21: 1-19.
- Wollenweber, H.W., 1924. Zur Kenntnis der Kartoffel-Heterodera. *Illuster. Landwirtsch. Ztg.*, 44: 100-101.
- Wouts, W.M. and Baldwin, J.G., 1998. Taxonomy and identification. In: Sharma, S.B. (Ed.) *The Cyst nematodes*. Kluwer Academic Publishers, London, UK. pp. 83-122. https://doi.org/10.1007/978-94-015-9018-1_4