International Journal of Agriculture and Plant Science
www.agriculturejournal.in
Online ISSN: 2664-7664, Print ISSN: 2664-7656
Received: 22-12-2021, Accepted: 06-01-2022, Published: 22-01-2022
Volume 4, Issue 1, 2022, Page No. 10-14

Survey of barley fields for plant parasitic-nematodes in Ethiopia

Belay Feyisa
Ethiopian Institute of Agricultural Research (EIAR) and Ambo Agricultural Research Center, Ambo, Ethiopia
*Corresponding Author: belay22feyisa@gmail.com

Abstract
Survey of plant- parasitic nematode genera linked in barley crop was accompanied to determine their types, frequency, and populations. Total of 48 roots and soils were collected from Oromia and Amhara regions. Nematodes were extracted from samples by modified Baermann technique. Based on examination beneath compound magnifying microscope, five plant-parasitic nematode genera were identified. Tobe specific: *Tylenchus, Scutellonema, Longidorus, Xiphinema,* and *Helicotylenchus. Longidorus* and *Tylenchus* were profoundly ruled and taken after by *Xiphinema* with (19%, 17%, and 6% of event separately). *Longidorus* was broadly dispersed in barley crop with all surveyed regions. This data was exceptionally imperative to plan nematode management tactics.

Keywords: barley, nematode, parasitic, survey

Introduction
Barely (*Hordeum Vulgare* L.) is one of the preeminent vital nourishment crops conveyed with in the world. In Ethiopia barley is positioned fifth of all cereals, based on range of generation, but third based on surrender per unit region. It covers 7.56% of the arrive beneath grain trim development with abdicate of 1.96t ha-1 [4]. Whereas the potential surrender goes up to 6 t/ha on test plots [7] showing an efficiency crevice of almost 4 tones/ha. It has numerous employments, counting animals nourish, human nourishment, and generation of malt, in Ethiopia. The grain is primarily produced for human utilization and sold for cash. Within the good countries of Ethiopia at elevations over 1800 meters over ocean level (m a s l), grain is trimmed twice a year. In spite of barley's long history of development in Ethiopia with assorted farmers' assortments, conventional hones, and its important employments [1], the generation and efficiency of the trim have been moo (<2t/ha) [3]. This surrender level is lower than around the world and national surrender potential [9, 1] obtained under well-managed plots in the country [12]. The moo efficiency of the trim is related with multidimensional abiotic and biotic components. Besides, plant-parasitic nematodes have been detailed to constitute a genuine impediment to cereal generation in ranges of the world [1]. Phytonematode caused impressive harm and misfortunes to diverse agrarian crops all over the world [15]. Barley is influenced by a few parasitic, nematodes, viral and bacterial illness. As numerous as 23 fungi, two bacteria, two viruses, and nine nematodes contaminate barley [2, 13]. Numerous study ponders have been conducted in Ethiopia [2, 1, 19]. Be that as it may, the significance of most grain nematodes in Ethiopia was not well archived and profiled in later a long time. Having the over result in see, this paper displayed the event, dissemination, and plenitude of plant-parasitic nematode influencing grain in Ethiopia. Hence, the display study was carried out to decide the plant-parasitic nematode genera related with two critical locales of grain crops at Oromia and Amhara.

Materials and Methods
Forty-eight soil and root tests were gotten from barley crops inside the rhizosphere zone, for the 2018 cropping season. Tests were gotten by burrowing the soil to depth of 15-30 cm from sampled area of barley in a precise, zigzag-sampling design sampled field. Soil tests of nearly 1kg and 200 g of roots were set in white plastic bags and conveyed straightforwardly to Ambo nematology laboratory and spared inside the ice chest at 4°C foreseeing extraction of nematodes [16]. Both sample extraction was done following Baermann strategy [5]. Plant-parasitic nematode genera were distinguished at the generic level [10], and numbered utilizing Peter's 1-ml eelworm counting beneath a compound microscope. Extracted nematodes were identified and distinguished to genus levels at various magnifications as depicted prior following procedure of (8). Nematode specimens from each test were mounted on glass slides for distinguishing proof to genus/species level taking after keys and references of [14] and [11] beneath a light magnifying microscope.

Data collected
Populations of PPN were communicated as number of juvenile two nematodes /100 cm3 soil or juvenile two nematodes /10 g new root weight (NRW) were decided. PV was calculated as: absolute density × √absolute frequency of occurrence/10 [5]. Frequency is communicated as the number of sites where a genus happened. Genera were considered wide when they happened in more than 30% of the

destinations. A genus whose mean density was more than 10 individuals/100 g of root was considered inexhaustible [16].

Results and Discussion

All forty-eight of both tests were collected from the inspected area of barley crops, in 2018 cropping season. In general, based on laboratory assay five genera of PPN having a place three (3) families were distinguished from both tests within the two regions (Table 1& fig 1).

Based on the laboratory assay five plant parasitic nematode genera; *Tylenchus, Scutellonema, Longidorus, Xiphinema and Helicotylenchus* were detected from both tests. Information on Table 2 appeared that *Longidorus* and *Tylenchus* genera alike to be the far reaching nematode bothers as they happened at the rates of 19 and 17 times with percent frequency of 39 and 35%, correspondingly. Moreover, the two nematode genera *Xiphinema* and *Scutellonema* appeared unassuming dispersions as they happened at the rates of 6 and 4 times with percent event of 13 % and 9 % separately. The genera *Helicotylenchus* was less broad as they happened at the rate of 2 times with percent event of 4%.

Table 1: PPN separated from both tests of barley in the two inspected regions.

Detected nematode family	Detected nematode genera
Hoplolaimidae	*Helicotylenchulus Scutellonema*
Tylenchulidae	*Tylenchus*
Longidoridae	*Xiphinema Longidorus*

Table 2: Frequency of occurrence of PPN genera on barley crop

No.	List of detected Nematode genera's	No	F.O%
1	*Tylenchus*	8	17
2	*Scutellonema*	2	4
3	*Longidorus*	9	19
4	*Xiphinema*	3	6
5	*Helicotylenchus*	1	2

No=Number of samples containing a genus.
F.O=Frequency of Occurrence

The PV of *Longidorus* (97), *Tylenchus* (96) and *Xiphinema* (41) was higher from soil tests. When the populations of different PPN genera in soil were evaluated for all mentioned regions, the population density ranged from 100 to 234 nematodes per 100 g of dry soil (Table:3). *Tylenchus* had a high mean density of 234 nematodes/100g soil. The transcendent genera shows were *Tylenchus, Longidorus* and *Helicotylenchus* over all the regions. The most noteworthy PV was recorded from *Longidorus* (97) and *Tylenchus* (96) taken after by *Xiphinema* (41) from soil tests. The lowest PV was recorded from *Helicotylenchus* (28) followed by Scutellonema (20) were calculated from soil samples (Table 3& Fig 2). Both tests were collected from the area of 2449 (Oromia) to 3009m (Amhara) region above sea level.

Table 3: PV, FO and abundance of predominant PPN recovered from soils and roots of barley.

List of Nematode genera	Soil tests (100cm^3)			Root tests(10 g)		
	Abundance	FO (%)	PV	Abundance	FO (%)	PV
Tylenchus	237	17	98	-	-	-
Scutellonema	100	4	20	-	-	-
Longidorus	222	19	97	-	-	-
Xiphinema	167	6	41	-	-	-
Helicotylenchus	200	2	28	-	-	-

- = nematode not found in the root,
PV = Prominence value

All 5 nematode genera except *Xiphinema* were detected from Oromia region. Among that the highest population of nematode was *Longidorus* (2000). *Xiphinema* nematode is the only nematode recorded from Amhara region. *Tylenchus* (1900) followed by *Xiphinema* (500) were the highest nematode population detected in both regions respectively. The highest nematode population found in the Amhara region was Xiphinema (500).The highest nematode population found in the Oromia and Amhara was Tylenchus (234/100cm^3) and Xiphinema (167/100cm3) of soil respectively.

Table 4: Occurrence and distribution of PPN genera in both tests from 2 regions of Ethiopia.

Nematode genera	*Oromia,*	*Amhara*
Tylenchus	+	-
Scutellonema	+	-
Longidorus	+	-
Xiphinema	+	+
Helicotylenchus	+	-

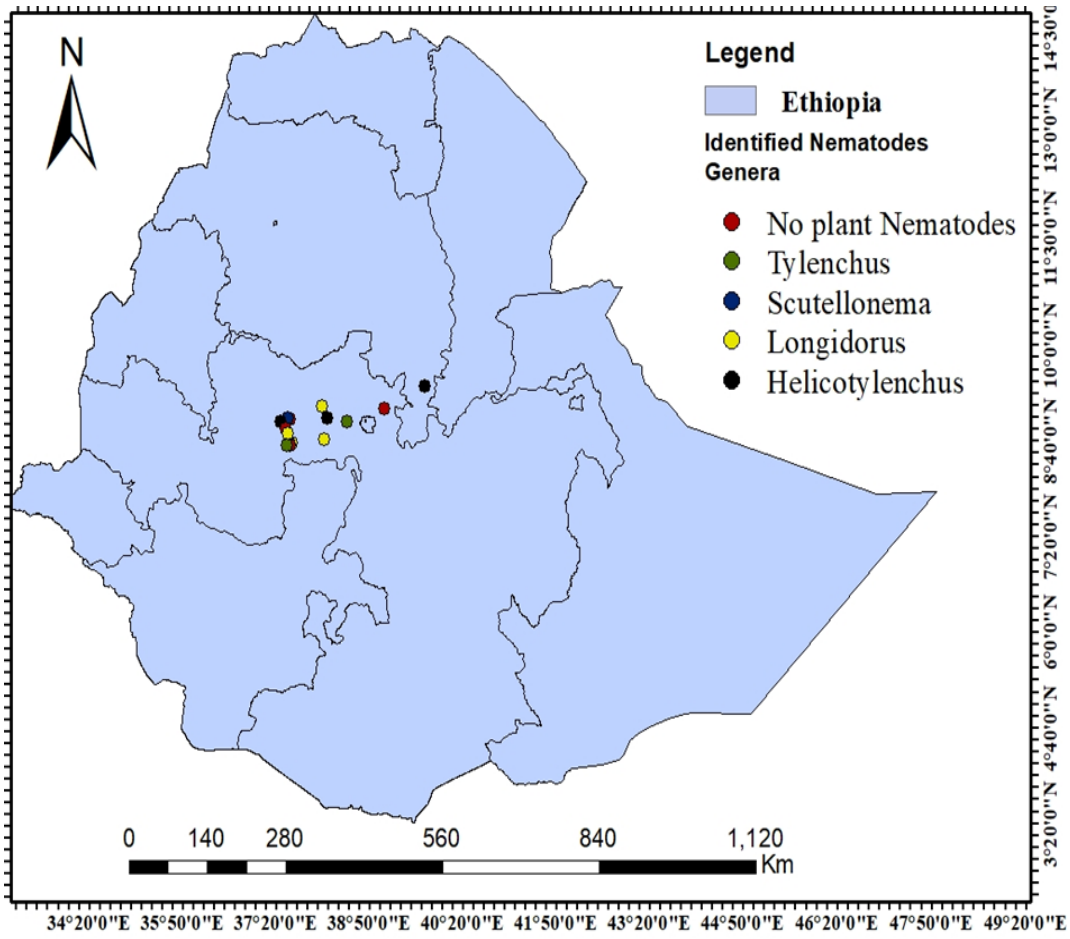

Fig 1: Distribution of plant parasitic nematodes genera in Barley growing districts in Ethiopia.

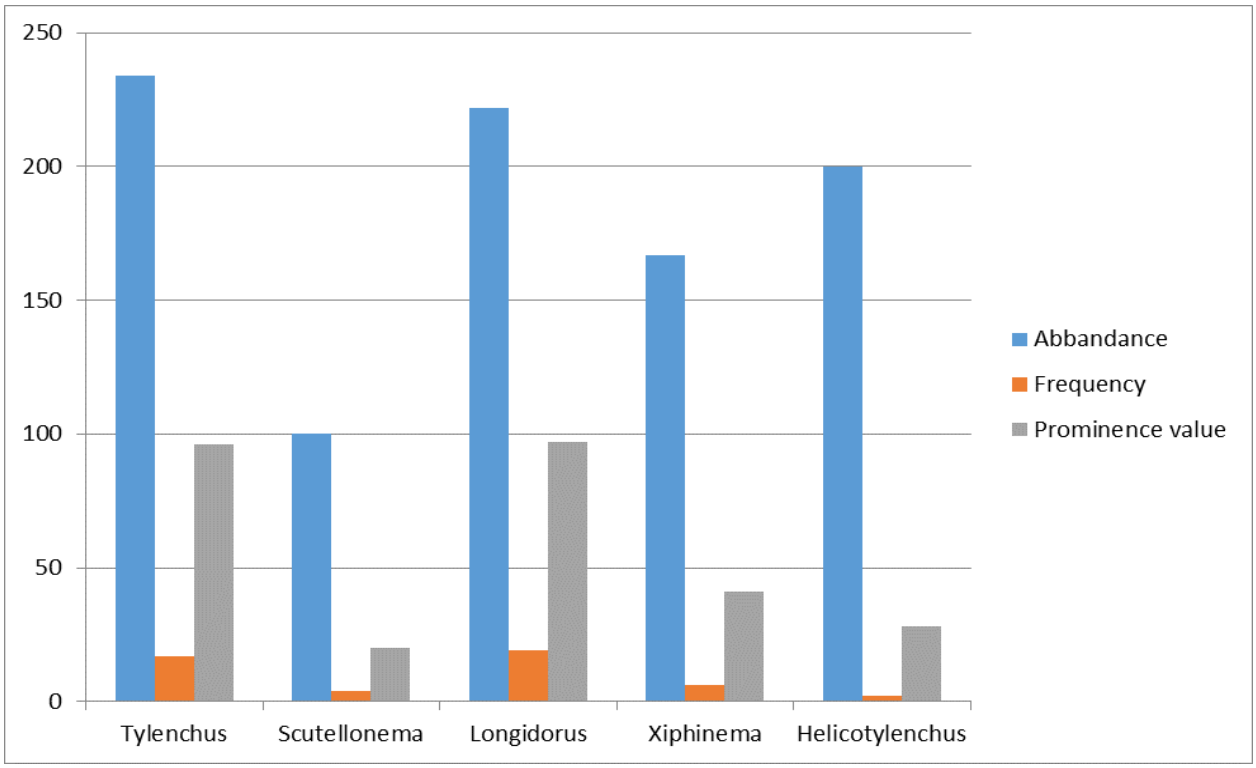

Fig 2: PPN abundance, frequency and prominence value recovered from barley soil tests

Conclusion and Recommendations

The show ponder detailed the nearness of five of PPN genera having a place to 3 families, found related with the rhizosphere of barley roots at Oromia, and Amhara regions. Among the five nematode genera, *Longidorus* and *Tylenchus* genera showed up to winning nematode as they happened at the rate of 9 and 8 times with percent event of 19% and 17%, individually. In addition, the nematode genera, *Xiphinema* and *Scutellonema* appeared humble dispersions happened at amounts of 29 and 20 times with percent event of 18% and 12%, separately, while, the genera, *Helicotylenchus* appears less visit as they happened at amounts of 1 times with percent event of 2%. Generally, the pith of this study encourage in selecting implanting framework within the chosen areas and sidestep planting the helpless has, as well as have to be utilized in arrange of nematode administration programs.

In Ethiopia, PPNS have been detailed as generation limitations of cereal, pulse and oil crops [18]. A few species of PPN having a place to 15 genera are detailed to be related with cereals, pulses and oil crops in Ethiopia [17]. Be that because it may, the budgetary importance of these nematodes in association to resign hardship and their effect on national era of these crops still remains darken.

PPN happen in grain based faming system in Ethiopia. Higher event and density of major nematode bothers such as *Longidorus* and *Tylenchus* may compel barley production with in the country. There's out to set up the money related significance of the point by point nematodes in Ethiopia as well as proceeded look for an compelling Plant Parasitic Nematode administration strategy in grain based cropping frameworks. The comes about of this study give not as it were insight concerning critical nematodes related with cultivated plants developed in Oromia and Amhara regions of Ethiopia but also sign of their recurrence of occurrence, geographical dissemination, and conceivable potential for crop damage and financial impact. This over view ought to offer assistance in deciding which PPNs may be included in plant disease problems within these two regions of Ethiopia. The survey comes about moreover appear the significance of accurate nematode recognizable pieces of proof in building up effective management techniques.

Author Contributions

The author did all survey activities and identification of plant parasitic nematodes from barley crop by itself because he is the only nematology researcher person from his center.

Acknowledgements

The author wishes to acknowledge Alemnesh Zinaye, Fikremariyam Yimer, Gemechu Kebede, and Sinkinesh Jifara for their unreserved support of laboratory facilities. The author also thanks Belgium University and Jimma University for their collaboration for they give me deep training on nematode extraction and identification.

References

1. Ayele B, Eshetu B, Betelehem B, Bekele H, Melaku D, Asnakech T, Melkamu A *et al*. Review of two decades of research on diseases of small cereal crops. In: Abrham, T. (eds.) Increasing crop production through improved plant protection volume I. Proceedings of 14th annual conference of plant protection society of Ethiopia (PPSE) 19-22 Dec.2006 Addis Ababa., Ethiopia, 2008, 375-416.
2. Bekele E. A review of research on disease of barley, tef and wheat in Ethiopia. In: Abate T, (ed.). Proceedings of the review of crop protection research in Ethiopia, Institute of Agricultural Research, 4-7 Feb Institute of Agricultural Research, Addis Ababa, Ethiopia, 1985, 79-108, 1985.
3. Central Statistical Agency (CSA). Report on area and production of major crops (private peasant holdings, summer season of 2014/2015).Vol. I. Statistical bulletin,2015:1:578:10-14.
4. Central statistical Agency (CSA).Report on Area and Production of major Crops. Stat. Bull.278: 1-119, 2016.
5. De Waele D, Elsen A. Challenges in Tropical Plant Nematology. Annual Review of Phytopathology,2007:45:457-485.
6. Goodey JB. Laboratory methods for work with plant and soil nematodes. (1st edn), Tech Bull No. 2 Min Agric, London, UK, 1957.
7. Habtamu A, Heluf G, Bobe B, Enyew A. Fertility Status of Soils under Different Land uses at Wujiraba Watershed, NorthWestern Highlands of Ethiopia. Agriculture, Forestry and Fisheries,2014:3:410-419.
8. Hooper DJ, Hallmann J, Subbotin S. Methods for extraction, processing and detection of plant and soil nematodes. In: Luc, M., Sikora, R.A. and Bridge (Eds.). Plant Parasitic Nematodes in Subtropical and Tropical Agriculture, 2nd Edition Wallingford, UK: CAB International, 2005, 53-86.
9. Lake B, Gebre H, Alemayehu F. Barley production and research. In: Gebre, H. and J. Van Leur. (eds.). Barley Research in Ethiopia: Past Work and Future Prospects. Proceedings of the first Barley Research Review Workshop, 16–19 Oct 1993. IAR/ICARDA, Addis Ababa, Ethiopia, 1996, 1-8.
10. Marinari-Palmisano A, Vinciguerram T. Classificazione dei ematodi. In: Ambrogioni, L., d'Errico, F.P., Greco, N., Marinari-Palmisano, A., Roversi, P.F., (Eds.), Nematologia Agraria generale e applicata. Società Italiana di Nematologia, (Firenze), 2014, 23-41.
11. Mekete T, Dababat A, Sekora N, Akyazi F, Abebe E. Identifcation key for agriculturally important plant-parasitic nematodes for the International Nematode Diagnosis and Identifcation Course 2012 – A manual for nematology. Mexico: CIMMYT, 2012, 39.
12. MoA (Ministry of Agriculture). Animal and plant health regulation directorate. Crop variety register. Issue No. 17. Addis Ababa, Ethiopia, 2014.
13. Semeane Y, Hundie B, Woldeab G, Tadesse D. Disease surveys and loss assessment studies on barley. In: Gebre, H. and J.A.G. van Leur (eds.). Barley Research in Ethiopia: Past Work and Future Prospects. Proceedings of the 1st Barley Research Review Workshop, 16-19 Oct 1993, Addis Ababa. IAR/ICARDA, Addis Ababa,

Ethiopia,1996:105-115.
14. Siddiqi MR. Tylenchida: parasites of plants and insects. 2nd ed. Wallingford (UK): CABI Publishing, 2006, 833.
15. Sikora RA, Bridge J, Starr JL. Management practices: an overview of integrated nematode management technologies. In: Luc, M., Sikora, R.A. and Bridge, J. (eds) Plant Parasitic Nematodes in Subtropical and Tropical Agriculture, 2nd edn. CAB International, Wallingford, UK, 2005, 793-825
16. Talwana HL, Butseya MM, Tusiime G. Occurrence of plant-parasitic nematodes and factors that enhance population build-up in cereal-based cropping systems in Uganda. African Crop Science Journal,2008:16(2):119-131.
17. Tegegne G, Abebe F, Hussien T, Tilahun T, Belete E, Ayalew M *et al*. Review of maize, sorghum and millet pathology research. In: Tadesse, A. (Ed.). *Increasing crop production through improved plant protection*. Addis Ababa, Ethiopia, Plant Protection Society of Ethiopia, 2008, 245-302.
18. Tsedeke Abate, Ferede Negasi, Kemal Ali. A review of grain legume pest management. Research in Ethiopia. In: a review of crop protection research in Ethiopia, ed. Tsedeke Abate, Institute of Agricultural Research, Addis Ababa, 685, 1985, 327-44.
19. Woldeab G, Hundie B, Abebe F, Tekalign A, Degefa M, Taddese K *et al*. Achievements of research on Barley Rusts and Powdery Mildew in Ethiopia. In: Mulatu, B. and S. Grando. (eds). Barley Research and Development in Ethiopia. Proceedings of the 2nd National Barley Research and Development Review Workshop.28- 30, HARC, Holetta, Ethiopia. ICARDA, PO Box 5466, Aleppo, Syria. pp xiv +, 2006, 391.