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# Determination of extent of survival of *Aphelenchoides besseyi* in prosomillet

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**ABSTRACT**

Foliar nematode, *Aphelenchoides besseyi* is of great concern for profitable cultivation of prosomillet *(Panicum miliaceum)*. Attempts were made for the studies on population dynamics and comparative survival of *Aphelenchoides besseyi* in different germplasm of prosomillet from Tamilnadu and Madhya Pradesh to be the first kind of its own study. The Present investigation included nine germplasm of prosomillet namely -TNAU-137, TNAU-145, TNAU-149, TNAU-151, TNAU-155, TNAU- 164, TNAU-183, TNAU-191 and TNAU- 194 and some MP. The germplasm were stored for the period of consecutive four years and investigated their population dynamics and survival in field and laboratory of Plant Pathology during 2014-15.

**Key words**: Survival, *Aphelenchoides besseyi*, germplasm, prosomillet

Prosomillet *(Panicum miliaceum)* is an important minor millet mainly grown in Uttar Pradesh, Bihar, Tamil Nadu, Maharashtra, Andhra Pradesh Karnataka and Madhya Pradesh. The crop is able to evade drought by its quick maturity. Being a short duration crop (60-90 days) with relatively low water requirement it possess better prospects for intensive cultivation in scanty rainfall dry weather marginal lands. The crop mainly cultivated under unirrigated conditions of the *kharif* seasons. But in areas where irrigation facilities are available, seems too profitabe as summer in high crop intensity. It is one of the oldest cereals cultivated in India, Japan, China, Egypt, Arabia and Western Europe, as well as in many parts of the world. People know it with different names such as broomcorn millet, hog millet, Hershey millet, prosomillet or common millet, *etc.*

The nematode *Aphelenchoides besseyi* was first reported on *Setaria italica* from Japan (Yoshii and Yamamoto, 1950) and then from India (Dave *et al.,* 1979). Due to incidence of the nematode the crop suffers with many unique features, *viz.*, early maturity (60-65 days) chaffy panicles, poor seed weight (light grains) and erect without branches are the specific symptoms of nematode infestation. The optimum temperature for development was observed between and 21-25°C, the life cycle completes in 8-10 days at temperature range of 21-23°C. Nematode completes several generations in a season (EPPO. Data sheets on Quarantine Pests: *Aphelenchoides besseyi*. http.//http://www.eppo.int/QUARANTINE/nematodes/Aphelenchoides besseyi/APLOBE ds.pdf).

## MATERIALS AND METHODS

The experiments were carried out in Department of Plant Pathology, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (M.P.) during the season 2014-2015.

## Collection of germplasm

The materials used during the study included Tamil Nadu and other germplasm of prosomillet collected from Scientist in-charge, AICRP on Small millets, Department of Plant Pathology, College of Agriculture, Rewa (M.P.)

**Germplasm** TNAU-137, TNAU-145, TNAU-149, TNAU-151, TNAU-155, TNAU- 164, TNAU-183, TNAU-191 and TNAU- 194 and compared with other prosomillet which were stored for the consecutive four years. Seed weight were also recorded to understand quantity parameters. The categories were designated with their physical appearance. Nematodes were extracted by dehulled seeds manually and they were allow for 24 hours on nematode extraction assembly to recoup nematode population at room temperature (25°C±2). Two methods were compared for the extraction of the nematode such as seeds split longitudinally and placed seed over extraction assembly and seeds grinded with mortar and pestle and placed over extraction assembly. Random counting of one thousand seeds of each prosomillet germplasm with dividing it randomly in four parts each of approximately 250. Abnormal and apparent healthy looking seeds from each lot were separated and dehulled using mortar pestle grinding and kept for extraction of nematode population.

## Inoculation of *A. besseyi*

The plants were inoculated by adding 250 nematodes suspensions with the help of hypodermal syringe holding nematode suspension in 1 ml sterilized water over a sprouted seed and completely randomized design with four replications. The temperature was 28-30°C with humidity 85-90% in poly house. The symptoms were recorded periodically.

## Seed sowing

Inoculated seeds of prosomillet were sown at the depth of 1.5- 2 cm under aspectic environment .Maintained moisture during course of investigation, emerged panicles and bulk harvest was examined. Symptomatology was duly recorded.

## Results and Discussions

Valuable findings revealed direct seed weight loss and increased nematode population / 250 a seed was generated from present study.

Data summarized in table 1 indicated that, there was drastic and significant loss in gain weight in TNAU-155 (2010 over 2009). Similar observations were also noticed in the seed lot of 2012, however, other eight germplasm showed decreased weight / 250 seeds. Maximum (50) loss in seed weight was recorded in TNAU-164, between 2009 and 2010 and TNAU-149 of 2011

**Table 1. Seed weight of prosomillets germplasm / 250 seeds.**

| Germplasm / years | 2009 | 2010 | 2011 | 2012 | Average |
|---|---|---|---|---|---|
| TNAU-137 | 1.21 | 1.10 | 1.13 | 1.0 | 1.053 |
| TNAU-145 | 1.39 | 1.27 | 1.24 | 1.10 | 1.117 |
| TNAU-149 | 1.23 | 1.15 | 1.21 | 1.06 | 1.078 |
| TNAU-151 | 1.32 | 1.21 | 1.12 | 1.11 | 1.090 |
| TNAU-155 | 1.36 | 1.39 | 1.21 | 1.22 | 1.137 |
| TNAU-164 | 1.40 | 1.2 | 1.14 | 1.12 | 1.101 |
| TNAU-183 | 1.32 | 1.3 | 1.24 | 1.20 | 1.125 |
| TNAU-191 | 1.26 | 1.23 | 1.18 | 1.11 | 1.093 |
| TNAU-194 | 1.38 | 1.3 | 1.25 | 1.24 | 1.137 |
| CD 0.01 | | | | | 0.040 |
| CD 0.05 | | | | | 0.029 |
| CV | | | | | 1.812 |

*Mean of nine replications

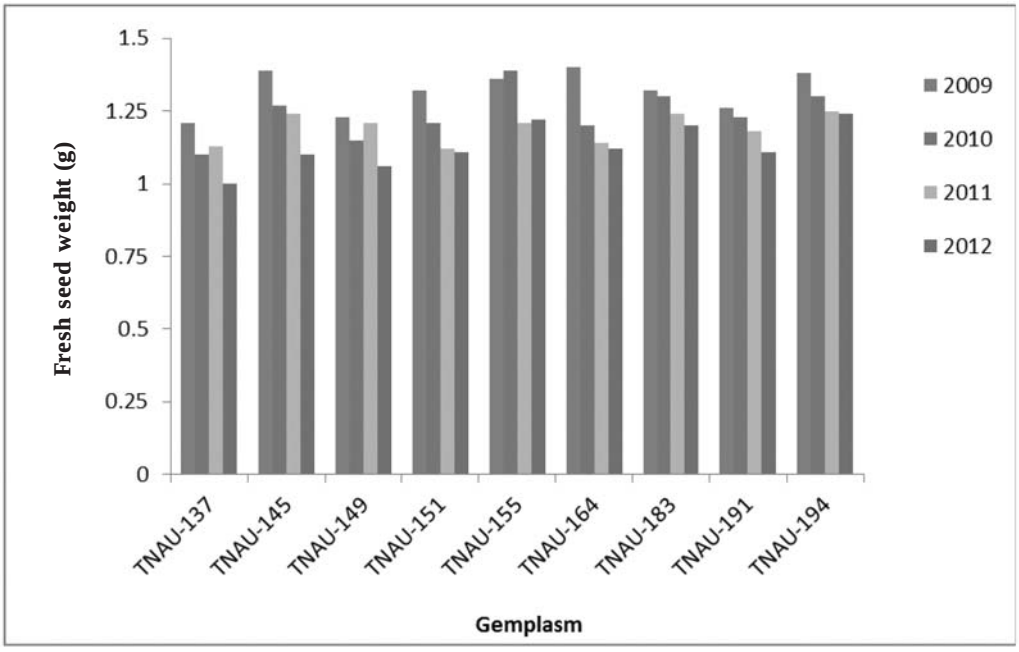


Fig. 1. Fresh seed weight/250 in TNAUs Germplasm.

over 2012. The ratio of losses in seed weight varied from 1:1.02 to 1:1.16 during 2010, whereas, 1:1.06 to 1:1.14 during 2012. (Table 1 & Fig. 1).

**Nematode population in Prosomillet germplasm out of 250 seed**

All the germplasm of Prosomillet exhibited reduction in population of A.besseyi with seeds during 2010 in TNAU-145 (74), TNAU-155 (73), TNAU-137 (66), TNAU-194 (61), TNAU-183 (58), TNAU-191 (44) and TNAU-164 (4), however two germplasm *viz*; TNAU-149 and TNAU-151 revealed highest nematode population over 2009 germplasm population. Minimum (4) nematode population indicated sustainability of *A. besseyi* in seeds. All of them exhibited percent reduction in seed population of A.besseyi during 2012. Seeds of TNAU-137 (16) and TNAU155 (51) recovered less population then the previous year germplasm. However remaining germplasm viz. TNAU-145, TNAU-149, TNAU151, TNAU-164, TNAU-183, TNAU-191, TNAU-194 revealed higher nematodes, then 2011 germplasm. (Table 2 & Fig 2).

**Table 2. Nematode population in Prosomillet germplasm out of 250 seeds.**

| Germplasm / years | 2009 | 2010 | 2011 | 2012 | Average |
|---|---|---|---|---|---|
| TNAU-137 | 68 | 23 | 69 | 58 | 7.24 |
| TNAU-145 | 120 | 31 | 32 | 55 | 9.39 |
| TNAU-149 | 5 | 21 | 39 | 56 | 5.13 |
| TNAU-151 | 14 | 42 | 57 | 81 | 6.69 |
| TNAU-155 | 101 | 27 | 80 | 39 | 7.60 |
| TNAU-164 | 72 | 69 | 35 | 61 | 7.63 |
| TNAU-183 | 87 | 36 | 28 | 58 | 7.05 |
| TNAU-191 | 58 | 32 | 48 | 58 | 6.95 |
| TNAU-194 | 73 | 28 | 46 | 109 | 7.72 |
| CV | | | | | 25.58 |

*Mean of nine replications

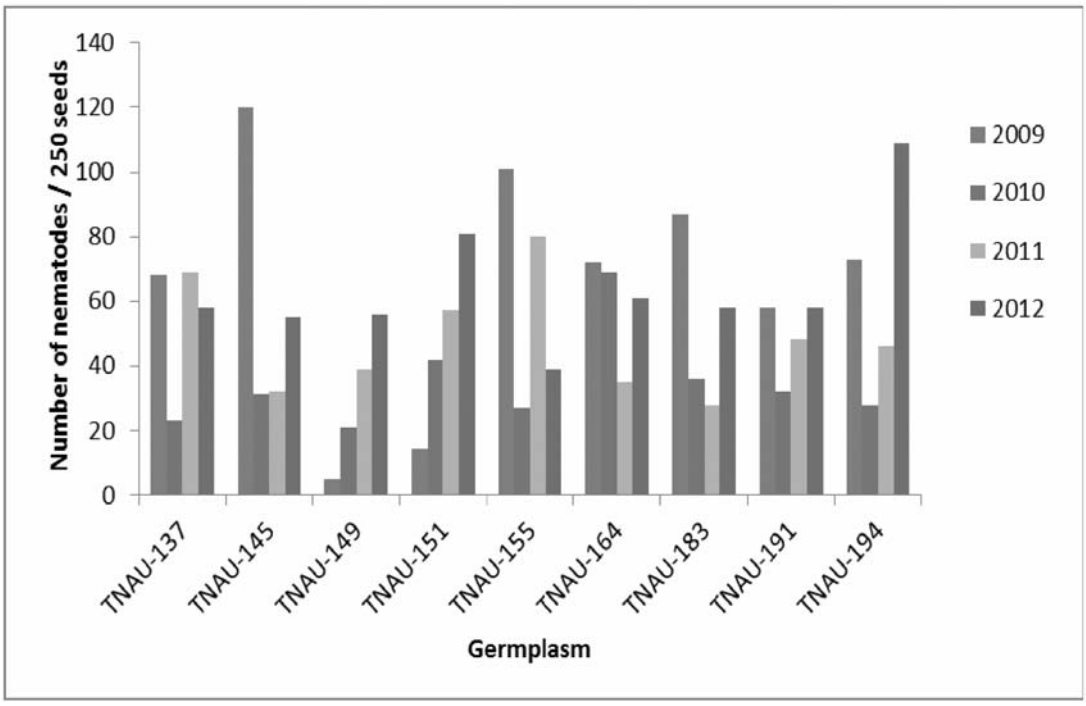


Fig. 2. Incidence of *A. besseyi* in TNAUs germplasm / 250 seeds

**Germination of Prosomillet germplasm/100 seeds**

All the germplasm of prosomillet exhibited 50 percent loss in germination and reduction in seed weight of TNAU-137 as compared to rest of the germplasm during 2010, however, TNAU-151, TNAU-155 and TNAU-194 did not showed reduction in percent germination. Whereas remaining *viz*. TNAU-145 TNAU-149, TNAU-164, TNAU-183 and TNAU-191 favoured high germination percentage over 2009. The seed lot of 2012 favoued germination, whereas TNAU-137, TNAU-145, TNAU-149, TNAU-151, TNAU-155, TNAU-164, TNAU-183, TNAU-191 and TNAU-194 resulted highest germination percentage over the seed lots of 2011 (Table 3 & Fig. 3).

**Incidence of *A. besseyi* in germplasm**

Germplasm showed poor vigor TNAU-149 (8.0) followed by TNAU-137 (7.2), TNAU-183 (6.0), TNAU-191 (5.0) and TNAU-145 (4.8),

**Table 3. Germination percent of Prosomillet germplasm.**

| Germplasm / years | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|
| TNAU-137 | 20 (26.56) | 10 (18.43) | 40 (39.23) | 60 (50.76) |
| TNAU-145 | 10 (18.43) | 20 (26.56) | 20 (26.56) | 50 (45.00) |
| TNAU-149 | 20 (26.56) | 30 (33.21) | 50 (45.00) | 90 (71.56) |
| TNAU-151 | 20 (26.56) | 20 (26.56) | 40 (39.23) | 60 (50.76) |
| TNAU-155 | 10 (18.43) | 10 (18.43) | 40 (39.23) | 60 (50.76) |
| TNAU-164 | 10 (18.43) | 30 (33.21) | 50 (45.00) | 70 (56.78) |
| TNAU-183 | 20 (26.56) | 40 (39.23) | 50 (45.00) | 50 (45.00) |
| TNAU-191 | 30 (33.21) | 40 (39.23) | 30 (33.21) | 70 (56.78) |
| TNAU-194 | 20 (26.56) | 20 (26.56) | 20 (26.56) | 60 (50.76) |

*Mean of nine replications. Figures in parentheses are arcsin values

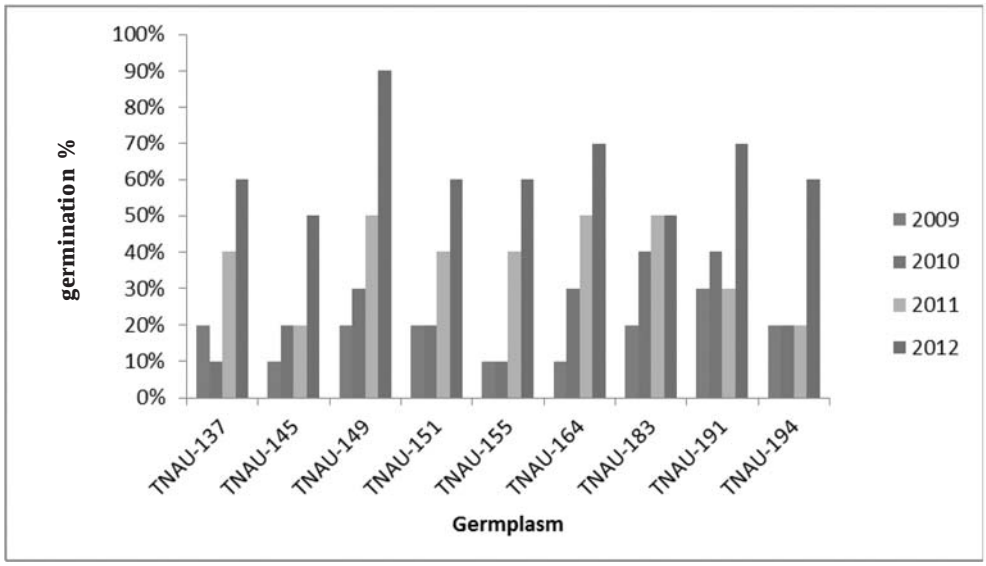


Fig. 3. Percent seed germination of TNAUs germplam.

whereas remaining TNAU-194 (3.0), TNAU-164 (3.2), TNAU-155 (3.0) and TNAU-151 (3.5), harboured 3.0 to 8.0 nematodes per seed (Table 4 & Fig. 4).

## Discussions

The findings of present investigation suggested extent of reduction in fresh seed weight which is directly proportion nematode population. Further, healthy looking seeds harboured high population of *A. besseyi* as compared to deformed and discolored seeds. The impact of nematode population directly or indirectly was involved in the reduction of fresh

**Table 4. Nematode population of proso millets germplasm / seed.**

| Germplasm | Number of nematodes / seed |
|---|---|
| TNAU-137 | 7.2 |
| TNAU-145 | 4.8 |
| TNAU-149 | 8.0 |
| TNAU-151 | 3.5 |
| TNAU-155 | 3.0 |
| TNAU-183 | 6.0 |
| TNAU-164 | 3.2 |
| TNAU-191 | 5.0 |
| TNAU-194 | 3.0 |

*Mean of nine replications

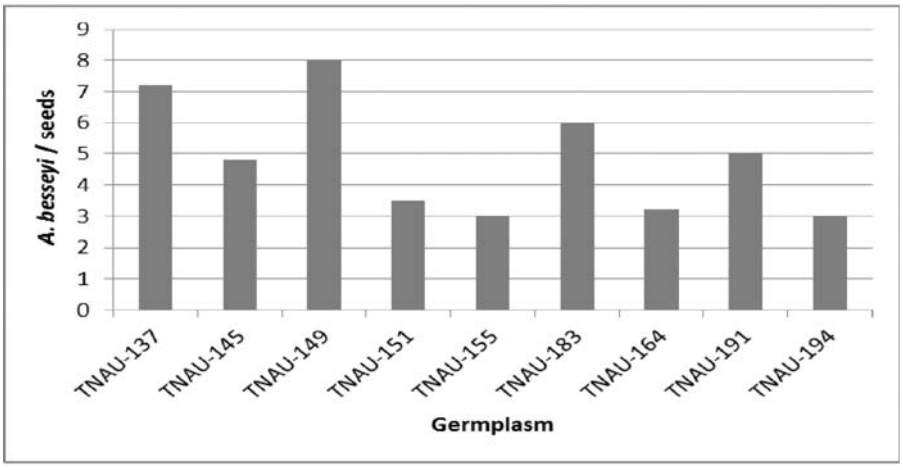


Fig. 4. Incidence of *A. besseyi* / seed in TNAUs germplasm.

seed weight. During the storage there are more chances to the extent of loss in seed weight and as well as survival of *A. besseyi*, but present finding indicated that loss are positive correlation with nematode population in the seeds. The enormous seed weight losses occurred their association. If the losses exceeded above two percent the seed germination are affected Choudhary and Choudhary (1996); Togashi and Hoshima (2003); Amin and Shalaby, 2005; Jagdale and Grewal, 2006; Berqam *et al.*, 2006 and Fuz and Wells, 2012.

Chowhan (2014) in pointed out that TNAU-155 prone to susceptible against *A. besseyi*. Where seed hold 301-400 nematode/250 seeds and simultaneous later decreased during long storage However, TNAU-191 proved viable in respect of germination (70, 60, 70, 70) during entire period of staorage right from 2009, 2010, 2011 and 2012 with a good number of viable nematodes (7.72 nematode/seed). The findings indicated that population of *A. besseyi* does not have much effect of the storage but tend to moisture capacity of the germplasm. The nematode remained in diapauses during store seeds nearby endosperm and when correlated high (174 N) *A. besseyi* population reflected poor plant vigour and germination percentage, such impact continued till the emergence of panicle and seed maturity. The vegetative primordia usually served as food source for the growth of *A. besseyi* where it continuously feed whereas, floral primordial is better and provide desirable avenues for the reproduction and development of *A. besseyi.*

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