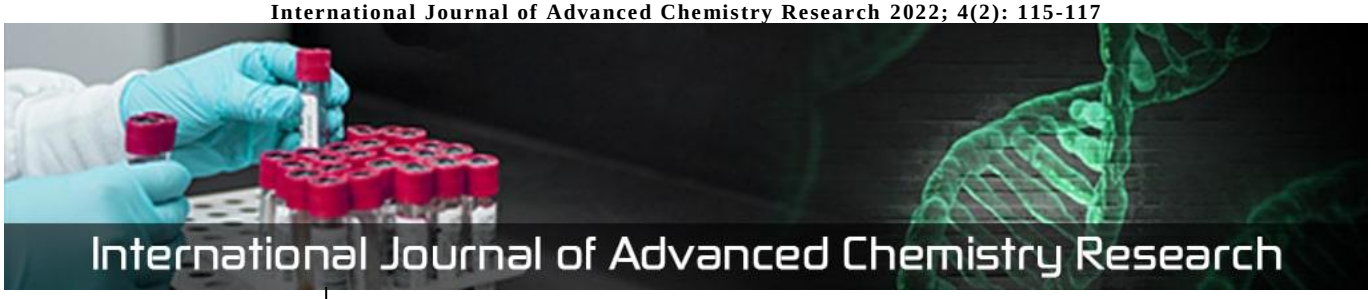


**ISSN Print:** 2664-6781
**ISSN Online:** 2664-679X
**Impact Factor:** RJIF 5.32
IJACR 2022; 4(2): 115-117
www.chemistryjournals.net
Received: 03-08-2022
Accepted: 04-09-2022

**G Santhosh**
Dr. Rajendra Prasad Central Agricultural University, Pusa, Bihar, India

**Singh US**
Dr. Rajendra Prasad Central Agricultural University, Pusa, Bihar, India

**R Shalem Raju**
Dr. Rajendra Prasad Central Agricultural University, Pusa, Bihar, India

**Shraddha Bhaskar Sawant**
Dr. Rajendra Prasad Central Agricultural University, Pusa, Bihar, India

**Corresponding Author:**
**G Santhosh**
Dr. Rajendra Prasad Central Agricultural University, Pusa, Bihar, India

# Evaluation of maize varieties against stunt nematode *Tylenchorhynchus mashhoodi*

**G Santhosh, Singh US, R Shalem Raju and Shraddha Bhaskar Sawant**

**Abstract**
A field experiment was conducted on Screening of maize varieties against stunt nematode *Tylenchorhynchus mashhoodi*, 8 maize varieties Shaktiman-1, Shaktiman-2, Shaktiman-3, Shaktiman-4, Shaktiman-5, Laxmi, Dewaki, Ganga safed-2 seeds received from T.C.A., Dholi, Dr. Rajendra Prasad Central Agricultural University, Bihar, Pusa, were evaluated for their reactions to stunt nematode using Completely Randomized Design (CRD) with 5 replications in net house at 8 – 29ºC temperature during rabi season 2018-2019. Observations were recorded on plant height, fresh shoot and root weight and final nematode population in each pot. The results revealed that all eight varieties showed susceptible where shaktiman-4 and Ganga safed-2 showed highest susceptible when compared with other varieties.

**Keywords:** Maize, *Tylenchorhynchus mashhoodi*, plant height, fresh shoot and root weight

## Introduction
Maize (Zea mays L.), also recognized as "Queen of Cereals or Miracle Crop," has the highest productivity per day and is flexible in nature compared to other cereal crops. Maize acts as the main crop for food safety owing to enormous demographic growth with reducing soil and water supplies. Even after attaining self-sufficiency in food and grain production, about 50% of kids are struggling with malnutrition. Globally, maize offers more than 4.5 billion people in 94 emerging nations with 15 percent protein and approximately 30 percent of food calories. Today, maize has become the main crop in many areas of the globe with its total output exceeding that of wheat or rice by engaging more than 15 million people in agriculture. Furthermore, maize demand is anticipated to double globally by 2050. Higher maize manufacturing needs the hour to satisfy this increasing requirement (Srinivasan *et al*. 2004).

Several biotic and abiotic pressures attack crops such as financial significance. The most significant diseases affecting maize are Fusarium stalk rot caused by *Fusarium moniliforme*, Pythium stalk rot caused by *Pythium aphanidermatum* Fitz., late wilt by *Cephalosporium maydis* (Samara, Sabet and Hingorani), charcoal rot caused by *Macrophomina phaseolina*, black bundle illness caused by *Cephalosporium acermonium*, further leaf blight caused by *Helminthpsporium maydis* and northern leaf blight caused by *Helminthosporium maydis* (Anon, 1973). Besides these, disease induced by plant parasite nematodes is also of financial significance.

Out of total known species of nematodes, about 50% are marine, 25% free living, 10% plant parasitic and 15% animal parasitic forms (Ayoub, 1980). Plant parasitic and free living forms are grouped as soil and fresh water nematodes. More than forty nematode species are associated with maize but significant ones belong to the genera cyst nematodes (*Heterodera zeae*), lesion nematodes (*Pratylenchus spp*.), root knot nematodes (*Meloidogyne incognata* and *M. javanica*), stunt nematode (*Tylenchorhynchus mashhoodi*), spiral nematode (*Helicotylenchus spp*.) and so on. (Patel *et al*., 2000) [5] and are accountable for crop losses of 10.2 percent (Sasser and Freckman, 1987) [6]. Nematodes, apart from causing damages, interact with other diseases causing agents and adversely affect the quality and quantity of maize production. Kumar (2001) [3] reported that screening of maize varieties against the spiral nematode *Helicotylenchus indicus* in five varieties with 2000 inoculation of *H. indicus*. Data revealed that all the five varieties viz; Shaktiman-1, Pusa early hybrid1,Suwan, Deoki and Lakshmi were categorized as a susceptible. Nelson (1956) [4] growed various hybrids, inbreeds and single crosses of maize for their in infested soil filled in pots for screening of

of susceptibility of *T. claytoni* by results revealed that twenty-one inbreeds and 11 single crosses showed decrease in shoot and root weights when exposed to high nematode population. Nine inbreeds exhibited some resistance to nematode attack and had shoot and root weights similar to those of controlled and un inoculated.

## Material and Methods

A field experiment was conducted on Screening of maize varieties against stunt nematode *Tylenchorhynchus mashhoodi*, 8 maize varieties Shaktiman-1, Shaktiman-2, Shaktiman-3, Shaktiman-4, Shaktiman-5, Laxmi, Dewaki, Ganga safed-2 seeds received from T.C.A., Dholi, Dr. Rajendra Prasad Central Agricultural University, Bihar, Pusa, were evaluated for their reactions to stunt nematode using Completely Randomized Design (CRD) with 5 replications in net house at 8 – 29ºC temperature during rabi season 2018-2019. Three seeds of 8 maize varieties were seeded in 15 cm diameter earthen pots previously disinfested with 4 % formaldehyde (formalin 40 EC) solution and filled with 1 kg sterilized soil. Ten days after seeding, seedlings were thinned down to one/pot. Out of 10 pots five plants were inoculated with 2000 nematodes in the rhizosphere of seedlings by making ring surrounding the stem with spatula. After inoculation, ring was covered with same sterilized soil. Remaining 5 un inoculated plants served as check for comparison purpose. Regular watering and after cares were taken. Plants were depotted carefully and roots were washed with tap water after 90 days of inoculation. Cobb's sieving and decanting method is utilized for estimating final nematode population from 100g of sample collected from each inoculated pot. Observations were recorded on plant height (cm) fresh shoot and root weight (g) and final nematode population in each pot.

## Results and Discussions

### Screening of various maize varieties/lines available for source(s) of resistance against *T. mashhoodi*

To locate the source(s) of resistance to *T. mashhoodi* an experiment was conducted in pots. To evaluate their reaction towards *T. mashoodi* eight different maize varieties or strains are subjected to experimentation.

**Table:** Screening of maize varieties against stunt nematode *Tylenchorhynchus mashhoodi*

| Sl. No. | Variety/ Lines | Treatment | Plant Height (cm) | Fresh shoot Wt.(g) | Fresh root Wt.(g) | % reduction over uninoculated control | Nematode Population (Log x + 1 trans) Reproduction | | | Reaction |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Final | Reproduction factor Rf = Pf/Pi | Reproduction good (G) or Poor (P) | |
| 1 | Shaktiman 1 | I<br>UNI | 36<br>(38.98)<br>59 | 9.70<br>(49.55)<br>19.23 | 9.13<br>(39.2)<br>15.03 | 41.20% | 4.446<br>*(27963) | 11.69 | G | S |
| 2 | Shaktiman 2 | I<br>UNI | 33.7<br>(48.39)<br>65.3 | 10.67<br>(42)<br>18.43 | 8.27<br>(41.76)<br>14.20 | 46.24% | 4.386<br>*(24369) | 12.18 | G | S |
| 3 | Shaktiman 3 | I<br>UNI | 32.1<br>(37.79)<br>51.6 | 10.20<br>(44)<br>18.27 | 8.40<br>(47.92)<br>16.13 | 42.20% | 4.427<br>*(26759) | 13.3 | G | S |
| 4 | Shaktiman 4 | I<br>UNI | 22.4<br>(51.1)<br>45.9 | 7.40<br>(52.56)<br>15.6 | 4.87<br>(52.30)<br>10.21 | 51.65% | 4.566<br>*(36893) | 18.4 | G | S |
| 5 | Shaktiman 5 | I<br>UNI | 41<br>(30.86)<br>59.3 | 12.33<br>(31.99)<br>18.13 | 8.17<br>(46.44)<br>15.23 | 33.74% | 4.450<br>*(28210) | 14.10 | G | S |
| 6 | Laxmi | I<br>UNI | 19.9<br>(50.6)<br>40.3 | 8.93<br>(45.11)<br>16.27 | 5.73<br>(48.05)<br>11.03 | 49% | 4.418<br>*(30289) | 15.4 | G | S |
| 7 | Dewaki | I<br>UNI | 32..1<br>(41.87)<br>55.23 | 11<br>(39.79)<br>18.27 | 7.70<br>(39.22)<br>12.67 | 41.01% | 4.414<br>*(25987) | 12.99 | G | S |
| 8 | Ganga safed 2 | I<br>UNI | 36.3<br>(36.86)<br>57.5 | 11.70<br>(32.09)<br>17.23 | 8.00<br>(31.79)<br>11.73 | 35.23% | 4.452<br>*(28321) | 14.16 | G | S |

| Character | SEm ± | CD(P=0.05) | SEm ± | CD (P=0.05) | SEm± | CD (P=0.05) | SEm ± | CD(P=0.05) |
|---|---|---|---|---|---|---|---|---|
| Variety | 0.32 | 0.85 | 0.09 | 0.27 | 0.07 | 0.20 | 0.02 | 0.08 |
| Treatment | 0.15 | 0.42 | 0.04 | 0.13 | 0.37 | 0.10 | 0.10 | 0.04 |
| V × T | 0.42 | 1.21 | 0.13 | 0.39 | 0.10 | 0.29 | 0.03 | 0.11 |
| CV% | 2.23 | | 2.21 | | 2.26 | | 4.09 | |

Nematode reproduction: G – Good (more than 9000 nematodes per plant); P- Poor (less than 9000 nematodes per plant) Rf – Reproduction Factor; Pf – Final Population; Pi- Initial Population; I-Inoculated; UNI-Un inoculated; S- Susceptible .Figures in parentheses indicate percent reduction over un inoculated control *Figures in parenthesis are retransformed values.

### 1. Plant height

There is a significant decrease in plant height due to inoculation of 2,000 *T.mashhoodi* nematodes per plant in all 8 varieties viz., Shaktiman-1, Shaktiman-2, Shaktiman-3, Shaktiman-4, Shaktiman-5, Laxmi, Dewaki, Gaga safed-2as against their uninoculated control Average reduction in plant height over control were observed maximum reduction in varieties Shaktiman-4 51.1% and followed by Laxmi-50.6% and minimum reduction in varieties Shaktiman-5 30.86%and followed by Ganga safed-2.

### 2. Fresh shoot weight

All 8 varieties show significant reduction in fresh shoot weight. Average reduction in fresh shoot weight over un inoculated control were 52.56%, 49.55%, 45.11%, 44%, 42% , 39.79%, 32.09%, 31.9% in followingShaktiman-4, Shaktiman-1, Laxmi, Shaktiman-3, Shaktiman-2, Dewaki, Ganga safed-2, Shaktiman-5, respectively.

### 3. Freshroot weight

Similarly significant reduction will be observed in fresh root weight. Average reduction in fresh root weight over un inoculated control were 52.30%, 48.05%, 47.92%, 46.44%, 41.76%, 39.22%, 39.2%, 31.79%, in following varieties Shaktiman4, Laxmi, Shaktiman-3, Shaktiman-5, Shaktiman-2, Dewaki, Shaktiman-1, Ganga safed-2, respectively.

### 4. Nematode reproduction

Final nematode population will be increased / plant / pot varies from 24,336 (Variety Shaktiman-2) to 36,893 (Variety Shaktiman-4) it shows that variable nematode reproduction encouraged by different maize varieties under

Screening test. All varieties Shaktiman-1, Shaktiman-2, Shaktiman-3, Shaktiman-4, Shaktiman-5, Laxmi, Dewaki, Ganga safed-2 will be have nematode population of more than 9,000 nematodes / plant indicating good nematode reproduction. All the varieties shows susceptible reaction. Reproduction factor will observe maximum in Shaktiman-4 18.4% followed by Laxmi 15.4% varieties and least reproduction factor observed in varieties Shaktiman-1 11.69% and Shaktiman-2 12.18%.

From the above debate, it is found that maize varieties, Shaktiman-1, Shaktiman-2, Shaktiman-3, Shaktiman-4, Shaktiman-5, Dewaki, Laxmi, Ganga Safed-2 are susceptible to *T. mashhoodi*. Therefore, there is an urgent need to monitor quite a large amount of maize varieties / accessions / hybrids to find sources of *T. mashhoodi* resistance. Even after that, if resistance sources are not available, tolerant varieties / lines should be exposed to chemical mutations to create genetic variability to search for resistance to nematodes and breeding programmed to incorporate resistance sources into the evolving agronomically suitable cultivars of nematode resistance. As *T. mashhoodi* is a fresh evolving main nematode restricting the profitable cultivation of maize in light as well as heavy (clay) soils and no data is accessible on the management aspects of this maize nematode. Therefore, study work on practically feasible and economically viable management strategies through crop rotation, soil solarization, use of resistant varieties and bioagents, cultural methods, nematicides / fungicides, etc. should be scheduled in an incorporated manner in the future. Screening of various maize varieties / lines showed that all eight varieties / lines studied, namely Shaktiman-1, Shaktiman-2, Shaktiman-3, Shaktiman-4, Shaktiman-5, Laxmi, Dewaki, Ganga safed-2 were susceptible to stunt nematode *Tylenchorhynchus mashhoodi*.

## References


1. Anonymous. Annual report of PL-480 on corn cyst nematode (*Heteroderadera zeae*) Rajendra Agricultural University, Pusa, 1987.
2. Parihar DS. Disaster events and management in the Himalayan Watershed Gori Ganga, Kumaun Himalaya. Int. J Geogr Geol. Environ 2022;4(1):89-100. DOI: 10.22271/27067483.2022.v4.i1b.87
3. Kumar D. Studies on the spiral nematode, *Helicotylenchus indicus* infesting maize crop. MSc. thesis submitted to department of nematology, Rajendra agricultural university, Bihar, Pusa (Samastipur); c2001.
4. Nelson RR. Resistant to stunt nematode in corn. Plant Pis. Reptr. 1956;40:635-639.
5. Patel NB, Patel RG, Patel AD, Patel HV, Patel BA, Patel DJ. Occurrence and distribution of *Tylenchorhynchus vulgaris* and Pratylenchuzeae in maize growing areas of Panchmahal district of Gujrat. Indian J. Nematol. 2000;30:95-96.
6. Sasser JN, Freckman DW. A world perspective on nematology- The role of the society. In: Vistas on Nematology. (Eds J.A. Veech and D.W Dickson).The Society of Nematologists, Inc., Maryland, USA, 1987, pp. 7-15
7. Srinivasan G, Zaidi PH, Prasanna BM, Gonzale F, Lesnick K. Proceeding of 8th Asian Regional Maize Workshop New Technologies for the New Millenium Bangkok, Thailand, 5-8 August, 2002, CIMMYT Mexico DF, 2004.
8. Ayoub SM. Plant Nematology-An Agricultural Training Aid. Nema Aid Publication, Sacramento, California, USA, 1980.