



Research Article

RACES OF RICE ROOT KNOT NEMATODE, *Meloidogyne graminicola* INFECTING RICE IN TAMIL NADU

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Abstract: The rice root-knot nematode, *Meloidogyne graminicola* belongs to the family Heteroderidae is one of the most economically important nematode affecting rice. It has been reported to cause significant yield loss of 20-50 per cent. The root knot nematode, *M. graminicola* infecting rice in Tamil Nadu was identified as race 'b' by North Carolina host differential test. The results of North Carolina host differential test showed that *M. graminicola* reproduced on both rice and wheat. However, when compared to wheat, rice had the highest rate of reproduction. In comparison to wheat (409.92), the number of second stage juveniles (J_2) per gram of root in rice was recorded as 992.69. Similarly, number of galls on rice roots were significantly higher (72.69) compared to wheat (37.62) and size of galls were bigger in case of rice compared to wheat.

Keywords: Rice, Root Knot Nematode, *Meloidogyne graminicola*, Race, Host Differential Test

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Introduction

The rice root-knot nematode, *M. graminicola* belongs to the family Heteroderidae is one of the most economically important nematode infesting rice crops. It has been reported to cause significant yield loss of 20-50 per cent in many regions of rice production. *M. graminicola*, like other root-knot nematode causes swellings and galls in the root systems. Infected rice root tips show swollen and hooked like symptoms. The nematode can retard plant growth and cause unfilled spikelet, reduced tiller development, chlorosis and wilting under upland and intermittently flooded conditions. *M. graminicola* has a wide host range that includes many of the common weeds of rice fields and can also be damaging to agricultural crops that are grown in rotation with rice, onion, cabbage and tomato [1]. The recent adoption of labour and water conserving practices eg. direct seeding, aerobic rice etc. increase the potential of *M. graminicola*. The objective of this study was to identify the races of root knot nematode, *M. graminicola* infecting rice in Tamil Nadu by North Carolina host differential test.

Materials and Methods

North Carolina host differential Test

The North Carolina host differential test was performed under Agricultural College and Research Institute, Coimbatore, Tamil Nadu Agricultural University using rice cv. Co 43 and wheat cv. CoW 1 as differential hosts. The seeds of these plants were grown in 5 kg capacity pots filled with sterilized soil. After one month all the pots were inoculated at the rate of two infective juveniles per gram of soil and replicated 13 times. The experiment was terminated 75 days after sowing and it was repeated once. At the end of the experiment the following parameters viz., shoot length, root length, shoot weight, root weight, number of J_2 , number of females, number of egg masses, number of J_2 in soil, number of galls and number of *M. graminicola* eggs per root system were observed.

Estimation of number of nematode eggs, juveniles and females in roots

One gram of galled root was macerated for 30 to 40 seconds using blender and

counting was done using the suspension obtained. The total number of nematode present in the roots were calculated by multiplying the number of nematode present in one gram of root by the total weight of the root [2].

Results

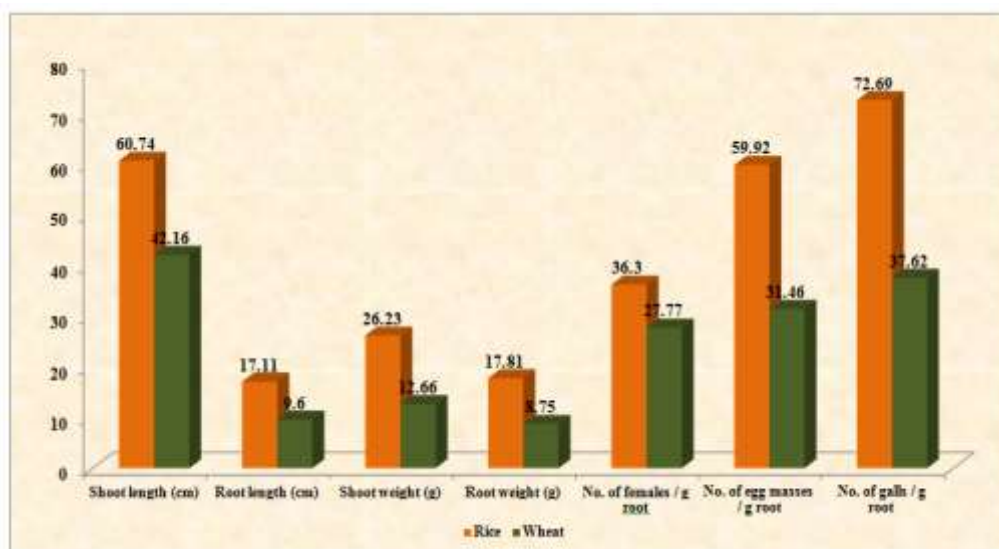
The root knot nematode, *M. graminicola* infecting rice in Tamil Nadu was identified as race 'b' by North Carolina host differential test. The results showed that *M. graminicola* reproduced on both rice and wheat. But the rate of reproduction was highest in rice compared to wheat. Second stage juvenile (J_2) per gram of root in rice was 992.69 compared to wheat (409.92). Based on the observation of the number of root knot females, *M. graminicola* clearly preferred rice (36.30) over wheat (27.77). In rice, number of egg masses (59.92), and eggs (2162.23) were significantly higher compared to wheat (31.46, 933.46). Soil population in rice and wheat were 821.54 and 619.69 respectively. Similarly, number of galls on rice roots were significantly higher (72.69) compared to wheat (37.62) [Table-1, Fig-1].

Discussion

The root knot nematode, *M. graminicola* infecting rice in Tamil Nadu was identified as race b based on North Carolina host differential test. Race 'a' reproduced only in wheat and race 'b' reproduced in wheat and rice which confirmed the existence of at least two races in this species [3]. *M. graminicola* was found to reproduce on both wheat and rice in the current study. However, when compared to wheat, rice had the highest rate of reproduction. It was confirmed with previous reports which reported that *M. graminicola* reproduced six times more on rice than wheat [4]. Higher reproductive factor of *M. graminicola* was observed on rice than wheat indicating higher rate of reproduction of this nematode in rice. The higher reproduction of the nematode might be due to the genetic make-up of the plants and the availability of root biomass for nematode growth and reproduction [5]. Rice has a greater root mass than wheat, thereby supporting higher nematode reproduction [6].

Table-1 Host differential test for identification of *M. graminicola* races

Differential hosts	Shoot length (cm)	Root length (cm)	Shoot weight (g)	Root weight (g)	No. of J2 / g root	No. of females / g root	No. of egg masses / g root	No. of eggs / g root	No. of J2 / 250 cc soil	No. of galls / g root
Rice	60.74	17.11	26.23	17.81	992.69	36.3	59.92	2162.23	821.54	72.69
Wheat	42.16	9.6	12.66	8.75	409.92	27.77	31.46	933.46	619.69	37.62
t - value	9.38	3.92	5.01	2.67	15.54	2.15	9.07	4.81	5.69	13.91

Fig-1 Identification of *M. graminicola* races by North Carolina host differential test

Size of the root galls was bigger in case of rice compared to wheat [2]. These findings were in line with the observations of the present study. Heavy rooted plants will allow more nematode reproduction and tolerate more damage than small rooted plants despite the latter having fewer invasion sites for the nematode [7]. Results of the variety x isolate interaction in rice and wheat [8] provided further support to the hypothesis that genetic make-up of plants plays a greater role in the reproduction of *M. graminicola* [9].

Conclusion

By using the North Carolina host differential test, the root knot nematode, *M. graminicola* that was infecting rice in Tamil Nadu was determined to be race "b." It multiplied on wheat and rice. However, when compared to wheat, rice had the highest rate of reproduction. The genetic makeup of the plants and the availability of root biomass for nematode growth and reproduction may be the cause of the nematode's increased reproduction. Because rice has bigger roots than wheat, it can support more nematode reproduction.

Application of research: Study was to identify the races of root knot nematode, *M. graminicola* infecting rice in Tamil Nadu by North Carolina host differential test

Research Category: Nematology

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University: Tamil Nadu Agricultural University, Coimbatore, 641003, India
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Study area / Sample Collection: Agricultural College and Research Institute, Coimbatore

Cultivar / Variety / Breed name: Rice

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

Ethical Committee Approval Number: Nil

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