RICE ROOT KNOT NEMATODE– A MENACE IN RICE

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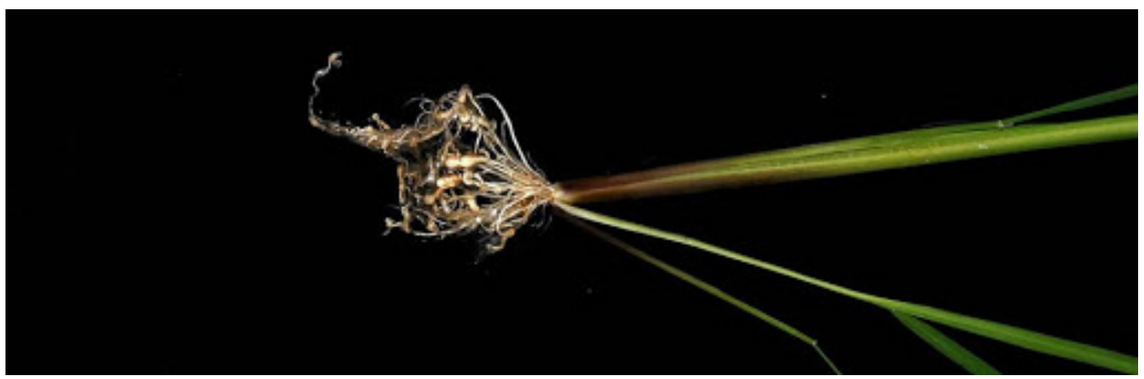
INTRODUCTION

Rice is the staple food of more than half of world's population and Asia is the hub of 90 percent of world's population. Out of total rice area under cultivation under 53% is under irrigated, 31% under low land rainfed, 13 % under upland and 3 % under deep water. Rice crop is affected by several factors viz. biotic and abiotic factors of which nowadays plant parasitic nematodes constitute important component in biotic factors. The common endo and ectoplant parasitic nematodes of rice are *Meloidogyne spp.* and *Ditylenchus angustus* which are pests of deep water rice and *Hirschmanniella spp.* and *Aphelenchoides besseyi* are the pests of upland rice and that constitutes about 10% of damage to rice. Among these nematodes the rice root knot nematode *Meloidogyne graminicola* is the pest of national as well as international importance and causes yield loss to the extent of 17- 30% due to poorly filled kernals. This nematode is common in nurseries as well as in upland rice. It is also found in deep water and irrigated rice in many states and localities of India viz., Assam, Andhra Pradesh, Karnataka, West Bengal, Orissa, Kerala, Tripura, Madhya Pradesh, Haryana, Himachal Pradesh, Punjab, Jammu & Kashmir and Kerala. The climate change like erratic pattern of rainfall and depletion of ground water resources as well as the modern concepts of rice husbandry i.e., 'Direct Seeded Rice' and 'System of Rice Intensification' are aimed at saving water usage socio-economic conditions had led to multiple fold increase in *M. graminicola* populations. Apart from rice this nematode is associated with grasses and weeds like *Echinochloa spp., Alopecurus spp., Elusine spp., Cyperus spp., Digitaria spp., Physalis spp., Agropyron spp., Dactyloctenium spp*. etc. This nematode is more prevalent in rice wheat cropping system, intermittent irrigations and chemical weed controls.

LIFE CYCLE

The pyriform shaped females lays the eggs in the root cortex and the juvenile undergo their first molt in the eggs to become pre-parasitic second stage juveniles. They are non-parasitic and second stage juvenile become parasitic, when invades the roots at the elongation zone. The soil population fluctuates throughout the year and the factors like soil structure, temperature, pH, soil moisture, plant growth stage etc. affects the capacity of the nematode to survive in the ecosystem and consequently its ability to infect the hosts. The newly parasitic second stage juvenile migrates intercellularly in the rice root cortex towards the root tip where they invade the vascular cylinder and establishes its feeding site in the stele close to the root meristem, forming five to eight giant cells. The nematode gets established in the root and becomes sedentary, feeds on the giant cells and after three moults reaches the adult stage in which it forms pear-shaped shape for the females and threadlike shape for males. *M. graminicola* remains protected in the root cortex from the external environment from the predators, pathogens by the immune systems of the host and lay the eggs inside the cortex. While in other species of genus *Meloidogyne* the eggs are laid in egg masses that protrude out through the aperture into the soil. This nematode takes he advantage to survive when the host is in flooded conditions. The nematodes of next generation develop inside these egg masses and make more feeding sites within the root.

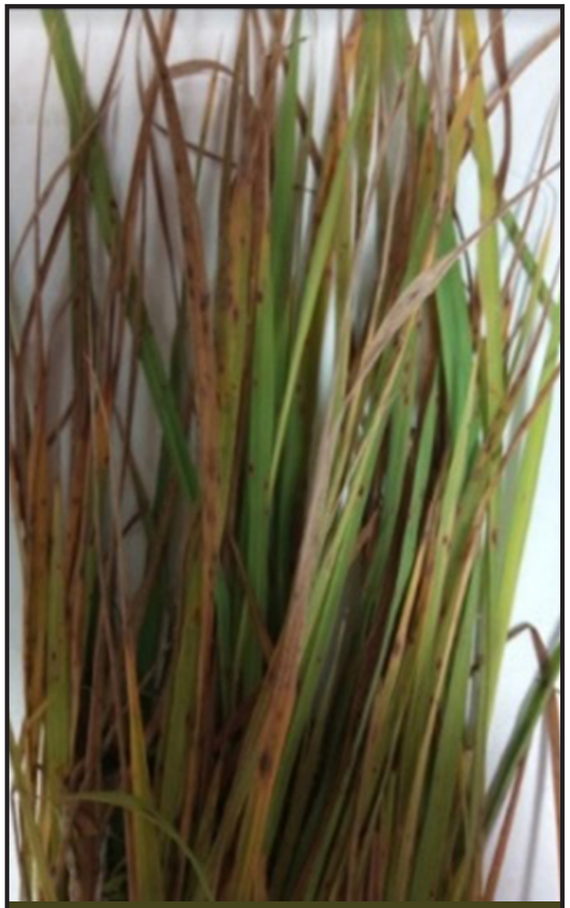
1. Spindle shaped galls of roots in rice



2. Rice roots infected with *Meloidogyne graminicola*

CONTROL ASPECTS-

•Growing of on hosts crops preferring solanaceous crops like potato and pulses.
•Growing of an effective and feasible non-host crop as crop rotation such as blackgram, cowpea, greengram, groundnut, soybean, sesame or solanaceous crops.
•Nursery bed treatment of rice with carbofuran3G@ 0.3g a.i./sq m followed by main field treatment with carbofuran @1 kg a.i./ha forty days after transplanting.
•Application of bio agent in soil like *Pseudomonas fluorescens* @20 g/sq m in nursery at sowing. Summer solarization of nursery beds of rice for 15 days with transparent polythene sheet having 25 µm thickness.



3.Above ground symptoms of Rice

SYMPTOMS CAUSED BY *M. graminicola* ON RICE

The symptoms can be detected only when the plants are uprooted because throughout the root system the special characteristic swollen hook like spindle shaped galls are produced at the root tips as shown in picture 1 & 2.
In the deep water rice, the young plants exhibit typical stunting and chlorosis, less tillering (Picture 2.) and after the flooding in the field the submerged plants with galled roots are unable to elongate and fail to emerge above water level.
In upland conditions and intermittently flooded lands the nematode cause reduction in growth rate of plants, poorly filled spikelets, reduced tillering, chlorosis, wilting and poor yields. The newly emerged leaves appear to be dried and the overall field appears to be patchy (Picture 4).

4. Overview of rice field infected with *Meloidogyne graminicola*