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Effect of root nematode, *Meloidogyne incognita* on biochemical analysis in the root of mazine crop

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Abstract
A study on the biochemistry is an important tool in characterizing the plant diseases through their biochemical analysis which reveals the extent of interaction between the host crop and the parasite study. Phenols are important chemical components which play major role in defense mechanism exhibited by host plants against the invading pathogens. Higher phenolic content was observed in all the inoculated host plants over uninoculated in this study. Decrease in total carbohydrates might have resulted due to the action of hydrolyzing enzymes secreted by *M. incognita*.

Keywords: *meloidogyne incognita,* total protein, pathogens, host plant, phenols

1. Introduction
Maize (*Zea mays.L*) is a cereal crop, which stands next to wheat and rice cultivation in the world. Maize occupies an important place in world agriculture. It is estimated that by the year 2020, demand for maize in developing countries will surpass demand for both wheat and rice. Global production of maize exceeds 600 metric tonnes as surveyed. A very high quantity (60 %) is produced in the developed countries particularly by the United States of America, about 27% of the world's maize is produced by China and the rest is grown in countries of Latin America, Africa and Southern Asia, with a large proportion being produced in tropics and subtropics.
Maize in India ranks fifth in total area and third in total production and productivity. This level of production has to be substantially raised to meet growing demand of maize for human food, animal and poultry feed as well as industrial processing by the wet and dry millers to produce value added products [1].

2. Materials and Methods
Biochemical Studies
The roots of the host plants inoculated with three different inoculum levels (500, 1000 and 2000 nematodes/pot) and uninoculated host plants were removed from the soil, washed in water, dried in blotting paper and subjected for biochemical analysis to estimate total proteins, total phenols and total carbohydrates. Individual chemical components were estimated by adopting the standard methods [2]. The estimation of total proteins by Lowry's method and the estimation of total carbohydrates by Anthrone method.

Fig 1: Maize (*Zeamays.L*) host plants

3. Result and Discussion
Amount of total proteins estimated in uninoculated host plant was 33mg/g and that recorded in 500, 1000 and 2000 nematodes was 44.66, 64.33 and 77.66 mg/g respectively. The amount of total proteins recorded in uninoculated are significantly different from the three inoculated maize crops. Amount of total proteins estimated between the inoculated plants also showed no variation and are highly significant. Percentage increase in total proteins was 35.33, 94.93 in 500, 1000 nematodes inoculated plants respectively when compared with the uninoculated control plants. A high increase in total proteins was found to be 135.33 per cent in the plants inoculated with higher density of nematodes over the control plants.
Study of biochemical components is important in characterizing the plant diseases through the interaction between the host and the parasite. Results obtained from the present investigation revealed that the amount of total proteins

of the inoculated host plants (maize crops) exceeded that of the uninoculated plants (Fig-2). Enhanced amount of total proteins in the host roots might be due to the nematode infection. Such increase of these chemical components due to invasion of pathogenic nematodes was also reported earlier by several authors in different crops [3, 4, 5, 6]. Increase in protein content in the host plants following infection with root-knot nematode was also reported [7]. Further, it can be explained that the increase in the concentration of protein may be due to synthesis of new enzyme proteins or may be the contribution from the nematode itself [8].

Statistical analysis of the data revealed that there was considerable increase in the amount of total phenols in all the three root-knot nematode inoculated host crops over their uninoculated control plants. The amount of total phenols recorded for the control plant was 3.15mg/g where as that recorded for the plants inoculated with 500 and 1000 nematodes were 7.58 mg/g and 5.87 mg/g respectively (Fig-3).

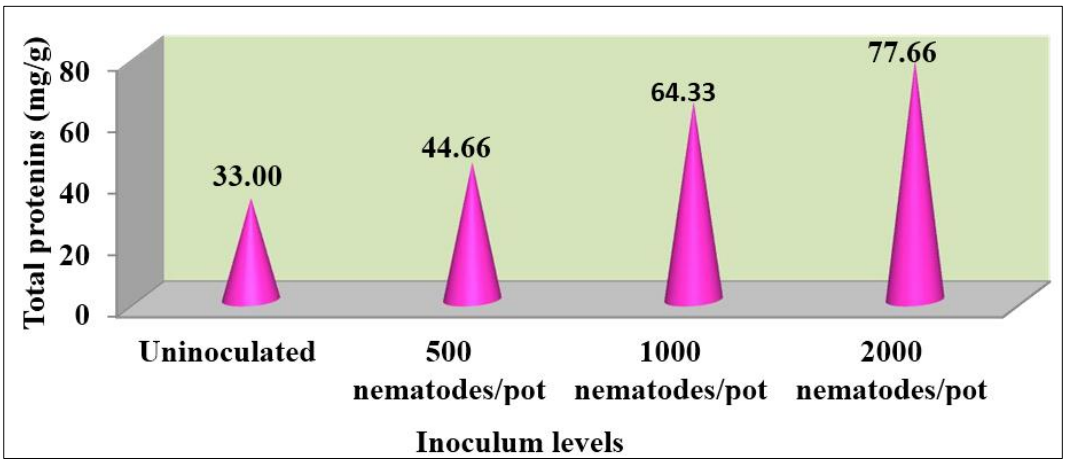

Fig 2: Total proteins in the maize roots inoculated with *M.incognita*

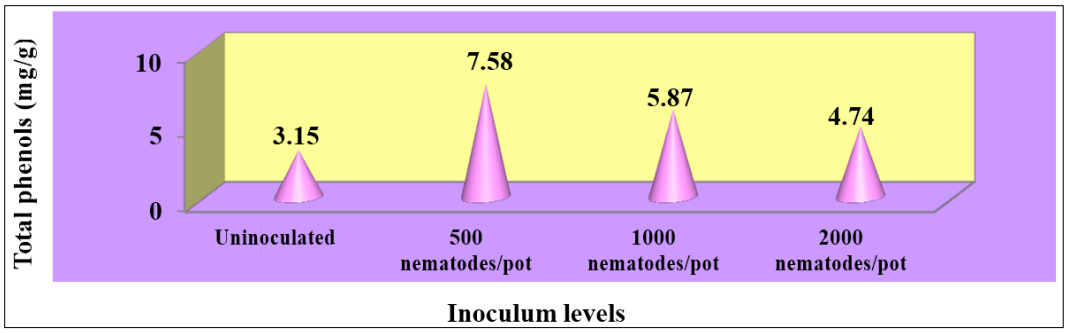

Fig 3: Total phenols in the maize roots inoculated with *M.incognita*

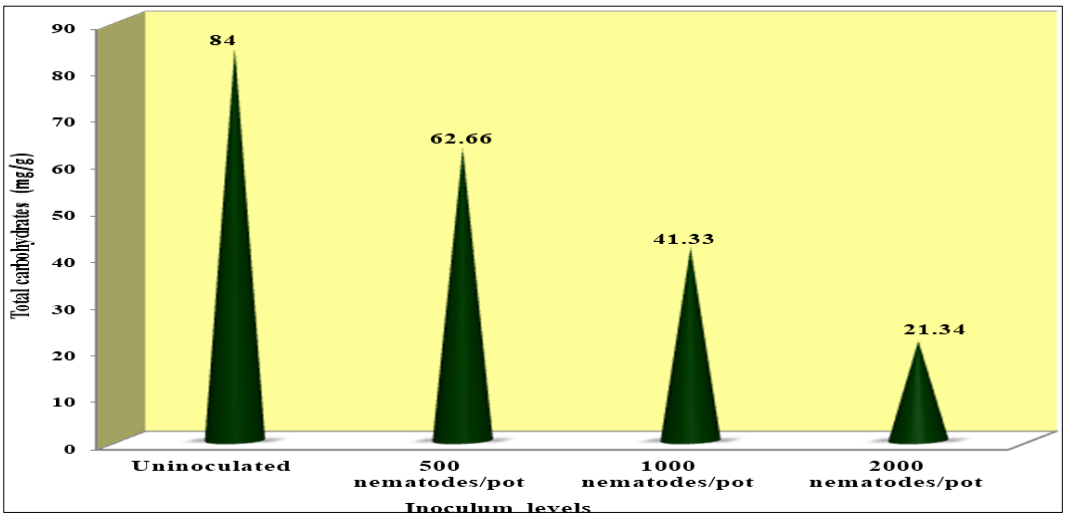

Fig 4: Total carbohydrates in the maize roots inoculated with *M.incognita*

Phenols are important chemical components which play major role in defense mechanism exhibited by host plants against by host plants against the invading pathogens. Higher phenolic content was observed in all the inoculated host plants over uninoculated in the present study. Which is an indication that these host plants were able to fight against the infection caused

by the root-knot nematodes. Role of phenolic compounds against nematode invasion have been studied by several authors. An increase in phenolic content was reported to be a contributory factor developed for resistance in host plants during nematode infections [9]. Those phenols and their oxidative products are toxic to invading pathogens. Same observation was also made in the present investigation indicating the resistant nature of the hybrid maize crop [10].

Figure 4 show a decrease in total carbohydrates in all the *M. incognita* inoculated roots of the host crops when compared with control. Amount of total carbohydrates estimated in uninoculated control plant was a maximum of 84 mg/g. A decreasing tend in the amount of total carbohydrates was clearly evident in all the three inoculated maize crops. All the values show a significant difference between the inoculated and uninoculated plants. Significant variation was also observed within the inoculated plants.

Decrease in total carbohydrates might have resulted due to the action of hydrolyzing enzymes secreted by *M. incognita* or its influence in the production of these enzymes in host which might have helped in the conversion of total carbohydrates [11] and due to rapid consumption of these substances by nematodes [12, 13]. Such reduction in total carbohydrates was also reported [14, 6, 15]. Due to root-knot nematode infection in tomato cultivars and chick pea which might have altered the metabolism of the host plant.

4. Conclusion

From the present study, it can be concluded that the selected host plant being a hybrid could tolerate to some extent to the pathogenic attack. Regarding the biochemical analysis of phenolic content, the maize crop showed hypersensitive response and defense mechanisms by producing higher amount phenols when compared with uninoculated plants.

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