

Full Length Research Paper

Screen house management of *Meloidogyne javanica* (Treb) in UC82B tomato (*Solanum lycopersicum*) with leaf extract of *Jatropha curcas*

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Screen house experiment to determine the effect of the aqueous leaf extract of *Jatropha* on the control of *Meloidogyne javanica* infections on tomato (*Solanum lycopersicum*) was conducted at Federal College of Agriculture, Ishiagu in 2016. UC82B tomato was used as the test crop. The test crop was planted in pots filled with 5 kg sterilized soil. Each pot was inoculated with 3000 *M. javanica* eggs collected from the infected roots of *begonia* plant. The aqueous extract was used at three concentrations of 150, 300 and 450 g/l and applied to each pot with water as the control. The parameters evaluated were plant height (cm), number of leaves at 50% anthesis, stem girth (cm), fruit weight (kg), number of galled roots and root gall index at harvest. The leaf extracts increased significantly ($P<0.05$) the plant height, number of leaves, stem girth and fruit weight. There were significant ($P<0.05$) reductions in the number of galled roots and root gall indices with increase in the concentrations of the leaf extract. The extract at 450 g/l showed better potential in the control of *M. javanica* infections on tomato and could therefore be recommended to tomato farmers for trial under field conditions.

Key words: Inoculated, sterilized soil, test crop, galled roots.

INTRODUCTION

The commercial tomato (*Solanum lycopersicum*) belongs to the family of Solanaceae which is an important source of vegetable and desert crop. Tomato as one of the vegetable crops is very important in human nutrition. It is also grown in nearly all home gardens and large percentage of market garden (Peet, 1992). As a processed crop, it takes first rank among the vegetable crops (Kessel, 2003). Although tomato growing on a

garden basis has been practiced in Nigeria for a long period of time mainly for domestic consumption such as stew, soup and vegetable salads, the commercial cultivation is a recent innovation. This crop is now being grown commercially for the production of pastes, puree, ketchups and as fruit drinks. The fruit is known to contain high level of vitamins A, B and C.

Nematodes, the farmers' hidden enemies are interesting

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and remarkable creatures that escape the average eye. The behavior of Nematode" indicated that "Nematodes" have occupied a wide range of soils and spread of ecological niches and can be found in greater number wherever food and moisture are present.

The production of tomato is impaired by amongst other factors; its infections by nematodes (Abubakar et al., 2004). Adesiyun et al. (1990) reported reductions in yield ranging from 28 to 68% due to nematode attack. These Nematodes are responsible for greater yield loss of tomatoes when they infect plants at seedling stage. There has been therefore an increasing awareness of the importance of root-knot nematode and its control in Nigeria.

Chemical nematicides have been in use for the control. However, these chemicals are either too expensive for the resource poor farmers or may require a lot of skill for their proper application. They often constitute health hazards to man and his environment. These problems necessitated the trial on the use of plant-product, to determine the efficient and the effective use in controlling root-knot nematode infections on tomato.

The objective of this study is to determine the efficacy of *Jatropha* leaf aqueous extract on root-knot nematode infecting tomato (*S. lycopersicum*).

MATERIALS AND METHODS

The experiment was conducted at the screen house of the Federal College of Agriculture, Ishiagu, Ebonyi State, Nigeria. UC82B tomato variety obtained from Seeds Company Kano was used as the test crop. Older leaves of *Jatropha* were collected from the college vicinity.

Nursery practices

The tomato seedlings were raised in a wooden tray measuring 1 x 2 x 0.5 m using top soil, well cured poultry droppings and river sand, in the ratio of 2:2:1 sterilized for 30 min at 90°C in an electric soil sterilizer.

Preparation of the inoculum

An infected begonia (*Begonia rexculorum*) root already maintained in an inoculum bucket was used as inoculum source. The roots were washed thoroughly with distilled water, cut into pieces and put into 100 ml measuring cylinder. 0.5% sodium hypochlorite solution (household bleach) at the ratio of 1:4 water was poured into the measuring cylinder, tightly covered and was agitated vigorously for 4 min, to dissolve the gelatinous matrix thus freeing the eggs from the egg mass.

Inoculation of Nematode

The soil around each tomato stand was slightly opened in ring form of about 2 cm deep and 3 cm wide from the base of the plant, and a

graduated syringe was used to collect 10 mm (mls) of the inoculums, containing estimated 3000 eggs which were inoculated to each plant for one week after transplanting.

Preparation of the *Jatropha* leaf extract

The leaves were sliced into smaller sizes and weighed. These were separated into 150, 300, and 450 g weights. Each weight was blended in an electric blender with 100 ml into slurry and soaked in 900 ml of distilled water. The separate mixtures (150, 300 and 450 g/l) were filtered after 12 h and applied to the pots containing tomatoes for two days after inoculation.

Design of experiment

The experimental design was a completely randomized design (CRD) with three replications. Ten of each treatment pots were used as, a replicate.

Data collection

The following data were collected: Plant height (cm) and number of leaves at 50% flowering, stem girth (cm), weight of fruit (g) at harvest, number of galled roots and gall index at harvest. Gall index was scaled as follows: 0 = No of gall, 1 = 1 to 2 galls, 2 = 3 to 10 galls, 3 = 11 to 30 galls, 4 = 31 to 100 galls, 5 = above 100 galls.

Statistical analysis

All data collected were subjected to analysis of variance (ANOVA) using GENSTAT software and all significant means were separated using Least Significant Difference (LSD) at 5% level of probability.

RESULTS AND DISCUSSION

The various concentrations of the aqueous leaf extract of *Jatropha*, affected significantly ($P < 0.05$) the plant height and the number of leaves, produced by the plants at 50% anthesis (Table 1). This indicated that, the application of the plant extracts provided conducive environment for thrive of the plants in, the treated pots. The plants in the control pots showed clear interruption of the growth abilities of the plants, due to interference by the nematodes.

Similar trend was observed on the stem girth and the weight of fruits produced by the test crop (Table 2), in the treated pots. This indicates that, both the growth and yield parameters were significantly ($P < 0.05$) influenced by the introduction of the extract at, various concentrations. Emeasor et al. (2002) stated that, plant extracts exert toxic effects by disrupting the normal metabolic activities of the organisms. This led to enhanced physiological activities in the treated plants. The increases in the growth and yield parameters of the treated test crop were as a result of creating conducive

Table 1. Effect of *Jatropha* aqueous leaf extracts on the mean plant height (cm) and number of leaves at 50% flowering.

Extract (g/l)	Plant height (cm)	Number of leaves
Control	2.30	8.75
Jt 150	4.60	9.75
Jt 300	8.50	19.25
Jt 450	12.00	18.00
LSD _(0.05)	2.21	2.18

Jt = *Jathropha* aqueous leaf extract.

Table 2. Effect of *Jatropha* aqueous leaf extracts on the mean stem girth (cm), and fruit weight (g) at harvest.

Extract (g/l)	Stem height (cm)	weight of fruit (kg)
Control	1.13	0.11
Jt 150	4.08	0.16
Jt 300	5.30	0.19
Jt 450	7.40	0.39
LSD _(0.05)	2.34	0.02

Table 3. Effect of *Jatropha* aqueous leaf extract on the number of galled roots and galls/roots plant.

Extract (g/l)	Galled root	Gall index
Control	10.50	4.75
Jt 150	6.50	2.00
Jt 300	6.75	1.50
Jt 450	3.25	1.13
LSD _(0.05)	1.86	1.87

environment, by the application of an extract with anti-nematode quality of, the extract.

The galled roots and root gall indices reduced significantly ($P < 0.05$) with an increase in the concentrations of the extract (Table 3). Plant treated with *Jatropha* aqueous leaf extract at 450 g/l produced the least number of galled roots (3.25) with the control, significantly producing the highest number of galled roots (10.50). In the root gall index, the least root gall index was recorded as, the roots of plants treated with 450 g/l of the extract. This means that extract contains anti-microbial nutrients which are antagonistic to the nematode attack on the test crop. Non-chemical strategies had been employed in the control root knot nematode infections in tomato (Ogwulumba and Ogwulumba, 2010; Ogwulumba et al., 2011; Ugwuoke et al., 2011). Onyenobi and Achale (2008) reported the efficacies of various plant extracts in the control of root knot nematode on crops.

CONCLUSION AND RECOMMENDATION

The reduction of the number of galled roots and gall index in the treated crops, which led to enhance the growth and yield parameters of the treated crops confirmed the nematicidal quality of *Jatropha* leaf extract. It is therefore recommended that this trial should be done under field conditions, with higher doses of the extract to determine its effects in the field.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interest

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