



STUDIES ON AVOIDABLE YIELD LOSSES DUE TO ROOT KNOT NEMATODES *M. INCOGNITA* INFESTING BLACK GRAM

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Abstract: The yield recorded in treated and an untreated plots of black gram were 15.38 and 10.02 q/ha, respectively. The loss in yield of black gram in untreated plots ranged from 31.89 to 36.68 percent. However, the average loss of 34.81 percent in the yield of black gram was recorded in an untreated plots, when the treated plots were treated with carbofuran 3 G @ 2 kg a.i./ha.

Index Terms – Black gram, Root knot nematode, Carbofuran

INTRODUCTION

Pulses occupy an important position in Indian diet. They are important sources of protein and calories. On an average, pulses contain 22 to 24 per cent protein as against 8 to 10 per cent in cereals. Among pulses grown in India black gram is considered as an important pulse crop after chickpea, pigeon pea and mung bean. Black gram (*Vigna mungo* L.) is an important short-duration pulse crop grown in many parts of India. Its seeds are highly nutritious with protein (25-26%), carbohydrates (60%), fat (1.5%), minerals, amino acids and vitamins (Anonymous, 1991).

Such an important pulse crop is attacked by various insect and non insect pests. Of the several plant parasitic nematodes, root-knot nematode, *M. incognita* (Kofoid and White, 1919) Chitwood, 1949 is one of them causing considerable yield losses in black gram. Mahapatra and Swain (1999) recorded 49.1 percent loss in yield of black gram due to root-knot nematode.

Looking to the economic importance and increasing problem of nematode pests, it was felt necessary to undertake research work with objectives to study avoidable yield losses due to *M. incognita* infesting black gram.

REVIEW OF LITERATURE

Reddy (1986) reported 28.08, 33.68, 43.48 and 28.60 percent yield loss in okra, brinjal, french bean and cowpea, respectively due to root-knot nematode, *M. incognita* when the crops were treated with aldicarb (10 G) at 2 kg a.i./ha.

Darekar and Mhase (1988) recorded 46.92, 32.73 and 36.72 per cent loss in yield of tomato, brinjal and bitter gourd, respectively due to root-knot nematode, *M. incognita*, when the crops were treated with aldicarb 10 G or carbofuran 3 G at 6 kg a.i./ha.

Sharma (1989) conducted field trial on pea cv. Bonneville naturally infested with *M. incognita* and *M. javanica* with 2 treatments of carbofuran (1.5 and 2.0 kg a.i./ha). The nematode population showed a great decline at 2.0 kg a.i./ha dose (5.3 larvae/ml soil) over control (11.8 larvae/ml soil). Yields of treated plots were higher than controls.

Mote and Mhase (1997) recorded 35.08 percent loss in yield of mung bean due to root-knot nematode, when the crop was treated with carbofuran 3 G at 2 kg a.i./ha.

Mahapatra and Swain (1999) recorded 49.1 percent loss in yield of blackgram due to root-knot nematode, when the crop was treated with carbofuran 3 G @ 2 kg a.i./ha + carbendazim at 0.15%.

MATERIAL AND METHODS

Material

Maintenance of pure culture of root-knot nematode, *M. incognita*

The pure culture of root-knot nematode was maintained in earthen pots (Pela) in laboratory as well as 4.0 x 5.0 m size field plots.

Field plots

In case of assessment of yield losses and management experiment, root-knot nematode sick field plots of 4 x 5 m size were used throughout the investigations.

Seeds

The seed of black gram cv. TPU-4 is used for the assessment of yield losses.

Sowing

The sterilized earthen pots (Pela) were filled with 1 kg autoclaved soil mixture and two to three seeds of each germplasm lines were sown in each pot. On germination, every pot was thinned to one plant/pot. In root-knot nematode sick field plots two to three seeds of brinjal were sown per hill. Seven days after germination only one healthy seedling was maintained per hill.

Extraction of nematodes

Whenever, soil population of nematodes was needed, the soil from the root zone of brinjal grown continuously in pure culture field plots was taken and processed by Cobb's Sieving and Decanting method (Cobb, 1918).

Extraction of egg masses

Brinjal plants from earthen pots or field plots were uprooted, the roots gently washed under tap in running water and egg masses from such roots were removed in water and used for experimentation or for hatching second stage larvae for further experimentation whenever necessary.

Nematode inoculation

The nematodes collected were used for inoculation. Before inoculation, the nematodes per ml of suspension were determined and inoculated in pots with desired number of nematodes by making holes in the soil. The nematodes were inoculated by this method unless otherwise mentioned and proper control without nematode inoculation was also maintained.

Nematicides/insecticides

For the experiment on assessment of yield losses of root-knot nematode infesting blackgram under field plot conditions, the following nematicides were used.

| Sr. No. | Nematicides | Available conc. | Trade Name | Chemical Name |
|---------|-------------|-----------------|------------|---------------------------------------------------------------|
| 1. | Carbofuran | 3G | Furadan | (2, 3-dihydro-2, 2-dimethyl-benzofuron-7-yl-methyl-Carbamate) |

Methods

A statistically designed experiment was conducted during kharif season in naturally infested soil with root-knot nematode in the field plots.

In field plots the seeds of black gram cv. TPU-4 were sown by following the recommended agronomic practices. Only one plant was maintained at each hill. The details of the experiment are given below

Details of experiment

- a. Design : Paired Plot Design
- b. Replications : Ten
- c. Treatments : Two
 - i. T : Carbofuran 3 G at 2 kg a.i./ha
 - ii. UC : Untreated control
- d. Spacing : 30 x 10 cm
- e. Plot size : 4.0 x 5.0 m
- f. Method of sowing : Dibbling

- g. Date of sowing : 4.7.2013
 h. Date of termination : 30.10.2013
 i. Fertilizers : i.Urea @ 20 kg N/ha
 ii. Single super phosphate
 @ 40 kg P₂O₅/ha

Nematicide/Insecticide

The granular nematicide, carbofuran 3 G was applied @ 2 kg a.i./ha. The quantity of carbofuran 3 G required per plot was 134 g. The nematicide was mixed in the furrows with the help of khurpi and then sowing was done in the field plots.

Method of recording observations

The black gram yield from the field plots at maturation of pod sat termination was recorded and expressed in kilograms per field plot. From these observations the percent loss in yield in an untreated control was ascertained.

Analysis of the experimental data

The data obtained were subjected to statistical analysis for 't' test to find out the significant difference between two treatments.

RESULTS AND DISCUSSION

The yield recorded in treated and an untreated plots were 15.38 and 10.02 q/ha, respectively. The loss in yield of black gram in untreated plots ranged from 31.89 to 36.68 percent. However, the average loss of 34.81 percent in the yield of black gram was recorded in an untreated plots, when the treated plots were treated with carbofuran 3 G @ 2 kg a.i./ha.

The results obtained under study are in conformity with those of Mohanty and Mahapatra (1994) and Mahapatra and Swain(1999) who also reported 33.33 to 37.77 and 49.1 per cent loss in yield of mung bean and urid bean, respectively when the crops were treated with carbofuran 3 G @ 3 and 2 kg a.i./ha., respectively

Effect of nematicidal treatment on yield of black gram

| Replications | Yield in q/ha at termination | | Loss in yield (%) |
|--------------|-----------------------------------------|-------------------|-------------------|
| | Treated (Carbofuran 3 G @ 2 kg a.i./ha) | Untreated control | |
| 1 | 16.18 | 11.02 | 31.89 |
| 2 | 15.18 | 9.62 | 36.63 |
| 3 | 16.41 | 10.39 | 36.68 |
| 4 | 17.19 | 10.92 | 36.47 |
| 5 | 14.17 | 9.03 | 36.27 |
| 6 | 13.90 | 8.98 | 35.39 |
| 7 | 16.60 | 10.31 | 36.35 |
| 8 | 14.36 | 9.43 | 34.33 |
| 9 | 14.02 | 9.52 | 32.09 |
| 10 | 16.20 | 11.02 | 31.98 |
| Mean | 15.38 ^a | 10.02 | 34.81 |
| 't' cal. | 11.57 | | |

't' table 0.01 % = 3.25

't' table 0.05 % = 2.26

a = Highly significant differences from an untreated plots according to 't' tests for paired comparison

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