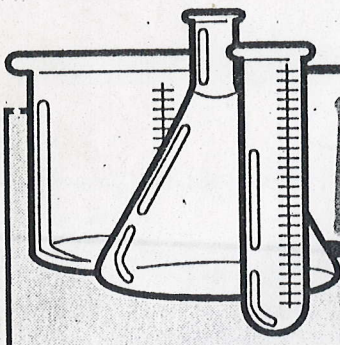


# Investigatory Projects

IN COOPERATION WITH THE
DEPARTMENT OF SCIENCE AND TECHNOLOGY

# Effects of Population Densities of Root-Knot Nematodes on the Growth of One Variety of Tomato Plant*

**Abstract:** This experimental study determined the extent of effects of four population densities of root-knot nematodes on the growth of one-tomato variety, Tomato is a solanaceous crop. It is an excellent source of Vitamin A and C.

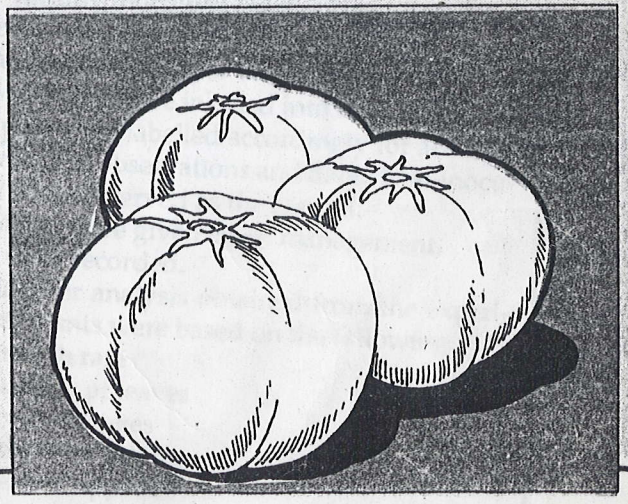
Results showed that the different densities of root-knot nematodes affect the growth of the tomato plants variety R61 through growth rate, root weight, galls, number and color of leaves. The population level 10 and 50 egg mass per kilogram soil of root-knot nematodes inoculum level are levels that would affect the growth of tomato plants.

## INTRODUCTION

The occurrence of nematodes in nearby biological niche has been a phenomenon. They are presented by enormous numbers of species and have been studied as parasites of man and plant life. Plant-parasitic nematodes are a great menace to crop production. They inhibit the soil and the roots of the plants. Thus, they affect their growth and development.

Root-knot nematodes stimulate nuclear division and polyploid. They increase cell size and inhibits cell wall deposition.

The root-knot disease caused by root-knot nematodes is characterized by the presence of galls or swellings on the roots. Under severe infection, the whole root system appears knotty. Plants affected by this disease exhibit root malformation. It prevents the normal development of feeder roots. Root-knot nematodes are known to be most destructive on vegetables.



* This project was submitted in partial fulfillment of the requirements in Investigatory Laboratory by students of the U.P. Integrated School.

Like any agricultural crop, tomato is prone to the attack of destructive pests and diseases during the entire growth. The presence of root-knot nematodes in production area is causing great loss. One of the hindrances of successful tomato production lies on the difficulty of checking and controlling the root-knot nematodes.

The importance of a nematode species depends upon whether or not the population exceeds the tolerance level of a crop. Inherently, crops have their own tolerance level.

This study dealt with finding out the responses of tomato variety R61 to root-knot nematodes at different inoculum levels.

## Review of Related Literature

* Morphology

The plant parasitic nematodes differ from all other organisms which cause plant diseases. They belong to Phylum Nemata.

• Phylum Nemata

The vertical distribution of nematodes in a cultivated field is closely related to the distributor of plant roots. Nematodes are concentrated mainly in the top inch of the soil. Information on the distribution of nematodes is limited. However, root-knot nematodes have been recovered from a depth of 17 ft. over 2,000 species.

* Ecology

Many plant parasitic nematodes can survive in soil for at least one year in the absence of a suitable bost. They mostly occur in sandy soil. The optimum temperature in the soil for root-knot nematodes fall between 68°F and 86°F.

Pathogenecity and population Abundance Root-Knot nematodes cause severe growth retardation and characteristic root galls. It was noticed long ago that plants infected with these nematodes differ from healthy plants.

The process of galling by nematodes is brought about by all hypertrophy and synoptical formation. It starts relatively rapidly. Galling is not essential for nematode development and growth, and its extent varies in different hosts. Galling may result from the introduction of growth regulators from the sub-ventral glands of the second stage larval of nematodes.

Meloidogyne infection causes a decrease in the size of the root system. Roots are badly discolored and rotten due to the invasion of fungi. Other symptoms of infection are stunting, loss of yield, reduction in quality, severe deficiency symptoms of some elements particularly nitrogen.

In the Philippines, no estimate has been made although most likely, it will amount to several millions of pesos. Nematode reproduction in the tropics is so rapid and no control measures are being done to eliminate or minimize the increasing population.

## Materials

five tomato plants (variety R61), five day pots (8" in diameter), root-knot nematodes, microscope, forceps, sandy loam soil, tape measure, electronic sale.

## Methods

1. Five tomato plants in day pots 8 inches diameter were readied.
2. Nematode egg masses were collected from affected tomato plants.
3. Enough inoculum were put in each plant, according to treatments. The various inoculum were 0, 1, 5, 10, and 50 egg mass/kg. of soil.
4. The various inoculum level assignments were introduced into the pots by incorporating them with one inch top layer of soil at the base of the plants. Some were injected into the roots.
5. The pots were labelled accordingly for accurate recording of observations and data. Non-inoculated Plant A served as the control.
6. All plants were given equal management.
7. Data were recorded.
8. All data for analysis obtained from the experimental plants were based on the following:
   a) growth rate
   b) number of leaves
   c) color of leaves
   d) degree of galling
   e) general appearance

## Results and Discussion

The growth rate was affected by the different root-knot nematode inoculum levels. They were

generally reduced with increasing nematode inoculum levels.

The number and color of leaves were also affected. The number of leaves and color generally went down. The effects were faster on the 10 and 50 egg mass inoculum levels.

The degree of galling of the roots showed galls in the 10 and 50 egg mass inoculum levels.

***Table 1. Growth rates of the five tomato plants.***

| Date | Plant Growth (in inches) | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| February 29 | 20 | 18 | 11.4 | 11 | 15 |
| March 2 | 22.6 | 19.7 | 15 | 145 | 18 |
| March 7 | 25.5 | 21.4 | 18.5 | 18 | 207 |
| March 9 | 26.6 | 22.4 | 19.8 | 195 | 215 |
| March 11 | 28 | 24 | 21 | 205 | 222 |
| March 14 | 29 | 25 | 22 | 21 | 226 |

The growth rates of the full tomato plants are indicated on Table 1. The heights of the plants were not affected until the middle of the second week of infestation. Setups 1, 2, and 3 were not affected while setups 4 and 5 showed growth. It was more visible in setup 5.

***Table 2. Number of Leaves***

| Date | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| March 7 | 86 | 75 | 67 | 72 | 71 |
| March 9 | 83 | 72 | 62 | 66 | 64 |
| March 11 | 78 | 66 | 56 | 55 | 52 |
| March 14 | 69 | 56 | 44 | 40 | 35 |

***Table 3. Color of Leaves.***

| Date | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| March 7 | A | A | A | A | A |
| March 9 | A | A | A | B-c | B |
| March 11 | A-B | A-B | B | C | C-D |
| March 14 | E | E | E | E | E |

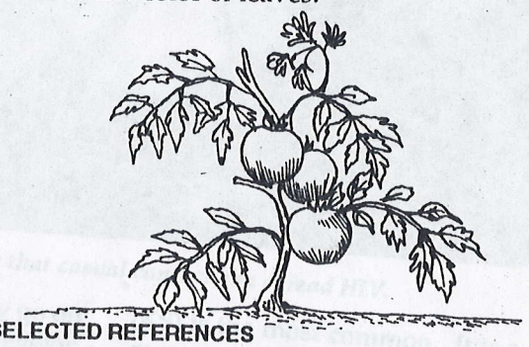
All the setups reduced in leaf count but setup 4 and 5 showed dramatic reduction of leaf counts in their last week. Leaf color observations corresponded with the other findings. Setups 4 and 5 easily wilted during hot periods. This is due to the impaired water absorption because of the damaged root system by the nematodes.

***Table 4. General Appearance.***

| Plant | Appearance |
|---|---|
| 1 | not infected |
| 2 | not infected |
| 3 | not infected |
| 4 | slightly infected |
| 5 | infected |

Setups 4 and 5 showed symptoms of the disease.

The different population densities of root-knot nematodes affect the growth of the tomato plants variety R61 through growth rate, root weight, galls, number and color of leaves.

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