



## EFFICACY OF AFRICAN MARIGOLD EXTRACT ON THE MANAGEMENT OF NEMATODE INFESTATION ON TOMATO (*Solanum lycopersicum* L.)

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### ABSTRACT

The study assessed the efficacy of leaf and the root extracts of African Marigold for the management of nematode infestation on tomato (*Solanum lycopersicum* L.). The experiment was conducted at the Horticultural nursery of Crop Production Department, Federal University of Technology, Minna, Nigeria. Data collected on the following parameters: number of leaves, flowers, and fruits, leaf area, height, girth, and fruit weight were subjected to analysis of variance (ANOVA) using Statistical Analysis Software (SAS) and means were separated using Duncan Multiple Range Test (DMRT). Tomato plants treated with the root extract of African Marigold showed significantly higher number of leaves (74), flowers (8), and fruits (6), thicker stem (1.1cm), tallest plant (48.9cm), broadest leaf area (9.3cm<sup>2</sup>) respectively, and they were statistically higher than other treatments. It was observed that 30 ml of African marigold root extracts performed better in suppressing the activities of the nematode thus translating to improved growth and yield of tomatoes. The study revealed that extracts of African marigold possess nematicidal properties that can be explored as alternative to synthetic nematicides in the control of nematode infection in tomatoes cultivation. It is recommended based on the findings from this research that 30 ml root extract of African marigold is required to improve the growth and fruit yield of tomato/pot against nematode infection. Further study is recommended for the evaluation of the exacts in the open, to be able come up with recommended dose.

**Keyword:** African marigold extract, Nematicide, *Solanum lycopersicum*, Tomato

### INTRODUCTION

Tomato (*Solanum lycopersicum*) is a member of the Solanaceae family (Ercolano *et al.*, 2012). All over the world, tomato is part of a healthy diet because it contains calcium and Vitamin K which helps maintain strong bones. It also contains vitamin B and Potassium which helps reduce cholesterol levels and lowers blood pressure (Bhowmik *et al.*, 2012). Tomatoes are warm-season crop that require direct sunlight for optimum production, it do not thrive in cold weather or extreme heat. Fruit set will not occur at prolonged temperatures below 14 °C or above 30 °C. Tomatoes will produce good yields on a wide range of fertile, well drained soils with pH of 5.5 –7.5 (Yadav and Tungpu, 2012). The fruit is rich in lycopene which may have beneficial health effects. The tomato is a major vegetable crop that has achieved tremendous popularity over the last century. It is grown in practically every country of the world – in outdoor fields, greenhouses and net houses. The tomato plant is very versatile and the crop can be divided into two categories; fresh market tomatoes and processing tomatoes. In both cases, world production and consumption has grown quite rapidly over the past 25 years. Tomatoes, aside from being tasty, are very healthy as they are a good source of vitamins A and C. it also contains Lycopene; which is a very powerful antioxidant that can help prevent the development of many forms of cancer. Cooked tomatoes and tomato products are the best source of lycopene since the lycopene is released from the 3 tomato when cooked. A raw tomato has about 20% of the lycopene content found in cooked tomatoes. However, raw or cooked tomatoes are considered the best source for this antioxidant.





Fig 2: Response of cocoa seedling number of leaves to grounded dried cashew leaves (GDCL)

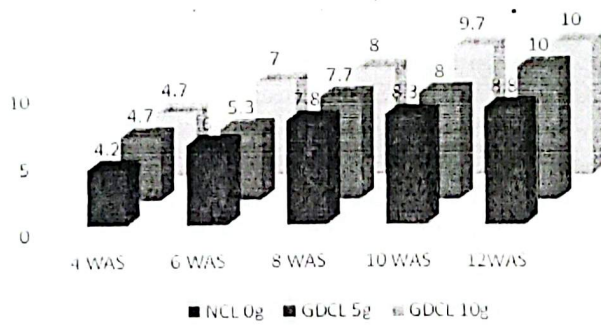


Fig 3: Response of cocoa seedling stem girth (mm) to grounded dried cashew leaves (GDCL)

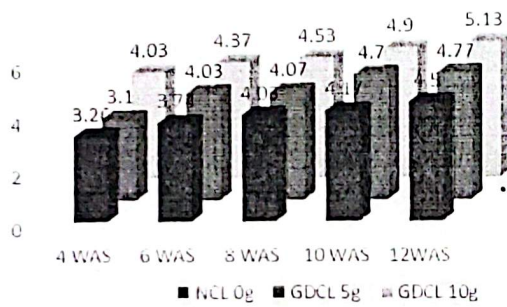
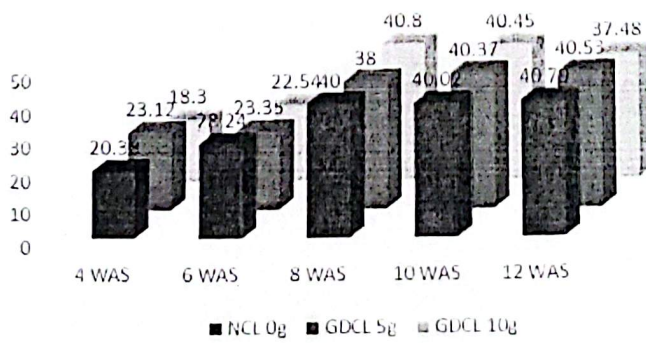


Fig 4: Response of cocoa seedling leaf area (cm<sup>2</sup>) to grounded dried cashew leaves (GDCL)





Post Soil

|          |      |      |      |      |      |      |     |     |      |
|----------|------|------|------|------|------|------|-----|-----|------|
| GDCL 5g  | 4.89 | 0.4  | 0.18 | 7.31 | 0.23 | 0.33 | 3.3 | 1.4 | 0.69 |
| GDCL 10g | 4.99 | 0.27 | 0.04 | 4.82 | 0.68 | 0.72 | 4.4 | 2.1 | 0.46 |

\*NCL- No cashew leaves, GDCL-Grounded dry cashew leaves

**Table 2:** Nutrient status of the pre-grounded dried cashew leaf and post Grounded dried cashew leaves mixed with soil.

| TRT      | N (%) | P (mgkg <sup>-1</sup> ) | K (mgkg <sup>-1</sup> ) | Na (cmol/kg) | Ca (cmol/kg) | Mg (cmol/kg) | OM%   | OC%   |
|----------|-------|-------------------------|-------------------------|--------------|--------------|--------------|-------|-------|
| Pre GDCL | 2.52  | 7.89                    | 2.69                    | 2.10         | 3.76         | 1.86         | 93.91 | 54.60 |
| NCL      | 0.13  | 5.13                    | 0.17                    | 0.3          | 4            | 1.9          | 0.59  | 0.34  |
| GDCL 5g  | 0.1   | 7.31                    | 0.23                    | 0.33         | 3.3          | 1.4          | 0.69  | 0.4   |
| GDCL 10g | 0.04  | 4.82                    | 0.68                    | 0.72         | 4.4          | 2.1          | 0.46  | 0.27  |

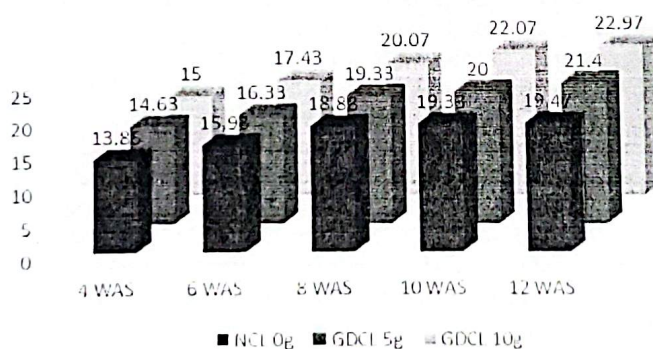
\*NCL- No cashew leaves, GDCL-Grounded dried cashew leaves

**Table 3:** Cocoa Seedling emergence (%) response to grounded dried cashew leaves.

| TRT      | 2WAS   | 3WAS   | 4WAS   |
|----------|--------|--------|--------|
| NCL      | 83.33a | 83.33a | 83.33a |
| GDCL 10g | 33.33a | 66.67a | 66.67a |
| S.E      | 19.2   | 19.2   | 19.2   |

\*NCL- No cashew leaves, GDCL-Grounded dried cashew leaves

**Fig 1:** Response of cocoa seedling plant height (cm) to grounded dried cashew leaves (GDCL)





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**Table 1: Nutrient status of the pre and post soil mixed with Grounded dry cashew leaves.**

| Pre-soil-Sand 32.80, Clay 43.20, silt 24.00% (Clay loam) |                             |     |    |                            |                |                 |                 |                 |      |
|--|-----------------------------|-----|----|----------------------------|----------------|-----------------|-----------------|-----------------|------|
| TRT  | pH<br>(1.1H <sub>2</sub> O) | OC% | N% | P<br>(mgkg <sup>-1</sup> ) | K<br>(cmol/kg) | Na<br>(cmol/kg) | Ca<br>(cmol/kg) | Mg<br>(cmol/kg) | OM % |





grounded dried cashew leaves (GDCL) can enhanced cocoa growth, and at the same time served as amendment to improved soil fertility.

### MATERIALS AND METHODS

The experiment was carried out in the greenhouse of Cocoa Research Institute of Nigeria (CRIN), Ibadan. The soil was collected from a depth of 0-15cm in a continuously cultivated farm plot that has little amount of composite plant materials, organic content, and low nutrient status after soil analysis. The soil collected was mixed with cashew leaf litters, which was air dried, grounded and filled into the soil in a ratio of 0g (control), 5g and 10g, in a polythene bag of 14.2 and 16.8 cm radius and length respectively, arranged in a randomized complete block (RCD) in three replicates. Pre/Post leaf and soil samples were analyzed in the lab to obtain their nutrient composition. The experiment was monitored for 12 weeks. Vegetative data was collected at 4 weeks after sowing (WAS), 6WAS, 8WAS, 10WAS, and 12WAS on growth morphological parameters (plant height, number of leaves, stem girth and leaf area). Data collected was subjected to statistical analyses (Genstat 17 Version). Analysis of variance was performed using a range test of 0.05% probability level.

### RESULTS AND DISCUSSION.

The physico-chemical properties of the soil (Table 1) all fall below the critical levels; hence fertilization becomes appropriate. The soil pH (H<sub>2</sub>O) was 4.25, not quite suitable for optimum cocoa production. N 0.08 compared to 0.09 and 1.8gkg<sup>-1</sup>, K Potassium 0.49 also fall below the critical level of 1.2cmolk<sup>-1</sup> used to raise cocoa plant according to Egbe, N. E, *et al.*, (1989) and wessel M (1971) respectively. Moreso after the experiment the soil was richer in nutrients when fertilized with the application of 5g of GDCL, an indication of easy absorption of the nutrient present from GDCL for growth. The incorporation of grounded dry cashew leaves (GDCL) as shown in Table 2 on the pre and post GDCL was not significantly different, but it was efficiently utilized by cocoa seedlings when mixed with the nursery soil. This was in cognizance of the report of Tanimu *et al.*, (2007) and Murphy (2015) in their report that organic materials apart from being a major source of organic matter and plant nutrients resulted in improved soil physical and chemical attributes. The different types of treatments applied (Table 3) was not significantly different for cocoa seedling emergence. Subsequently, treatments with the application of GDCL emerged lesser when compared to the control (0g).

The cocoa seedling's morphological parameters at the nursery stage and plant vigor were influenced by GDCL as shown in Fig. 1 to Fig 4, although not significantly. 10g of GDCL produced the tallest plant height (Fig 1). Also, at 12WAS, 5g and 10g GDCL were similar (Fig 2) in leaf production (10.10) when compared to the control (8.8). 4WAS (Fig 3), the use of 10g GDCL improved the stem girth of the cocoa seedling, though not significantly with continuous elongation till 12WAS. This supported Pandit *et al.*, (2018) report that dried cashew leaves may have the potential for enhancing soil nutrient availability. The already observed trend did not continue in Fig. 4 (leaf area), because the smallest leaf area was recorded from 10g of GDCL (37.48cm<sup>2</sup>) plot, closely followed by 5g (40.53cm<sup>2</sup>). However, the highest leaf area (40.79) was recorded in seedlings sown without (NCL) the application of GDCL.

### CONCLUSION

Cashew leaves litter can easily be sourced from farms due to their abundance as Agro-waste. The awareness of it as manure can solve waste disposal problems and can improve cocoa soil structure and texture. From this study, no exceptional impact of grounded dried cashew leaves on cocoa seedlings was observed using both application rates. However, application using higher rates is recommended for trial as the organic fertilizer have been observed to have basic nutrients that can support plant growth. The study provides a reasonable amount of information about the nutrient status of cashew dry leaves. Nevertheless, future studies on the rate of decomposition and its economic value to cocoa productivity should be shared with farmers through training toward best agronomy practices on cocoa farms.

