FUDMA Journal of Sciences (FJS)
ISSN online: 2616-1370
ISSN print: 2645 - 2944
Vol. 9 No. 10, October, 2025, pp 240 – 242
DOI: https://doi.org/10.33003/fjs-2025-0910-3863

COMPARATIVE EVALUATION OF CASTOR (*RICINUS COMMUNIS*) AND PONGAMIA (*PONGAMIA PINNATA*) LEAF POWDERS FOR ECO-FRIENDLY SUPPRESSION OF PLANT PARASITIC NEMATODES (*MELOIDOGYNE* SPP.) IN OKRA (*ABELMOSCHUS ESCULENTUS* L. MOENCH)

***[1]Kumshe, I. Bukar, [2]Mohammed, F. Kubili., [1]Bukar, Ahmadu and [1]Muhammad Muastapha**

[1]Department of Agronomy and Soil Science, Borno State University P. M. B 1122, Maiduguri, Borno state, Nigeria.
[2]Department of Crop Protection, Faculty of Agriculture University of Maiduguri, P. M. B 1069, Maiduguri, Borno state, Nigeria.

*Corresponding authors' email: isakumshe@gmail.com Phone: +2348033482491

ABSTRACT

Root-knot nematodes (*Meloidogyne* spp.) are major soil-borne pests that reduce okra yield and profitability in tropical and subtropical regions. Concerns over the environmental safety of synthetic nematicides have led to increased interest in botanicals. This study compared the nematicidal performance of Castor (*Ricinus communis*) and Pongamia (*Pongamia pinnata*) leaf powders at 10 g per treatment under field conditions in Nigeria. A randomized split-plot design was used with Carbofuran as a standard chemical control. Castor leaf powder at (10 g) per treatment significantly reduced nematode populations and improved plant growth and yield, performing on par with Carbofuran and better than pongamia. These findings reinforces the viability castor leaf powder (10 g) for nematode management in okra cultivation.

Keywords: Okra, Nematodes, Leaf powders, Organic amendments, Suppression

INTRODUCTION

Okra (*Abelmoschus esculentus* L. Moench) is an important vegetable crop grown throughout tropical and subtropical regions for its edible pods rich in vitamins, minerals, and mucilage. Globally, okra production exceeded 11 million metric tonnes in 2022, with India producing over 7.16 million tonnes (62% of global production), followed by Nigeria with approximately 1.87 million tonnes (16%) (FAO, 2023). In Africa, Nigeria is the top producer, underscoring the crop's strategic role in food security and local economies (FAOSTAT, 2023). Despite its importance, okra yields are heavily constrained by *Meloidogyne* spp., root-knot nematodes (RKNs), which interfere with root function and reduce nutrient and water uptake (Jha, 2021) Although synthetic nematicides such as Carbofuran are widely used, their toxicity to non-target organisms and persistence in the environment have raised concerns (Xiong *et al.*, 2023). Consequently, there is growing interest in eco-friendly alternatives. Plant-based nematicides, particularly those derived from castor and pongamia, are promising due to their bioactive phytochemicals including alkaloids, flavonoids, saponins, and terpenoids (Sharaf et al., 2016; Saha et al., 2019). However, comparative studies under field conditions remain limited. This study evaluates and compares the nematicidal efficacy of castor and pongamia leaf powders and their impacts on okra performance. The objectives of study was to evaluate botanical efficacy of castor and pongomia leaf powders against root knot nematode on okra plant.

MATERIALS AND METHODS

The experiment was conducted at the Faculty of Agriculture Teaching and Research Farm, University of Maiduguri. The experiment was located at the latitude 11˚05N and longitude 13˚05e. The semi-arid region where the research site was located is characterized by their short rainy season of about 3 - 4 months with an annual rainfall from 300 mm - 350 mm and the soil is a composition of sandy-loamy (Adamu *et al.,* 2024). Castor and Pongamia, leafs was collected from the University of Maiduguri around the experimental site. It was dried and grounded into a powder form. The plant material was weighed at 10 grams for each plant stand. Nematicide (Carbofuran) was bought from accredited dealers at Monday market of Maiduguri Metropolitan City (MMC) and was measured 1gram applied per crop stand. The experiment was carried out in Split plot design with three replications and five treatments within each replication. The treatments are namely; castor (CLP) and Pongamia (PLP). Carbofuran was used as a standard for comparison with the experimental factors. Non-amended plots served control. The plots were measured 3 m × 3 m and spacing of 1m between plot and replication.

Data were collected on two sets of parameters. The nematodes population parameters and plant growth and yield parameters. The nematodes population parameters include the initial, final nematodes population and reproductive factor. The plant growth and yield parameters consist of the shoot height, root length, dry shoot and root weight. Data were collected on the number of nematode population available in the soil. Soil samples numbering 5 per plot and measuring 200 cm^3 were collected before transplanting for analysis of the initial nematodes population (Pi) and also on crop harvest for analysis of the final nematodes population (Pf). All soil samples were collected in polythene bags, labeled with plot number and dates. The soil samples were all subjected to extraction of the nematodes, counting, and identification.

The okra fruits were harvested measured per plot. The shoot height was measured using a meter rule from the point of attachment to root to the plant tip. Root length is measured using the meter rule. The sample plants were exposed to sun light under a shed for 4 days in other to extract the moisture content. Dry shoot and root weight was measured in grams using an electric digital weighing machine.

Data was analyzed using the analysis of variance (ANOVA) method. Means were separated by means of Fishers least significant difference (LSD) at 0.05 level of significance.

RESULTS AND DISCUSSION

Table 1 showed the effect of castor and Pongamia on root-knot nematode population infecting okra. There is no significant ($P < 0.05$) difference in the initial population (Pi).

Pongamia showed significant (P < 0.05) difference with the highest final nematode population (Pf) of 26.5, followed by castor with 18.5. This is compared to Carbofuran which produced the same nematodes population with castor of 18.5. The untreated (control) produced the highest final nematode population (Pf) of 248.0. The reproductive factor (RF) which depicts the relationship between the Pf and Pi showed that castor exhibited the least significant (P < 0.05) nematodes population with 0.13 followed by the nematicide (Carbofuran) with 0.14 in an increasing order, while Pongamia gave 0.22 and the untreated (control) with 2.14 showed the highest in the reproductive factor parameter.

Table 1: Effect of castor and Pongamia on Nematode Population infecting okra

Treatment	Initial Pop. (Pi)	Final Pop. (Pf)	% Reduction	Reproduction Factor (RF)
CLP(10g)	140.0a	18.5b	86.8%	0.13
PLP(10g)	116.0b	26.5b	77.2%	0.22
Carbofuran	134.0a	18.5b	86.2%	0.14
Control	115.5b	248.0a	–114.7%	2.14

Means are average of three replications. Means which are followed by the same latter within each column are not significantly different (P < 0.05) as indicated by Fisher's least significant difference (LSD) test.

The Table 2 Showed that there was showed no significant (P≤0.05) difference in shoot height between the treatment except the control which was significantly different (P≤0.05), with the highest mean recorded in castor leaf powder (42.3) and the lowest was recorded in control (25.9). The result also reveals that there was no significant (P≤0.05) difference in shoot weight in all the treated plots except the control which was significantly (P≤0.05) lower, with highest recorded in castor leaf powder (26.7) and the least in the control (12.9). All the treated plots showed no significant (P≤0.05) difference in root length except the control, with the highest recorded in Carbofuran (20.1) and the least in the control (16.9). Root weight showed no significant (P≤0.05) difference between the treated plots except the control which was significantly lower, with highest recorded in Carbofuran (10.5) and the least in the control (6.7). Yield had no significant (P≤0.05) difference between the treated plots except the control was significantly lower, with highest recorded in castor leaf powder (273.7) and the least in the control (77.2^{c}) (Table, 2).

Table 2: Effect of Castor and Pongamia on Growth and Yield of okra infested by plant parasitic nematode

Treatment	Shoot Height (cm)	Shoot Weight (g)	Root Length (cm)	Root Weight (g)	Yield (kg/ha)
CLP(10g)	42.3	26.7	20.1	10.3	273.7
PLP(10g)	37.1	26.0	19.9	9.3	261.6
Carbofuran	40.8	26.7	20.6	10.5	270.1
Control	25.9	12.9	16.9	6.7	77.2

Means are average of three replications. Means which are followed by the same latter within each column are not significantly different (P < 0.05) as indicated by Fisher's least significant difference (LSD) test.

Discussion

Castor leaf powder significantly reduced nematode populations and enhanced plant performance. Its efficacy is attributed to the presence of ricin, ricinoleic acid, and phenolic compounds which act as antifeedants, repellents, and nematicidal agents (Kouakou *et al*., 2023). Saha *et al.* (2019) reported that Pongamia leaf powder displayed nematicidal effects, albeit at a slightly lower level, likely due to the activity of karanjin and pongamol which interfere with nematode egg hatching and mobility. These results align with previous studies that reported successful suppression of *Meloidogyne incognita* in tomato and okra using botanical residues (Singh and Sitaramaiah, 2012). The comparable performance of CLP and Carbofuran further validates castor's role as an effective, eco-friendly nematode control method. Nigeria's prominent position in global and African okra production underscores the importance of integrating such botanical strategies into sustainable pest management programs. Using local plant materials not only reduces reliance on synthetic inputs but also promotes organic agriculture and environmental conservation (IITA, 2020; FAO, 2023).

CONCLUSION

Castor leaf powder is an effective botanical alternative for managing root-knot nematodes in okra cultivation. It matches the efficacy of carbofuran while offering additional benefits such as biodegradability, safety, and affordability. Pongamia leaf powder, while less effective than castor, still presents a viable option where castor is unavailable. Promoting plant-based nematicides aligns with Nigeria's agricultural sustainability goals, especially in view of its global standing in okra production.

RECOMMENDATION

It is recommended that further research will be carried in a large scale to achieve standard concentration for control of root node nematode species and other soil borne parasites.

REFERENCES

Adamu, I. B., Adamu, I., Talha, I. Z., Ngala, A. L., Samaila, D., & Turajo, A. A. (2024). Soil fertility assessment and land suitability evaluation for wheat and rice cultivation in selected farmlands of Konduga LGA, Sudan Savannah Zone, Borno State. *Journal of Arid Agriculture*, 25(2).

FAO. (2023). *FAOSTAT Statistical Database*. Food and Agriculture Organization of the United Nations. https://www.fao.org/faostat/en/

IITA. (2020). *Okra Production and Management. International Institute of Tropical Agriculture*.

Kouakou, K., Soro, L. C., Kouadio, L. P., & Sangaré, A. (2023). Nematicidal potential of dried castor leaf powder against *Meloidogyne* spp. in tomatoes. *African Journal of Agricultural Research*, 18(6), 120–132.

Saha, H., Verma, A. K., & Raj, A. (2019). Nematicidal potential of *Pongamia pinnata* leaf extract on *Meloidogyne incognita*. *Biopesticides International*, 15(1), 35–42.

Sharaf, S. A., El-Morsi, A. A., & Abdel-Azim, H. M. (2016). Phytochemical constituents and nematicidal activity of castor leaf extract. *Egyptian Journal of Phytopathology*, 44(2), 67–75.

Singh, R. S., & Sitaramaiah, K. (2012). Use of leaf powders and oil cakes in managing plant parasitic nematodes. *Indian Journal of Nematology*, 42(1), 25–30.

Whitehead, A. G., & Hemming, J. R. (1965). A comparison of methods for extracting small vermiform nematodes from soil. *Annals of Applied Biology*, 55(1), 25–38.

Xiong, R. G*., Li, J., Cheng, J., Wu, S. X., Huang, S.Y., Zhou, D. D. & Saimaiti, A.*(2023). New insights into the protection of dietary components on anxiety, depression, and other mental disorders caused by contaminants and food additives. Trends Food Science and Technology.

Jha, Y., (2021) Macrophytes as a potential tool for crop production by providing nutrient as well as protection against common phyto pathogen Highlights Bioscience, 4