Faculty of Natural and Applied Sciences Journal of Scientific Innovations
Print ISSN: 2814-0877 e-ISSN: 2814-0923
www.fnasjournals.com
Volume 5; Issue 3; March 2024; Page No.95-99.

Investigations on The Susceptibility of Cucumber Crop and Nematode Infectivity in Abua, Rivers State, Nigeria

***Ekine, E.G., & Ezenwaka, C. O.**
Department of Biological Science, Federal University Otuoke, Bayelsa State, Nigeria

Corresponding author email: ekineeg@fuotuoke.edu.ng

Abstract
Cucumis sativa is a valuable crop plant known with special interest in the study area. Its viability in supporting local trade necessitated the examination of prospects of threat to quality yield and its sustenance. The present study investigated the susceptibility of cucumber crops to nematode infectivity and examined two cucumber mono-culture vegetations in Abua. Root tissues and soil within the root region of the cucumber crop were sampled using hand trowels and kitchen knives for the collection of the samples. The modified Barmann's technique was adopted for nematode bioassay and nematode identification was done using a pictorial key. Overall nematode richness of 649 was obtained with 417 (64.3%) occurring in soil and roots from farm A and farm B had 232 (35.7%) appearing in roots and soil. Nematode with the highest density was *Rotylenchus* species 0.82 and *Meliodogyne* species 0.49 in farms A and B respectively. The availability of nematodes within the root region and inside the root tissues of cucumber as observed in this study suggests that the crop is vulnerable to nematode infectivity which means catastrophe to the farmer and the society relying on quality farm produce for survival. The result here opined that continuous mono-cropping supports nematode multiplication in the natural ecosystem. The study further suggests that the ever presence of susceptible plants in cultivated fields with nematode species of specificity can facilitate nematode growth sequence and prompt their widespread in the ecosystem.

Keywords: Cucumber Plant**,** *Cucumis Sativa,* Gall, Nematode Infectivity, Susceptibility,

Introduction

Cucumber, *Cucumis sativa* is a valuable food crop known with a special interest in Abua. It represents an important vegetable fruit among most others cultivated in the area. It is virtually impossible to see food served in the locality without cucumber slices as accompaniment. It is most regarded as a supplement for rapid digestion of food. Its viability has made it a noticeable factor in the development of the rural economy in the area. Its nutritional importance has further increased its use range. However, the sustainability of the crop plant is threatened due to nematode infestation. Nematodes are significant biotic factors in soil particularly as it concerns crop plants and the farmer. They form different groups with specific feeding actions. Some are non-parasitic and are farmers-loving due to their actions in improving soil nutrients (Ingham et al., 2019; Coyne et al., 2003). This group of nematodes form a variety of associations beneficial to plants. However, the majority of nematodes and plant-feeding groups plaque the farmer's effort by their activities and prompt low production of food crops. The phyto-parasitic group hits plants' roots and inflicts injuries of different degrees. Their activities in soil against plant growth have been implicated as a major cause of low food production and supply in Africa (Gboeloh et al., 2019; Coyne et al., 2018; Almohithef et al., 2018; Imafidor & Ekine, 2016).

In Abua, the rate of occurrence and severity of infections with plant parasitic nematodes in cucumber farming have not been given attention in terms of investigations, despite their huge impact in predicting soil nutrient and crop performance. However, understanding specific species endemic in a particular locality, the dynamics of occurrence and the extent of abundance is essential in forecasting disease severity and can be beneficial in planning for effective nematode management. Hence, adequate evaluations of parasitic nematodes of crop plants endemicity will help in dealing with the problems associated with the pests aid sustainable food production and supply and enhance the living conditions for rural farmers. Information from the present study will present valuable insight regarding the

Cite this article as:
Ekine, E.G.,&Ezenwaka, C. O.(2024). Investigations on the susceptibility of cucumber crop and nematode infectivity in Abua, Rivers State, Nigeria*FNAS journal of Scientific Innovations, 5*(3), 95-99.

susceptibility of cucumber and nematode infectivity on the crop and highlight important preventive measures for the parasites that could aid crop performance and boost the farmer's income. Therefore, this study is aimed at investigating the susceptibility and nematode infectivity of cucumbers in Abua.

Materials and Methods

The field survey was carried out in Abua. Abua is the food basket of Rivers State. It is located 36 kilometres away from Port Harcourt Township, the capital of Rivers State. The residents are mostly farmers deriving a living from the cultivation of cassava and vegetable fruit crops. Abua is $4^{o}49.502^{l}$N, $6^{o}39.067^{l}$E. The vegetation is that of tropical rainforest types. Two cucumber mono-culture vegetations were randomly selected and surveyed for susceptibility to nematode infectivity. These farms were designated A and B. The farming history and other relevant information for each of the cucumber vegetation was taken and noted from the farm owner to ascertain its impact on nematode richness in the study. For instance, Farm A is on continuous mono-cropping and Farm B is on a piece of land fallowed for four years. Soil and roots were collected concurrently in each of the cucumber vegetation. Soil was taken randomly from the root region of the cucumber plant as bulk samples and twenty-five cucumber stands were removed and roots taken after paying for it. Both soil and roots from each of the cucumber vegetation were conveyed to the laboratory for nematode extraction. The cucumber crop plant was physically examined each time of sample collection for the presence of foliar symptoms relating to nematode infectivity and root-knot was determined on physical assessment of the roots. The extraction of nematodes from soil and roots samples was carried out using the modified Baermann's technique as seen in Nzeako et al. (2016) and the nematodes were stored for viewing in sterilized specimen bottles on 5% formalin. Nematode viewing was done using a light microscope of x4, x10 and x40 objectives, and a nematode pictorial key according to Mekete et al. (2012) was employed for the identification of genera level. The percentage abundance of nematodes was obtained by n/N x 100 (n = individual nematode and N = total nematodes extracted). Population density for each nematode genera was obtained by dividing the total abundance for each nematode genera and the number of samples viewed. Test for significance of nematodes abundance and diversity was done using ANOVA in SPSS version 23 and an independent t-test was used to test the significant assemblage of nematodes between the two cucumber vegetations.

Results

Nematode infestation of soil and roots of cucumber in farm A

The survey of soil and roots of cucumber from farm A reported a total nematode assemblage of 417 from 8 genera. One hundred and seventy-four, 174 (41.7%) were extracted from the soil samples and 243 (58.3%) were observed from the root tissues of the cucumber sampled. Nematodes genera such as *Rotylenchus* species had the highest population density. Following the sequence was *the Tylenchus* species (0.67) followed by *Hoplolaimus* and *Rotylenchulus* species which showcase population densities of 0.64 each. Other nematode genera with reasonable densities were *Pratylenchus* (0.41), *Paratylenchus* (0.42), *Meliodogyne* (0.29) and *Longidorus* (0.26). Soil and roots evaluation in farm B revealed a total nematode abundance of 232 with 170 (73.3%) occurring in soil and 62 (26.6 %) observed in the root tissues. Nematodes of high important densities were *Meliodogyne* species, *Hoplolaimus* species, *Hemicyclophora* species *Longidorus* species. The occurrence of nematodes here exhibits variations between soil and roots. The overall nematode abundance in farms A and B was 649. The total nematode occurrence in farm A was 417 (64.3%) and in farm B had 232 (35.7%). A higher density of assemblage was recorded in farm site A (4.17) as against the observation in farm B with 232 total population density.

Table 1: Percentage occurrence and population density of soil and roots nematodes of cucumber in farm A

Nematodes	Soil (%)	Roots (%)	Total (%)	Pop Density
Rotylenchulus	26 (14.9)	38 (15.6)	64 (15.3)	0.64
Rotylenchus	31 (17.8)	51 (21.0)	82 (19.7)	0.82
Pratylenchus	14 (8.0)	27 (11.1)	41 (9.8)	0.41
Meliodogyne	10 (5.7)	19 (7.8)	29 (7.0)	0.29
Hoplolaimus	34 (19.4)	32 (13.2)	64(15.3)	0.64
Tylenchus	21 (12.1)	46 (18.9)	67 (16.1)	0.67
Paratylenchus	12 (6.9)	30 (12.3)	42 (10.1)	0.42
Longidorus	26 (14.9)	0	26 (6.2)	0.26
Total	**174 (41.7)**	**243 (58.3)**	**417 (64.3)**	**4.17**

Cite this article as:
Ekine, E.G.,&Ezenwaka, C. O.(2024). Investigations on the susceptibility of cucumber crop and nematode infectivity in Abua, Rivers State, Nigeria*FNAS journal of Scientific Innovations*, *5*(3), 95-99.

Nematode infestation of soil and roots of cucumber in farm B

Nematodes	Soil (%)	Roots (%)	Total (%)	Pop density
Trichodorus	16 (9.4)	0	16 (6.9)	0.16
Hemicyclophora	21 (12.4)	11 (17.7)	32 (13.8)	0.32
Longidorus	0	2 (3.2)	2 (0.9)	0.2
Ditylenchus	16 (9.4)	9 (14.5)	25 (10.8)	0.23
Xiphinema	9 (5.3)	0	9 (3.9)	0.9
Hoplolaimus	41 (24,1)	2 (3.2)	43 (18.5)	0.43
Meliodogyne	33 (19.4)	16 (25.8)	49 (21.1)	0.49
Scutellonema	11(6.5)	14 (22.6)	25 (10.8)	0.25
Tylenchus	4 (2.4)	0	4 (1.7)	0.4
Pratylenchus	19 (11.2)	8 (12.9)	27 (11.6)	0.27
Total	**170 (73.3)**	**62 (26.7)**	**232 (35.7)**	**2.23**

Table 3: Nematode infectivity on the cucumber crop plant

	Farm A	Farm B
Root-knot (gall),	+	+
Stubby root,	+	-
Dieback	+	-
Excessive root branching	+	+
Wilting	+	-

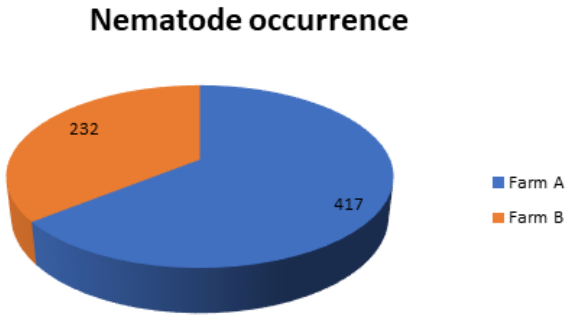

Fig 1: Nematode actual richness in farm site A and B

Discussion

Cucumber, a significant fruit plant of special value in the land of Abua was sampled, to test its susceptibility to nematode infectivity. The result reported an overall richness of 649 nematodes within 12 genera occurring in both farms A 417 (64.3%) and B 232 (35.7%) respectively. The availability of nematodes within the root region and inside the root tissues of cucumbers suggests that the crop is vulnerable to nematode infectivity. The exposure of the cucumber plant to nematode-inflicted injuries is a threat to the local economy of the inhabitants of Abua of which cucumber trading constitutes an integral part. The result implies that poor performance of cucumber crops in the area reduced production below expectations and starvation of man of quality food and fruits is inevitable with time due to nematode infestation. Nzeako et al. (2016) state that nematodes can cause adverse damage in plants of all families ranging from vegetables, fruits and ornamentals and subject the farmer to untold hardship. Soil-inhabiting nematodes constitute a significant biotic feature that predicts soil fertility and influences crop performance through their activities as decomposers and plant feeders respectively. Phyto-parasitic nematodes have been implicated as important economic pests of crop plants both in field and greenhouse and facilitate yield loss (Howland & Quintanilla, 2023; Almohithef et al., 2018; El-Sheriny, 2011). The traces of phyto-parasitic nematodes in vegetation can impair the economic viability of the crop plant and starve the farmer of the best.

Cite this article as:
Ekine, E.G.,&Ezenwaka, C. O.(2024). Investigations on the susceptibility of cucumber crop and nematode infectivity in Abua, Rivers State, Nigeria*FNAS journal of Scientific Innovations*, *5*(3), 95-99.

The study revealed an important sensational appearance on cucumber crop plants connected to nematode-inflicted injuries. This result is indicative that cucumber crop plants are susceptible to infections relating to plant nematodes. The infections of nematodes on crop plants could mean catastrophe to the farmer and the global society relying on the farm produce for survival. That is, severe nematode infectivity can throw man into famine. Nematode infectivity on agricultural soil can be harsh to society as its activity is capable of starving men of quality food and presenting a landscape with a poor look in displaying disease symptoms (Ezenwaka & Ekine, 2024; Gboeloh et al., 2019).

High nematode abundance and vicious infectivity were noticed in farm A with a continuous mono-cropping system. However, signs of nematode infectivity were moderate in farm B with a record of four years fallow. This result implies that continuous mono-cropping supports nematode multiplication in the natural ecosystem. The study further suggests that the continuous presence of susceptible plants in fields with nematode species of specificity can facilitate nematode growth sequence and prompt their widespread in the ecosystem. This opinion agrees with Ekine et al. (2020); Talwana et al. (2008) and Cadet et al. (2003) who all reported that the presence of a suitable host promotes rapid nematode profusion in fields. The low infectivity seen in farm B suggests that fallowing can be a viable management technique for nematodes. Fallowing can alter nematode growth sequence and boost crop performance (Howland & Quintanilla, 2023; Abebe et al., 2005).

Conclusion

Cucumber crop is susceptible to nematode infestations. However, a profitable management technique for nematode pest of cucumber crop plants for the rural farmers in Abua may mean a sustainable local market and enhancement of the living status of the residents. Therefore, farmers should adopt fallowing as a farming strategy to mitigate nematode infectivity and boost cucumber yield.

References

Abebe, G., Sahile, G., & Al-Tawaha, A. R. M. (2005). Evaluation of potential trap crops on Orobanche soil seed bank and tomato yield in the central rift valley of Ethiopia. *World Journal of Agricultural Sciences*, *1(2),* 148-151.

Almohithef, H.A., Al-Yahya, F.A., Al-Hazimi, A.S., Dawabah, A.AM & Lafi, H.A (2018).Prevalence of plant parasitic nematodes associated with certain green house vegetable crops in Riyadh region, Saudi Arabia. *Alexander Journal of Agricultural Research,19 (1),* 127-137.

Cadet, P., Pate, E., & Nioiaye-Faye, N. (2003). Nematode community changes and survival races under natural fallows in sudano shalhelian area of Senegal. *Pedosiologia,47,* 149-16.

Coyne, D.L., Cortada, L., Dalzell, J.J., Claudius-cole, A.O., Haukeland, S, Luambano, N., & Talwana, H (2018). Plant parasitic nematodes and food security in sub-Saharan Africa. *Annual Review of Phytopathology,56(4),* 381-403.

Coyne, D.L., Talwana, S., & Maslsen, N.R (2003). Plant parasitic nematodes associated with root and tuber crops in Uganda. *African Plant Protection,9(2),* 87-98.

Ekine, E.G., Gboeloh, L.B.,Imafidor, H.O & Elele, K (2020**).** Nematode community composition and species diversity from pre-cropping to harvesting of cucumber (*cucumis sativa*) in Abua, Rivers State. *Nigeria Journal of Nematology5,* 19-29.

El-Sheriny, A.A.I (2011). Phytoparasitic nematodes associated with ornamental shrubs, trees and palms in Saudi Arabia including new host records. *Pakistan Journal of Nematology29(2),* 147-164.

Ezenwaka, C.O. & Ekine, E.G. (2024). Assessment of nematode pests of ornamental plants in

Federal University Otuoke, Bayelsa State, Nigeria. *International Journal of Biological Research Advancement,1(1),* 40-46.

Gboeloh, L.B. Elele, K & Ekine, E.G. (2019). Plant parasitic nematodes associated with cucumber (*Cucumis sativa*) cultivated in Abua/Odual local government area of Rivers State, Nigeria. *International Journal of Science, Technology, Engineering, Mathematics and Science Education*, *4(1),* 23-31.

Howland, A. D., & Quintanilla, M. (2023). Plant-Parasitic Nematodes and their Effects on Ornamental Plants: A Review. *Journal of Nematology, 55(1),* 201-209.

Imafidor. H.O & Ekine E.G (2016). A survey of the nematode pests of the crop cassava (*Manihotesculenta*) in Rivers State, Nigeria.*African Journal of Applied Zoology & Environmental Biology, 18,* 17-18.

Ingham, R. E, Trofymow, J. A., Ingham, E. R., & Coleman, D. C (2019). Interactions of bacteria, fungi, and their nematode grazers: effects on nutrient cycling and plant growth. *Ecologica Monogram, 55(1),* 119–140.

Mekete, T., Dababa, A., Sekora, N., Akyazi, F & Abebe (2012).Identification key for agriculturallyimportant plant parasitic nematodes identification course. A manual for nematode identification,109.

Nzeako, S.O., Imafidor, H.O, Ogwuamba, E., & Ezenwaka, C.O (2016).Vertical distribution of lesion nematode: *pratylenchus*species in selected turf field in rivers state. *Journal of Agriculture and Veterinary Science*, 9 (7), 53-58.

Talwana, H.L. Butseya, M.M., & Tusime, G. (2008).Occurrence of plant parasitic nematodes and factors that enhance population build up in cereal based cropping system in Uganda. *African Crop Science Journal,16 (2),*119-131.