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Reaction of Some Improved Cowpea Varieties to Root-Knot Nematode (Meloidogyne javanica) under Screen House Condition in Nigeria

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ABSTRACT: Ten different improved varieties of cowpea (TVu14, TVu16, TVu38, TVu46, TVu49, TVu56, TVu64, TVu65, TVu72 and TVu93) were tried at the Federal University of Technology, Experimental Research Farm under the screen house condition during the 2007 dry season. The experiment consists of inoculated and uninoculated replicates. The experiment was laid out in a Completely Randomized Design with ten (10) treatments replicated three times. Sixty (60) plastic pots, a population of J2 and a sterilized soil were used. This was to determine the effect of root-knot nematode (Meloidogyne javanica) on the ten (10) cowpea varieties under screen house condition. Data were taken on plant height at 4, 6 and 8 weeks, number of pods, root length (cm), root weight (g), number of galls, number of J2 per 250cm soil, number of J2 per 1g of roots and plant yield (g) on both inoculated and uninoculated cowpea plants. The result reveals that, cowpea variety TVu 45, 49, 65 and 72 showed high tolerance in most of the agronomic characteristics measured with better plant height at 4, 6 and 8 weeks after sowing, root length, root weight, fewer number of galls, less number of J2 per 250cm soil and 1g of root and grain yield. On the other hand, varieties TVu 56 and TVu 93 were highly susceptible to the root-knot nematode infestation, therefore should not be cultivated by farmers in high root-knot nematode infested fields.
Key Words: Cowpea, Variety, Nematode, Inoculation, Resistance, Susceptible.

INTRODUCTION

Cowpea (Vigna unguiculata L. Walp) has long been cultivated in the tropics and it probably originated in Africa where its wild species are apparently found in abundance (Yayock, 1988). Wide spread distribution of the wild cowpea is one of the strongest evidence favouring Africa (Integrated Pest Management, 2001). It is cultivated in West Africa and the cultivation zone extends to Australia, coastal South America and West Indies (Singh, 1990). They further reported that, the world leading cowpea producing areas include Nigeria, where it is widely grown in various ecological zones. Nigeria accounts for nearly 70% of the world production. Food and Agricultural Organisation (FAO) estimated that, 3.3 million tones of cowpea dry grains are produced worldwide. Nigeria alone produces 2.1 million tones followed by Niger Republic 650000 tones and Mali 110000 tones.

According to Integrated Pest Management (2001), the crop is an important source of livestock feed especially in dry savannah of West Africa and Semi-arid Tropics. Like other legumes crops, cowpea is an efficient crop for nitrogen fixation, up to 240kg/ha per annum for its own nutrient requirement and also replenishes the nutrients used by other non-leguminous crops (Singh, 1990).

Cowpea grain yield are generally low as a result of drought, excessive moisture, low fertility, weeds, diseases, insect pests and nematodes (Gungula and Garjila, 2005). Nematodes are groups of invertebrates, thread-like, unsegmented worms found in almost every conceivable habitat and ecological niche (Idowu, 1993). Misari (1992), observed that nematodes are a threat to agricultural crops particularly in Tropical and Sub-tropical regions. The problems caused by nematodes on cowpea field include leaf chlorosis, reduced yield, dissolution of middle lamella between the walls of the cells, dead of cells, necrosis of the cell tissue and becoming spongy, stunting and root galling (Caveness, 1987). Idowu (1993) reported a 10% yield loss in cowpea infested by Meloidogyne javanica. Hussey and Baker (1991) observed that, yield loss could be up to

50% especially when the variety is a susceptible one. This work is aimed at identifying the susceptibility of some cowpea varieties to root-knot nematode Meloidogyne javanica under the screen house condition in Yola.

MATERIALS AND METHODS

Experimental Site

The experiment was conducted in the screen house of the School of Agriculture and Agricultural Technology, Federal University of Technology, Yola. It is located within longitude 9^{o} 14" North and latitude 12^{o} 13" East of the equator in the Northern Guinea Savannah agro-ecological zone of Nigeria (Adebayo, 1999).

Soil Sample

A well drain fertile soil from the top soil (0-20cm) containing a good mixture (sandy loam) which was collected from Teaching and Research Farm of the Federal University of Technology, Yola was used.

Source of Seed

The seed was obtained from the International Institute of Tropical Agriculture (IITA), Ibadan. The ten improved cowpea varieties include; TVu14, TVu16, TVu38, TVu46, TVu49, TVu56, TVu64, TVu65, TVu72 and TVu93.

Sowing

Sowing was carried out in plastic pods of 18cm in diameter to which 3.5kg of sterilized soil was added. Two seeds per hole of each of the ten (10) improved cowpea varieties were sown at the depth of 2cm. There were ten (ten) treatments replicated three times placed in a Completely Randomized Design (CRD).

Maintenance of Nematode Culture (Meloidogyne javanica)

The culture of the test nematode (Meloidogyne javanica) was maintained on Tomato Roma VF in the screen house. This was used as the source of inoculum used in the experiment.

Inoculation

A population of one thousand (1000) J2 was inoculated two weeks after sowing. The J2 nematodes that were obtained from the Tomato Roma VF were extracted using the method described by Hussey and Baker (1973). The J2 was inoculated via the syringe with the uninoculated pots as the control. The pots with the plants were irrigated regularly to ensure good and growth of the crop.

Data Collection

The following data were collected thus:

Plant height at 4, 6 and 8 weeks after sowing:

The plant height was measured (cm) from the base of the plant to the tip using meter rule at 4, 6 and 8 weeks after sowing. This was done for each replicate, inoculated and uninoculated plants.

Number of pods per plant: At the time of maturity (10weeks) when the plants have stopped flowering and the pods started drying, number of pods were counted on each plant. The plants were then gently uprooted as described by Jada et al. (2007).

Root length and weight:

Root length for each plant was measured from the base of the vegetative part (soil level) down to the root tip using meter rule (cm).

Galling index:

Two days to uprooting the plants 250cm^3 of soil around each plant was collected from the top to a depth of 15cm using table spoon. The uprooted roots above were each washed thoroughly using a slow running chlorine free tap water. Roots of each plant were weighed using a sensitive weighing balance in the Laboratory. Each root of the plant was taken and number of root galls were counted and scaled in to root gall index. The root gall index was done as described by Taylor and Sasser (1978); scale of 1=1-2 galls, 2= 3-10 galls, 3= 11-20 galls, 4= 31-100 galls and 5= more than 100 galls.

Number of second stage juveniles (J_2) of M. javanica in 250 cm^3 of soil:

From each of the collected 250g soil samples J_2 were extracted from the soil using the modified Bearmans tray method as described by Barker (1985). From 2mil aliquots of each extracts, J_2 were counted under a dissecting microscope and this was repeated 15 times (30mil) to its population in 250cm^3 of soil.

Number of J_2 in one gram of roots: From roots of each plant one gram was weighed, placed in a petric dish containing 20mil of water and then teased gently using needle. Number of J_2 from 1gram of roots was counted under the microscope (x100).

Yield of plants: Using hand method, pods from each replicate were opened gently and the yield collected in small white polythene bags. Each was then weighed using sensitive weighing balance and recorded as yield weight.

Reproduction factor 'R' (host efficiency) was calculated as follows; 'R'=p_t/p_i, where p_t indicates the J_2 population in 250cm^3 of soil counted above and p_i= 1000 J_2 used as inoculum. 'R' factor of less than or equal to one indicates no apparent increase in the nematode population (Nwangor, 1998).

Final assessment of the various varieties in terms of susceptibility or resistance was based on Canto-saenz's host resistance designations scheme as given in Table 1.

Table 1. Quantitative Scheme for Assigning of Canto-Saenz's Host Susceptibility (resistance) Designation.

Plant Damage (GL)	Host Efficiency (R-Factor)	DR
≤ 2	≤ 1	Resistance
≤ 2	≤ 1	Hyper susceptible
≤ 2	≤ 1	Susceptible
≤ 2	≤ 1	Susceptible

GL= Gall index, DR= Degree of Resistance
Source: Sasser et al. (1984).

Statistical Analysis

Data collected were subjected to analysis of variance (ANOVA) appropriate to Completely Randomized Design according to Gomez and Gomez (1984). The treatment means were separated using the Least Significant Difference (LSD) method of mean separation at P≤0.05 level of probability.

RESULTS

Results for inoculated plant height at four (4) weeks after sowing as presented in Table 2 shows that cowpea variety TVu49 gave the highest plant height (27.00cm) slightly followed by varieties TVu65 (26.60cm); TVu64 and TVu16 (23.30cm); TVu14 (22.60cm); TVu38 (20.30cm); TVu46 and TVu56 (20.00cm) and the least was observed in cowpea variety TVu93 (16.60cm) at P≤0.05 using the Least Significant Difference (LSD) method of statistical analysis. On the other hand, it was observed that, the plant height at four (4) weeks after sowing for uninoculated plants shows that, variety TVu65 had the highest plant height (37.30cm) followed by varieties TVu16 (31.00cm); TVu49 (26.60cm); TVu64 (26.30cm); TVu72 (24.00cm); TVu46 (23.30cm); TVu38 (23.00cm) and the least was recorded in cowpea variety TVu93 (22.00cm).

Moreover, inoculated and uninoculated plant height at six (6) weeks after sowing as presented in Table 2 shows that, cowpea variety TVu65 gave the highest plant height (41.60cm and 69.30cm) followed by varieties TVu49 (30.30cm and 41.00cm); TVu16 (26.30cm and 40.70cm); TVu64 (26.00cm and 40.30cm); TVu14 (25.00cm and 39.00cm); TVu46 (24.00cm and 35.30cm) and the least was observed in cowpea variety TVu93 (20.00cm and 28.60cm) respectively at P≤0.05. Also, the inoculated and uninoculatd plant height at eight (8) weeks after sowing was recorded in cowpea variety TVu65 (48.30cm and 82.30cm) significantly followed by varieties TVu49 (34.60cm and 64.30cm); TVu16 (30.00cm and 60.00cm); TVu72 (30.00cm and 47.00cm); TVu64 (28.00cm and 59.30cm); TVu46 925.60cm and 47.00cm) and the least was observed in cowpea variety TVu93 (20.60cm and 41.60cm) at P≤0.05 using the Least Significant Difference (LSD).

Table 2: Effect of Root-Knot Nematode (Meloidogyne javanica) on the Plant Height at 4,6 and 8 Week after Sowing.

Treatments	Inoculated Plant Height(cm)			Uninoculated Plant Height (cm)		
	4 Weeks	6 Weeks	8 Weeks	4 Weeks	6 Weeks	8 Weeks
TVu14	22.60^{b}	27.00^{bc}	28.60^{bc}	27.30^{bcd}	39.00^{b}	51.60^{bc}
TVu16	23.30^{ab}	25.30^{bc}	30.99^{bc}	31.00^{b}	40.60^{b}	60.00^{bc}
TVu38	20.30^{bc}	23.00^{c}	24.00^{cd}	23.00^{d}	32.60^{bc}	43.00^{d}
TVu46	20.00^{bc}	24.30^{bc}	25.60^{c}	23.30^{cd}	35.30^{bc}	47.60^{cd}
TVu49	27.00^{a}	30.30^{b}	34.60^{b}	26.60^{bc}	41.00^{b}	64.30^{b}
TVU56	20.00^{bc}	22.30^{c}	23.30^{cd}	23.30^{cb}	39.00^{b}	49.30^{cd}
TVu64	23.30^{ab}	26.00^{bc}	28.00^{bc}	26.30^{bcd}	40.30^{b}	59.30^{bc}
TVu65	26.60^{a}	41.60^{a}	48.30^{a}	37.30^{a}	69.30^{a}	82.30^{a}
TVu72	22.00^{b}	24.30^{bc}	30.00^{bc}	24.00^{cd}	35.60^{bc}	49.00^{cd}
TVu93	16.60^{c}	20.00^{cd}	20.60^{d}	22.00^{d}	28.60^{c}	41.60^{d}
S.E	0.50	0.60	0.60	0.60	0.80	1.30
C.V	13.84	14.14	12.72	12.45	11.96	13.32

Means with the same letter (s) is not significantly different at P≤0.05 using the LSD

The results of the effect of root-knot nematode (Meloidogyne javanica) on pods, root length and root weight is presented in Table 3. It shows that, the highest number of pods for both inoculated and uninoculated plants was recorded in cowpea variety TVu65 (10.60cm and 14.60cm) slightly followed by TVu72 (8.60 and

11.60); TVu14 (8.30 and 11.60); TVu64 (7.30 and 10.00); TVu46 (7.30 and 9.60); TVu38 (6.60 and 9.30); TVu56 (6.00 and 9.30) and the least was seen in cowpea variety TVu93 (5.00cm and 7.60) respectively at P≤0.05.

Moreover, the effect of root-knot nematode (Meloidogyne javanica) on root length for both inoculated and uninoculated plants shows that, the cowpea variety TVu65 gave the highest root length (16.60cm and 31.00cm) followed by varieties TVu16 (14,30cm and 24.30cm); TVu49 (13.30cm and 23.00cm); TVu72 (13.00cm and 22.00cm); TVu56 (13.00cm and 17.60cm); TVu93 (12.60cm and 16.00cm); TVu38 (12.50cm and 14.60cm) and the least was recorded in cowpea variety TVu64 (11.00cm and 10.60cm) respectively at P≤0.05 using the Least Significant Difference (LSD).

Table 3 also shows the effect of root-knot nematode (Meloidogyne javanica) on root weight in both inoculated and uninoculated plants. The highest root weight was recorded in cowpea variety TVu93 (5.70g and 1.40g) followed by varieties TVu14 (3.30g and 1.40g); TVu56 (3.10g and 1.40g); TVu16 (2.80g and 1.40g); TVu64 (2.70g and 1.40g); TVu72 (1.70g and 1.40g) and the least was observed in cowpea variety TVu65 (1.40g and 1.40g) respectively at P≤0.05 using the Least Significant Difference (LSD) method of statistical analysis.

Table 3: Effect of Root-knot Nematode (Meloidogyne javanica) on Pods, Root Length and Root Weight

Treatments	Inoculated			Uninoculated		
	Number of Pods	Root Length(cm)	Root Weight(g)	Number of Pods	Root Length(cm)	Root Weight(g)
TVu14	8.30^{bc}	11.30^{de}	3.30^{b}	11.60^{c}	15.00^{e}	1.40^{a}
TVu16	5.30^{f}	14.30^{b}	2.80^{d}	11.30^{c}	24.30^{c}	1.40^{a}
TVu38	6.60^{de}	12.50^{cde}	3.30^{b}	9.30^{d}	14.60^{e}	1.40^{a}
TVu46	7.30^{cd}	12.30^{cde}	1.70^{e}	9.60^{cd}	12.00^{d}	1.40^{a}
TVu49	8.00^{bc}	13.30^{bc}	1.80^{e}	13.00^{b}	23.00^{b}	1.40^{a}
TVu56	6.00^{ef}	13.00^{bcd}	3.10^{c}	9.30^{d}	17.60^{d}	1.40^{a}
TVu64	7.30^{cd}	11.00^{e}	2.70^{d}	10.00^{d}	10.60$_{e}$	1.40^{a}
TVu65	10.60^{a}	16.60^{a}	1.40^{f}	14.60^{a}	31.00^{a}	1.40^{a}
TVu72	8.60^{b}	13.00^{bcd}	1.70^{e}	11.60^{c}	22.00^{bc}	1.40^{a}
TVu93	5.00^{f}	12.60^{bcd}	5.70^{a}	11.60^{c}	22.00^{bc}	1.40^{a}
S.E	0.11	0.11	0.01	0.11	0.11	0.00
C.V	9.10	7.12	2.55	5.65	5.22	1.03

Means with the same letter(s) are not significantly different at P≤0.05 using the LSD

The effect of root-knot nematode (Meloidogyne javanica) on formation of galls on both inoculated and uninoculated cowpea plants is presented in Table 4. The results shows that, cowpea variety TVu93 gave the highest galling index (4.00 and 0.00) followed by varieties TVu38 (3.10 and 0.00); TVu14 (3.00 and 0.00); TVu56 (2.00 and 0.00) and the least was recorded in cowpea varieties TVu49, TVu65 and TVu72 (1.00 and 0.00) respectively at P≤0.05 using the Least Significant Difference (LSD) method of statistical analysis.

In the same vane, the number of J_2 root-knot nematode (Meloidogyne javanica) in 250cm^3 of soil for both inoculated and uninoculated cowpea varieties is presented also in Table 4. According to the results, the highest number of J_2 found in soil of 250cm^3 was recorded in variety TVu93 (7493.00 and 0.00) significantly followed by varieties TVu38 (6014.00 and 0.00); TVu14 (5991.30 and 0.00); TVu56 (3927.00 and 0.00); TVu46 (3336.30 and 0.00); TVu72 (2776.30 and 0.00); TVu64 (2718.00 and 0.00) and the least was observed in cowpea variety TVu65 (2091.00 and 0.00) respectively at P≤0.005.

The number of J_2 root-knot nematode (Meloidogyne javanica) in 1g of root for both inoculated and uninoculated cowpea varieties is shown also in Table 4. The result shows that, cowpea variety TVu38 had the highest J_2 / g of roots (787.30 and 0.00) followed by cowpea varieties TVu14 (715.00 and 0.00); TVu93 (641.00 and 0.00); TVu16 (551.00 and 0.00); TVu56 (503.00 and 0.00); TVu49 (468.00 and 0.00); TVu46 (443.60 and 0.00); TVu72 (433.30 and 0.00); TVu64 (424.30 and 0.00) and the least was seen in variety TVu65 (364.30 and 0.00) respectively at P≤0.005 using the Least Significant Difference (LSD) method of statistical analysis.

Also, the effect of root-knot nematode (Meloidogyne javanica) on the plant yield in grams for both inoculated and uninoculated cowpea varieties is shown in Table 3. According to the result obtained, variety TVu49 gave the highest yield in grams (13.80 and 29.40) followed by varieties Tvu65 (11.30 and 27.20); TVu14 (9.90 and 25.90); TVu64 (8.30 and 19.90); TVu46 (7.00 and 19.70); TVu38 (6.80 and 19.10); TVu72 (6.00 and 17.20) and the least was recorded in variety TVu93 (5.70 and 15.00) respectively at P≤0.005 using the Least Significant Difference (LSD) method of statistical analysis.

Table 4. Effect of Root-knot Nematode (Meloidogyne javanica) on Gall Formation Converted to Galling Index, Number of J2 from 250cm of Soil, Number of J2 from 1.0g of Root and Plant Yield.

Treatments	Inoculated					Uninoculated				
	Galling Index	No. of J_2 per 250cm Soil	No. of J_2 per 1g Root	Plant Yield in grams		Galling Index	No. of J_2 from 250cm Soil	No. of J_2 from 1g Root	Plant Yield in grams	
TVu14	3.00^{b}	5991.30^{b}	715.00^{a}	9.90^{c}		0.00^{a}	0.00^{a}	0.00^{a}	25.90^{b}	
TVu16	2.00^{f}	3350.70^{d}	551.60^{c}	6.80^{e}		0.00^{a}	0.00^{a}	0.00^{a}	24.00^{c}	
TVu38	3.10^{e}	6014.70^{b}	787.30^{a}	6.80^{e}		0.00^{a}	0.00^{a}	0.00^{a}	19.10^{e}	
TVu46	1.00^{h}	3336.30^{d}	443.60^{de}	7.00^{e}		0.00^{a}	0.00^{a}	0.00^{a}	19.70^{e}	
TVu49	1.00^{h}	2676.00^{e}	468.00^{cd}	13.80e		0.00^{a}	0.00^{a}	0.00^{a}	29.40^{e}	
TVu56	2.00^{d}	3927.00^{c}	503.00^{cd}	5.90^{f}		0.00^{a}	0.00^{a}	0.00^{a}	18.70^{e}	
TVu64	2.00^{d}	2718.00^{e}	424.30^{de}	8.30^{d}		0.00^{a}	0.00^{a}	0.00^{a}	19.00^{e}	
TVu65	1.00^{h}	2091.00^{f}	364.30^{e}	11.30^{b}		0.00^{a}	0.00^{a}	0.00^{a}	27.20^{c}	
TVu72	1.00^{h}	2776.30^{e}	433.30^{de}	6.00^{f}		0.00^{a}	0.00^{a}	0.00^{a}	17.20^{f}	
TVu93	4.00^{a}	7493.00^{a}	641.00^{b}	5.70^{f}		0.00^{a}	0. 00^{a}	0.00^{a}	15.10^{d}	
S.E	0.30	0.40	0.40	0.70	0.50	1.40	0.35	0.64		
C.V	11.86	10.57	14.18	11.08	12.30	11.80	9.60	8.90		

Means with the same letter(s) are not significantly different at P≤0.05 using the LSD

As for the host suitability test, the result is presented in Table 5. Only three varieties viz: TVu16, TVu38 and TVu93 were susceptible(s) but all the remaining seven varieties showed that they were even hyper-susceptible when Canto-Saenz's host suitability test was used.

Table 5. Host Suitability of Some Improved Cowpea Varieties Tested for Root-Knot

Treatments	Galling index	J_2/250cm^3 of Soil	Host Effi	SD
TVu14	3.00	5991.00	5.99	S
TVu16	2.00	3350.70	3.55	HS
TVu38	3.10	6014.70	6.01	S
TVu46	1.00	3336.30	3.34	HS
TVu49	1.00	2676.00	2.68	HS
TVu56	2.00	3927.00	3.93	HS
TVu64	2.00	2718.00	2.72	HS
TVu65	1.00	2091.00	2.09	HS
TVu72	1.00	2776.10	2.78	HS
TVu93	4.00	7493.00	7.49	HS

Note: R-factor=Reproductive factor; SD=Suitability Designation, HS=Hyper-susceptible; S=Susceptible.

DISCUSSION

The reaction of ten (10) inoculated cowpea varieties to root-Knot nematode (Meloidogyne javanica) shows that, there exist significant (p≤0.05) differences among the cowpea varieties. This means that, some varieties are susceptible while some are tolerant to root-knot nematode (Meloidogyne javanica). Cowpea varieties TVu14, TVu16 and TVu38 showed no significant difference at 4, 6, and 8 weeks in plant height, number of pods and root length but had significant difference in root weight, number of galls (galling index), number of J_2 per 250cm^3 soil, number of J_2 per 1g of root and yield for both inoculated and uninoculated plants. This agrees with Misari (1992), who suggested that, when these characters are measured, they often exhibit material effect on yield.

Inoculated cowpea variety TVu46 showed no significant difference in plant height at 4, 6 and 8 weeks after sowing, number of pods, number of J_2 per 25ocm^3 soil and number of J_2 per 1g of roots and yield at 4, 6 and 8 weeks. This is in agreement with Idowu (1993) that, some cowpea varieties are tolerant to nematode infestation. The variety however gave significant response in the number of galls. The uninoculated cowpea TVu46 variety showed no significant difference at 4, 6 and 8 weeks after sowing for plant height, root length, yield but there was visible difference in root weight, number of galls, number of J_2 per 250cm^3 soil and number of J_2 per 1g of root.

Inoculated Cowpea varieties TVu49, TVu56 and TVu64 were susceptible in terms of their response to the root-knot nematode (Meloidogyne javanica) at 4, 6 and 8 weeks plant height. However, there was no significant difference among these varieties for number of pods per plant, root length, root weight, number of J_2 per 1g of root and grain yield. This agrees with Bridge et al. (1985) who reported that, nematode infestation in legumes could result to total loss. On the other hand, uninoculated cowpea varieties TVu49, TVu56 and TVu64 showed better results for plant height at 4 and 6 weeks but had relative decline in plant height at 8 weeks after sowing. This is not unconnected with the fact that these cowpea varieties have different growth rate and that

since they were not inoculated with the nematode, their performance was better. This is in agreement with Amosu (1974) who reported that when cowpea is grown free from nematode infestation and other factors being equal, better performance is inevitable. The uninoculated cowpea variety TVu49 gave higher number of pods and better root length compared to the other varieties but had lesser root weight. Varieties TVu56 and TVu64 were also outstanding in plant height, number of pods per plant, root length but had lesser root weight and fewer number of galls. They also gave better results in terms of the number of J_2 per 250cm^3 soil and 1g root and also good grain yield.

Inoculated cowpea varieties TVu65, TVu72 and TVu93 gave different responses or reactions to the introduction of the root-knot nematode (Meloidogyne javanica). There were significant decreases in plant height at 6 and 8 weeks with normal increase in plant height at 4 weeks in variety TVu65. Inoculated cowpea varieties TVu72 and TVu93 in like manner were susceptible to the root-knot nematode (Meloidogyne javanica) infestation at 4, 6 and 8 weeks respectively. These varieties also gave fewer numbers of pods per plant, smaller root length, lesser root weight, higher number of root galls and lower grain yield. This is consistent with Riches et al. (1992) who suggested that reduced growth in terms of plant height, root length, root weight and curtailed grain yield is a characteristic of nematode infested and invaded cowpea plant. Uninoculated cowpea varieties TVu65, TVu73 and TVu93 gave better plant height at 4, 6 and 8 weeks, number of pods per plant, root length, root weight, no galls and increased yield. This agrees with Amosu (1974) who stated that, when cowpea is grown free from nematode infestation and other factors being equal, better performance is guaranteed.

All the cowpea varieties tested were found susceptible to root-knot nematode (M. javanica). Eventhough TVu65, TVu64 and TVu72 were hyper-susceptible, they supported less of the root-knot nematode (M. javanica) population because of their low reproductive factor of 2.09, 2.72 and 2.78 respectively. Nwangor (1998) also reported some cassava varieties (73/309, 73/649 and 73/191) that were hyper-susceptible but did not support M. javanica race I reproduction.

CONCLUSION

The study shows that, all the inoculated cowpea varieties were susceptible to the root-knot nematode (Meloidogyne javanica) infestation more especially varieties TVu16, TVu56 and TVu93. However, inoculated cowpea varieties TVu49, TVu65 and TVu72 showed some degree of tolerance to the root-knot nematode (Meloidogyne javanica). There is no doubt that virtually all the ten (10) cowpea varieties gave considerably fair result when they were not inoculated. This indicated that, only cowpea varieties TVu49, TVu65 and TVu72 could be planted in highly root-nematode infested fields and even then farmers are advised to use additional control measures to reduce the nematode effect for optimum yield.

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