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EFFECT OF *JATROPHA CURCAS* ON ROOT-GALL NEMATODE DISEASE AND THE CONSEQUENT PROXIMATE COMPOSITION OF *OKRA: ABELMONCHUS ESCULENTUS* (L.) Moench.

C M. AGU[1], A.C. NWOGBAGA[2], C.G. UWANDU[3], C.A. PETER ONOH[3], C.O. MBUKA[3], F.O. OJIAKO[3], N.K. NDULUE[3] AND V.I. OGWUDIRE[3]

1. Centre for Agricultural Research, Federal University of Technology, Owerri. P.M.B.1526, Imo State, Nigeria.
2. Department of Crop Production and Landscape Management. Ebonyi State University, Abakaliki.
3. Department of Crop Science and Technology, Federal University of Technology, Owerri.

E-mail: cmagu2001@yahoo.com

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ABSTRACT

Root-gall nematode disease of okra as affected by Jatropha curcas and the consequent pod proximate composition were studied. This was on sandy loam soil endemic in Meloidogyne incognita. A 2x4 factorial experiment in randomized complete block design with four replications was used. Ground J. curcas seeds and leaves were separately applied at 0,20, 40 and 60g/plant. Results showed that okra root-galls decreased as application rate of *J.curcas* increased. Percentage carbohydrate, protein, fibre and moisture contents however correlated negatively with root-gall responses. The reverse was however true for crude fat content.

Keywords : *Jatropha curcas, nematode, okra, proximate composition and root-gall.*

Introduction

Okra (*Abelmoschus esculentus*), an economically (Agunloye, 1986), nutritionally (Ibezim, 2000); medicinally (Manandhar, 2002) and industrially (Agarwal *et al*, 2003) important vegetable crop is reportedly being produced at yields below the optimum. This could among other factors be attributed to nematode infection on the roots (Netscher and Sikora, 1990). The root nematode, *Meloidogyne* spp is the most important in Okra production (Luc *et al*, 1990). In the United States, yields on plots infested with *M. incognita* and treated with DD-MENCS and planted with Okra increased 507% (Johnson, 1985). Agu *et al* (2009) also noted a steady increase in mucilaginous property in Okra pods as okra galling response to *M. incognita* decreased at increased carbofuran (Furadan 5G) rates. Although several botanicals have been used to control nematode infections on crop plants (Rose *et al*, 2012; Ononuju and Nzenwa, 2011), the use of *Jatropha curcas* has not been investigated. This study therefore concerned evaluating *J. Curcas* seeds and leaves for control of okra root-gall nematode disease in soil endemic in *Meloidogyne* spp. Consequent proximate composition of pods was also considered.

Materials and Methods

This study was carried out at the Centre for Agricultural Research, Federal University of Technology, Owerri, located between latitudes 5° 20' N and 5° 27' N and longitudes of 7° 00' and 7° 07E. The soil type was sandy loam (94.38% sand, 2.96% silt and 2.66% clay) and endemic in a root-gall nematode, *Meloidogyne incognita* (Agu, 2008). A 2x4 factorial experiment was used in randomized complete block design with four replications. The factors whose effects were investigated included: *Jatropha curcas* parts (seeds and leaves) and rates of application (0, 20, 40 and 60g/plant).

Before planting, the existing bush was first cleared and seed beds made according to farmers' practice. Eight seed beds, each measuring 1.2x8m were made per block. Four blocks and hence thirty two (32) seed beds were used. The blocks and seed beds were separated by 1.0m and 0.5m furrows respectively. Every block had the eight seed beds randomly incorporated with the different rates of the *J. curcas* parts (seeds and leaves powder). This was followed by okra seed sowing. Okra variety: "Spineless (VG-IOR)", highly susceptible to *M. incognita* (Agu et al, 2009) was sown at 0.3x0.3m, a plant population of 111,111 plants/ha. Manual weeding was done 40 and 80 days after planting. Okra pods whose proximate composition was analyzed were sampled per treatment at 7-8 days after anthesis.

Percentage carbohydrate, crude protein, fat, fibre and moisture contents were obtained as described by James (1996). Ash content was obtained using official methods of analysis as described by Association of Analytical Chemistry (AOAC, 1990). Root-gall nematode infection on the okra plants was assessed 90 days after planting. This was by recovering roots intact and adhering soils removed by gentle washing under tap water. Root systems were then individually scored according to Agu and Ogbuji (1996) in which:0=no infection (no galls present); 1=rare infection (1-3 galls present), 2=light infection (4-10galls present), 3=moderate infection (10-30galls present) and 4=severe infection (more than 30 galls present). Data collected were subjected to analysis of variance according to Steel and Torrie (1981). Fisher's least significant difference (F-LSD) was used to separate means.

Results and Discussion

Okra plants treated with *J. curcas* had lower root-galls than the controls (Table1). Consistent decreases in root-galls occurred as the application rate of the *J.Curcas* increased. Reductions in root-galls were however not the same for *J. curcas* leaves and seeds powder. Significantly (P= 0.05) higher root-gall reduction occurred at seeds than leaves powder application. Diterpenes in *J. curcas* which contain phorbol esters (Goel *et al*, 2007) may have been indirectly responsible for the root-galls reductions. Goel *et al,* (2007) stated that phorbol ester are amphiphilic molecules with a tendency to bind phospholipid membrane receptors and act as an analogue for Diacyglycerol, thus amplifying the efficacy of carcinogens and eventual animal death. The differences in root-gall reductions associated with different *J. curcas* parts could be attributed to differences in amounts of phorbol esters contents. Makkar and Becker (2009) reported that phorbol esters in seeds and leaves were 2-6 and 1.83-2.75 mg/gdry matter respectively. Other *J.curcas* compounds like saponin, tannin, curcin and phytates would not have had any lethal effect on the nematode. This is because saponins are innocuous and tannins are found in negligible amounts (0.02-0.4%) or totally not detected in condensed form. Curcin was reported to display antitumor activity, suggesting therapeutic importance and phytates are degraded by non-ruminants like nematodes (Lin, *et al.*, 2003).

Proximate composition analysis revealed that percentage (%) carbohydrate content of the okra pods increased as root-galls decreased at increased *J. curcas* rates. The same was true for crude protein, fibre and moisture contents (Table-1). This may be due to increased absorption and

TABLE 1– RELATIONSHIP BETWEEN *Jatropha Curcas* APPLICATION, ROOT-GALL INCIDENCE AND PROXIMATE COMPOSITION OF OKRA PODS.

Jartopha curcas	*J.curcas*	Mean root-gall	% Proximate Composition					
parts	rate (g/plant)	indices (0-4)	Carbohydrate	Protein	Fat	Moisture	Fibre	Ash
	0	3.85	18.57	09.69	30.86	38.50	00.99	01.39
	20	2.42	26.12	12.25	15.27	41.71	02.96	01.69
SEEDS	40	1.80	32.87	13.81	07.39	42.23	02.46	01.24
	60	1.02	32.32	15.27	04.32	43.08	03.21	01.80
	0	4.00	19.19	09.86	29.00	39.36	01.00	01.59
	20	3.12	22.49	14.71	14.59	43.69	03.36	01.16
LEAVES	40	2.54	25.01	15.33	08.42	44.34	05.45	01.45
	60	2.14	25.61	15.20	06.15	46.36	05.20	01.48
	LSD0.05	0.96	2.64	1,02	5.78	1.56	1.20	N.S

N.S=Non-significant.

translocation of water and mineral nutrients to the vegetative shoot region. Otiefa and Elgindi (1962) stated that plants with fewer root-galls would translocate more nutrients to vegetative organs than heavily galled roots. Percentage crude fat content however showed a negative relationship and may be consequent upon protein increases. Hanson *et al* (1961) stated that variations in protein and fat contents are usually inversely related with about two weights of protein equivalent to one of fat. Weiss *et al* (1952) and Leffel (1961) also reported that whatever that decreases fat will cause protein to increase in plant's metabolic sink. Okra pod-ash content was not affected by the relationship between *J. Curcas* application and root-gall responses.

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