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Effects of Plant Extracts and Plant Density on the Severity of Leafspot Disease of Groundnut (*Cercospora arachidicola.* Hori) in Imo State

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Abstract: A two season Experiment was conducted during the rainy seasons of 2003 and 2004 respectively, to determine the effects of plant extracts and plant density on the severity of leafspot disease and yield of groundnut *Cercospora arachidicola* Hori in Imo State. Analysis of variance indicated that plant extract was significant on leafspot disease severity and seed yield (kg ha^{-1}) 110.05, 107.85 in 2003 and 2004. Similarly, plant density was highly significant on leafspot disease severity and seed yield (kg ha^{-1}) 91.15, 88.36. *Azadirachta indica* spray recorded lowest leafspot disease severity while no spray (control) recorded highest. Plant density (10×10) cm recorded highest leafspot disease severity while (40×40) cm had the lowest. Also *Azadirachta indica* spray recorded the lowest seed yield (kg ha^{-1}) 18.06; 17.08. Plant density of (10×10) cm recorded the lowest seed yield (kg ha^{-1}) 16.22, 15.19, while (20×20) cm recorded highest seed yield (kg ha^{-1}) 22.40; 20.69. leafspot disease severity increased with plants age.

Key words: Plant extract, density, Leafs pot, yield, groundnut

Introduction

Groundnut *(Arachis hypogeae* L.) belongs to the family papilionoideae, is both a food and a cash crop and the foliage or haulm provides a valuable fodder for livestock. In Nigeria, 20% of the entire groundnut production is consumed by humans while about 60% is consumed by livestock sector (Wudiri and Fatoba, 1992).

In the forest south, there is always a drastic reduction in yield of groundnut. This has been attributed to the menace of diseases and leafspot disease is the major foliar disease reducing yield of the crop wherever they are grown (Subrahmanyan *et al*., 1980).

Cercospora leafspot are effectively controlled by fungicides. However, difficulties in obtaining fungicides and application machinery, their high cost for small-scale farmers, have made it almost impossible for farmers to effectively use chemical control. This is also coupled with the side effects of the chemicals on other plants, non-target organisms and the environment (Tovigan *et al*., 2001). Moreso, the synthesized drugs sold and used in conventional hospitals or as fungicides are by products of plants. Thus, more emphasis should be on the use of our natural herbs in diseases management (Salako, 2002; Ihejinka, 2001). Hence the purpose of this study is to determine the effects of plant extracts and plant density on leafspot disease severity (*Cercospora arachidicola* Hori.) and yield of groundnut.

Materials and Methods

The experiment was conducted in the research plot of school of Agriculture and Agricultural Technology (SAAT) and laboratory of Federal University of Technology, Owerri in 2003 and 2004,

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respectively, using groundnut variety M554-76 of 90% viability. Sixty-four plots were mapped out and beds measuring 2×1 m were constructed in each plot with 0.4 m as the main plot gap and 0.2 m as the sub plot gap. The treatments comprised 4 levels of spacing and 4 levels of plant extracts in 2003 and 2004, respectively. The four levels of spacing were (10×10) cm, (20×20) cm, (30×30) cm and (40×40) cm, respectively while the 3 levels of plant extracts were extracts from *Azadirachta indica* (Neem leaf), *Ocimum viride* (Cent leaf) and *Vernomia amygdalina* (Bitter leaf) while No spray occurs as the control. The plant extract appears as the main plot while plant density occur as the sub plot. This gives 4×4 = 16 combinations in 4 replications, giving 4×4×4 = 64 plots in randomized complete block design.

Preparation and Application of Plant Materials

The plant materials were dried at room temperature until they were crispy dry and milled with a milling machine. The ground plant materials were passed through a mesh size of 600 um with sieves. Ten gram of the powder of each plant material were mixed with 1 L of water and spread per treatment level. A control experiment containing no spray was set up. Each plot was closely monitored to determine the severity of leafspot disease and yield and yield components of groundnut in 2003 and 2004, respectively.

Data was collected on leafspot disease severity and seed yield (kg ha^{-1}) in 2003 and 2004 respectively. Leafspot disease severity: The severity of the disease were estimated using the visual observation and scoring according to the following format as described by Ford and Herwitt (1980).

Severity estimation (%)	Scale	Interpretation
0	0	No infection
1-20	1	Slight infection
21-40	2	Moderate infection
41-60	3	Extensive infection
61-80	4	Very extensive infection
81-100	5	Leaves completely infected

Seed yield (kg ha^{-1}): After harvesting the pods, the pods were threshed and the seeds weighed in the laboratory, with a precision weighing balance and the yield were recorded in kilogram per hectare. The organisms responsible for the leafspot disease were subsequently determined using the standard blotter methods as recommended by the international seed testing association (ISTA, 1996). Data were analyzed using the methods of Steel and Torrie (1981) as described for the split plot experimental design. Means of treatment were separated using the Fischer's protected Least Significant Difference (LSD)

Results

Results showed a significant difference in leafspot disease severity and seed yield (kg ha^{-1}) at 5% probability level in 2003 and 2004 (Table 1). *Azadirachta indica* spray recorded lowest leafspot disease severity followed by *Vernomia amygdalina* spray, then *Ocimum viride,* when no spray (control) had highest severity of leafspot disease in all the plants age investigated. Also (10×10) cm recorded highest Leafspot disease severity in comparison with (30×30) cm, when (20×20) cm were low in all the stages and seasons investigated (Table 1). Investigation revealed that plant extracts was highly significant on yield (kg ha^{-1}) 110.05, 107.85 in 2003 and 2004, respectively. All the plant extracts and plant densities were directly related to leafspot disease severity with plants age (Table 2 and 3). (10×10) cm recorded lowest seed yield (kg ha^{-1}) 16.22; 15.19 while (20×20) cm recorded highest seed yield (kg ha^{-1}) 22.40, 20.69 in 2003 and 2004, respectively.

Table 1: Analysis of variance mean square values of leaf spot disease severity, plant height and leaf production in 2003 and 2004

	Leaf spot disease severity		Leaf production		Plant height	
Source	2003	2004	2003	2004	2003	2004
Factor A	8.16*	10.13*	420.1	407.2	2.8	3.3
Plot/block (SSK)	1.32	1.71	834.6	875.5	2.6	2.2
Erro (SSAK)	0.30	0.25	755.3	760.4	2.1	2.3
Factor B	8.10*	7.04*	54.2*	537.6*	2.7*	2.6*
AB Interaction	0.21	0.30	136.0	142.2	2.9	2.6
Erro	0.14	0.20	430.2	425.8	3.1	2.8
TSS	1.10	1.09	451.0	433.3	2.5	2.7

*Highly significant at 5% probability level

Table 2: Effects of plant extracts and plant density on leafspot disease severity at different times of plants age and seed yield of groundnut in 2003 and 2004

	Leafspot 4 weeks		Disease 8 weeks		Severity 12 weeks		Seed yield (kg ha^{-1})	
Plant extracts	2003	2004	2003	2004	2003	2004	2003	2004
NOS	0.889	0.790	3.201	3.188	3.870	2.697	16.55	17.08
VS	0.770	0.700	1.980	1.875	2.714	2.563	28.10	27.48
OS	0.795	0.782	2.055	2.375	2.802	2.686	18.90	17.12
NMS	0.585	0.625	1.040	1.313	2.148	2.500	32.80	22.40
LSD (0.05)	0.652	0.780	0.986	1.170	1.514	1.480	6.856	7.200
Plant density (cm)								
10×10	0.980	0.688	3.210	3.00	3.816	3.250	16.22	15.194
20×20	0.506	0.684	1.154	1.375	2.950	2.875	30.14	20.69
30×30	0.693	0.686	1.950	2.188	3.255	3.133	20.22	18.84
40×40	0.654	0.625	2.100	2.088	3.010	2.250	18.90	19.34
LSD 0.05	1.185	1.020	1.621	1.450	1.570	1.600	6.728	7.140

Table 3: Effects of plant extracts and plant density on plant height, leaf formation, number of pods per plant and seed yield (kg ha^{-1}) in 2003 and 2004

	Plants height		Leaf formation		No. of pods per plant		Seed yield (kg ha^{-1})	
Plants extracts	2003	2004	2003	2004	2003	2004	2003	2004
NOS	11.68	12.20	58.90	64.49	10.20	12.10	16.55	17.08
VS	13.64	15.22	68.35	78.86	13.86	13.64	28.10	27.48
OS	13.00	12.79	70.01	69.46	13.80	13.58	18.90	17.12
NMS	16.02	15.57	82.50	79.95	16.50	15.79	32.80	22.40
LSD (0.05)	4.93	5.54	36.44	34.12	7.22	7.07	6.856	7.200
Plant density (cm)								
10×10	15.30	15.44	64.70	65.09	11.35	12.19	22.46	15.194
20×20	15.30	15.24	78.50	71.52	16.06	15.17	30.14	20.69
30×30	14.42	14.88	68.25	77.35	13.21	12.79	20.22	18.84
40×40	14.80	14.67	0.16	78.80	14.00	14.98	18.90	19.34
LSD 0.05		4.33	23.45	21.19	7.24	6.999	6.728	7.140

Discussion

The survey revealed that all the plant extracts and plant density were directly related to leafspot disease severity with plant's age. *Azadirachta indica* spray recorded lowest leafspot disease severity while control recorded highest. This may be attributed to the bitterness of the plant extract, which prevented plant pathogens from entering and attacking the plants. This is in agreement with Salako (2002). Unlike no spray (control) that recorded highest leafspot disease severity due to no bitterness of such and no barrier for disease penetration and symptom manifestation.

Resistance per say, has been attributed to various morphological and anatomical characteristics and chemical constituents of the leaves. They exert toxic effects by disrupting the normal metabolic activities of the organism as proposed by Emeasor *et al.* (2002). (10×10) cm recorded highest leafspot

disease severity. This is because of the crowded nature of plants. The high competition for soil nutrient by this density created nutrient deficiency situation, resulting to quick reaction to disease infection and symptom manifestation. (20×20) cm recorded highest number of pods per plants as well as seed yield (kg ha^{-1}). This may be attributed to ideal competition among plants to accumulate a greater area and explore more water and soil nutrient thereby encouraging pod initiation development and seed yield.

The creation of favourable conduction for absorption of available nutrients also provides ideal crop interaction for efficient use of available soil nutrient for optimum growth and development of the plant. In conclusion (20×20) cm recorded lowest leafspot disease severity but highest seed yield (kg ha^{-1}) while (10×10) cm recorded highest leafspot diseases severity but lowest yield. *Azadirachta indica* spray recorded lowest leafspot disease severity but highest seed yield when no spray (control) recorded highest leafspot disease severity but lowest yield in 2003 and 2004, respectively.

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