CORRELATION COEFFICIENTS BETWEEN KERNEL YIELD OF GROUNDNUT (*Arachis hypogaea* L.) UNDER INFESTATION OF *Alectra Vogelii* (Benth) IN THE NORTHERN GUINEA SAVANNA ECOLOGY OF NIGERIA

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ABSTRACT

A field trial was undertaken in 2007 and 2008 rainy seasons at Mubi in the northern Guinea ecological zone of Nigeria. The objective was to evaluate the efficacy of nitrogen and poultry droppings in ameliorating the effect of Alectra parasitism on groundnut (*Arachis hypogaea* L.) The study was conducted in a split- plot designed with four groundnut varieties (SAMNUT-10, SAMNUT-11, SAMNUT-22, local variety, viz "Kampala") assigned to the main plots ;while three levels of nitrogen (0, 25, 50kgNha^{-1}) and three rates of poultry dung (0.2,5 ,5.0 tonnes $^{-1}$) were combined in factorial lay in the sub-plots. These were replicate three times. In the two years and the combined data kernel yield correlated positively with number of pods plant $^{-1}$ 100 Kernels weight, shelling percentage, crop vigour and plant height (9WAS). In the combined data, the correlation of kernel yield with these five characters were (r=0.695**, 0.283**, 0.625**, 0.549** and 0.440** respectively).

Key words: *Alectra vogelii*, nitrogen, poultry droppings, correlation

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INTRODUCTION

Weed infestation has been a serious threat to crop production (Kwaga, 2010). The menace of weeds can be more devastating and lead to drastic reduction in crop yield especially where parasitic weed is prevalent for years (Kwaga 2012) Alectra vogelii is one of the parasitic weeds that threatens groundnut and cowpea production in northern and southern Guinea Savanna of Nigeria (Kureh, *et al*, 1996, Kureh and Alabi, 2003). Infestation by Alectra has been reported to cause dry matter and grain reduction cowpea (Alonge *et al.*,2002).Groundnut (*Arachis hypogaea* L) is one of the important oil seed crop in Savanna ecology of Nigeria. It was once an important export commodity in the pre-independence era of Nigeria. However, with the coming of the oil boom the crop is mostly consumed locally by providing raw materials to local industries while oil extracted from it is used as cooking oil. The residue after oil extraction is processed into cakes, which is consumed locally or used in formulation of livestock feeds. The kernels are also taken as snacks.

Various strategies have been adopted by farmers to manage the scourge of parasitic weeds. Hand pulling and hoe weeding has been the most common methods used by farmers in the Savanna ecology of Nigeria. These methods have been ineffective, since much damage has been done to crop before the parasitic weeks emerge. The use of nitrogenous fertilizers have been found to improve crop yield inspite of *Alectra* infestation (Parker, 1978, Magani, 1992, Tarfa *et al.*,; 1996, Kwaga, 2004) Furthermore application of poultry droppings has been found to reduce Alectra infestation and enhance groundnut yield. (Kwaga, 2012)Carrying out correlation analysis among plant characters can reveal those characters that have significant influence on the performance of the crop. This can be used as appropriate traits for selection in breeding programme. Therefore this correlation was carried out to identify groundnut characters that have marked influence on groundnut yield.

MATERIALS AND METHODS

An experiment was conducted in the field in 2007 and 2008 rainy seasons to assess the efficiency of nitrogen and poultry droppings in ameliorating the parasitism of

Alectra vogelii on groundnut. The study was undertaken at the Teaching and Research Farm of Adamawa State University, Mubi in the northern Guinea Savanna ecology of Nigeria. The soil of the area is broadly classified as alfisols (Brady and Weil, 1990)..

The trial was laid out in a split-plot design with four groundnut varieties (SAMNUT-10, SAMNUT-11, SAMNUT-22, Local variety "Kampala") assigned to the main plots. Three nitrogen levels (0,25, 50KgNha^{-1}) and three rates of cow dung (0 ,2.5, 5.0 tonnes ha^{-1}) were combined in a factorial lay in the sub-plots. The trial was conducted in a field that has been naturally infested with *Alectra.* In the two years the crop was sown on July 4, at the rate of two seeds per hill at inter-row spacing of 75cm and intra-row spacing of 25cm. Nitrogen and poultry droppings were applied at the rate for each treatment. Poultry droppings were broadcasted and incorporated into the soil before seeding. Nitrogen was applied by side placement in two equal split doses at two weeks after sowing (WAS) and 6 WAS. Phosphorus was applied by side placement to all the plots uniformly at the ate of 22hgPha^{-1}.using single super-phosphate(18%)

The trial was hoe weeded at 3 and 7 WAS but hand pulled at 11WAS to avoid tampering with the un-emerged and emerged *Alectra* shoots. Emerged *Alectra* shoots were counted weekly from the time the first emerged Alectra shoot was observed in the trial. Crop vigour was assessed on the scale of 1 – 5; 1 =very weak plants 5 = very vigorous plants exhibiting flourishing normal growth. Correlation was run using SAS software for the various plant data collected.

RESULTS

The correlation coefficients between kernel yield and other groundnut characters in 2007, 2008 and combined are presented in Tables 1 – 3. In 2007 (Table 1), groundnut kernel yield exhibited significant positive correlation with plant height (9WAS), Crop vigour (9WAS), number of pods plant, $^{-1}$ shelling percentage and 100kernels weight (r = 0.473**, 0.420**, 0.777**, 0.685** and 0.646* respectively). Furthermore, plant and 100 Kernels yield (r = 0.587** and 0.380** respectively). Also crop vigour associated significantly positive with 100 kernels weight and number of *Alectra* shouts at 12 and 15 WAS (r = 0.319**, 0.196* and 0.209* respectively). Number of Pods per plant showed

appreciably positive correlation with shelling percentage and 100 kernels weight (r+0.579** and 0.418** respectively). Similarly shelling percentage had significant and positive association with 10 kernels weight. (r=0.464*). Also there was significant positive correlation haulm yield and number of *Alectra* shouts at 12 WAS (r=0.211*).Furthermore, number of *Alectra* shoots at 12 and 15 WAS had significantly positive relationship (r=0.935**).

TABLE 1: simple correlation coefficients between kernel yield and other characters of groundnut grown under *Alectra* infestation at Mubi in 2007 rainy season

	K1	K2	K3	K4	K5	K6	K7	K8	K9
K1	1.0000								
K2	0.473**	1.0000							
K3	0.420**	0.587**	1.0000						
K4	0.777**	0.097	0.147	1.0000					
K5	0.685**	0.107	-0.008	0.579**	1.0000				
K6	0.646**	.380**	0.319**	0.418**	0.464**	1.0000			
K7	0.082	-0.066	-0.017	-0.069	-0.083	-0.025	1.0000		
K8	0.187	0.187	0.196*	0.121	0.099	0.211*	-0.032	1.0000	
K9	0.122	0.136	0.209*	0.081	0.040	0.135	-0.058	0.935**	1.0000

K1	=	Kernel yield
K2	=	Plant height (12WAS)
K3	=	Crop Vigour score (9WAS)
K4	=	Number of mature pods/plant
K5	=	Shelling percentage
K6	=	100 Kernels weight
K7	=	Haulm yield
K8	=	*Alectra* shoots number (12WAS)
K9	=	*Alectra* shoots number (15WAS)
*	=	Significant at 5% level of probability
**	=	Significant at 1% level of probability
WAS	=	Weeks after sowing.

In 2012 rainy season, kernel yield showed significant correlation with plant height, crop vigour, number of pods plant $^{-1}$ 100 Kernels weight and haulm yield (r=0.397**, 0.589**, 0.677**, 0.522**, 0.370* and 0.414* respectively). Similarly plant height related significantly and positively with crop vigour, 100 Kernels weight and haulm yield (r=0.519**, 0.305** and 0.562** respectively). Also Crop Vigour exhibited significantly positive correlation with number of Pods plant$^{-1.}$ shelling percentage, 100

kernels weight, haulm yield and number of Alectra shots at 12 WAS (r=0.308**, 0.411**, 0.301**, 0.536** and 0.197* respectively). Similarly, number of Pods plant^{-1}-related significantly and positively with shelling percentage, 100kernels weight and haulm yield (r=0.355**, 0.258** and 0.193* respectively). Furthermore, there was significant positive association between shelling percentage and 100kernels weight, 100 kernels weight and haulm yield and then between *Alectra* shoots number at 12 WAS and at 15 WAS (r=0.205*, 0.390** and 0.918** respectively).

TABLE 2: simple correlation coefficients between kernel yield and other characters of groundnut grown under *Alectra* infestation at Mubi in 2008 rainy season

	K	K2	K3	K4	K5	K6	K7	K8	K9
K1	1.0000								
K2	0.397**	1.0000							
K3	0.589**	0.519**	1.0000						
K4	0.677**	-0.038	0.308**	1.0000					
K5	0.522**	0.088	-0.411**	0.355*	1.0000				
K6	0.370**	0.305*	0.301**	0.258**	0.205**	1.0000			
K7	0.414**	0562**	v0.536**	0.193*	0.186	0.390**	1.0000		
K8	0.051	0.147	0.197*	0.006	0.038	0.058	-0.053	1.0000	
K9	0100	0.093	0.153	0.1087	0.102	0.057	-0.081	0.0918**	1.0000

K1 = Kernel yield
K2 = Plant height (12WAS)
K3 = Crop vigour score (9WAS)
K4 = Number of mature pods/plant
K5 = Shelling percentage
K6 = 100 Kernels weight
K7 = Haulm yield
K8 = *Alectra* shoots number (12WAS)
K9 = *Alectra* shoots number (15WAS)
* = Significant at 5% level of probability
** = Significant at 1% level of probability
WAS = Weeks after sowing.

The combined data (Table 3) showed that kernel yield related significantly positive with plant height, crop vigour, number of pods plant^{-1} shelling percentage and 100 Kernels weight, (r=0.399**, 0.549**, 0.695**, 0.625** and 0.283** respectively.) Plant height associated significantly and positively with crop vigour score and *Alectra*

shoots number at 12 WAS (r=0.441** and 0.164* respectively).. Also crop vigour exhibited appreciably positive correlation with number of Pods plant^{-1}, shelling percentage, 100 Kernels weight and haulm yield (r=0.238**, 0.325**, 0.141** and 0.189** respectively). Similarly there was significant positive correlation between number of pods plant -1 and shelling percentage and then 100kernels weight (r=0.461** and 0.137* respectively). Significantly positive relationship was also exhibited between shelling percentage and 100 kernels weight, and between number of *Alectra* shoots at 12 and 15 WAS (r=0.231** and 0.922** respectively. It appears that cob length, 100 grains weight and plant height could be considered as prominent selection criteria in works on maize.

TABLE 3: simple correlation coefficients between kernel yield and other characters of groundnut grown under *Alectra* infestation at Mubi in 2007 and 2008 rainy season

	K1	K2	K3	K4	K5	K6	K7	K8	K9
K1	1.0000								
K2	0.399**	1.0000							
K3	0.549**	0.441**	1.0000						
K4	0.695**	0.014	0.238**	1.0000					
K5	0.625**	0.089	-0.325**	0.461**	1.0000				
K6	0.283**	0.118	0.141**	0.137*	0.231**	1.0000			
K7	0.045	-0.011	0.189**	-0.002	0.048	-0.031	1.000		
K8	0.096	0.164*	0.112	0.042	-0.025	0.109		0.062	1.000
	0.100	0.115	0.101	0.070	-0.006	0129	-0.079	0.922**	1.0000

K1 = Kernel yield
K2 = Plant height (12WAS)
K3 = Crop Vigour score (9WAS)
K4 = Number of mature pods/plant
K5 = Shelling percentage
K6 = 100 Kernels weight
K7 = Haulm yield
K8 = *Alectra* shoots number (12WAS)
K9 = *Alectra* shoots number (15WAS)
* = Significant at 5% level of probability
** = Significant at 1% level of probability
WAS = Weeks after sowing.

DISCUSSION

Groundnut kernel yield exhibited significantly positive correlation with number of mature pods plant^{-1}, 100 kernels weight and shelling percentage. This indicates that these characters exert considerable influence on groundnut kernel yield. Similarly in a field trial in the savanna ecology of Nigeria, Kwaga (1994) noted that number of mature pods per plant showed the highest significant positive correlation with groundnut kernel yield. Also Tanimu (1996), Shebayan (1998), Kwaga (2004) reported positive correlation between grain yield and grain weight in bambara groundnut (Vigna subterranean L.Verdeourt), soybean (Glycine max L. Merill) and groundnut (Arachis hypogaea L.) respectively. The significant effect of these characters on the yield performance of legumes shows they are yield determinants in these legumes. Therefore selection of varieties that are high in these characters or utilizing factors that can increase the character such as phosphorus fertilization could possibly enhance the yield of groundnut (Kwaga, 2004).

The positive association between groundnut kernel yield and plant height and with crop vigour, shows that some appreciable level of vegetative performance as source for production of assimilates is necessary for the good performance of groundnut. Furthermore, these growth characters also exhibited positive correlation with yield determinants such as number of pods plant^{-1}, shelling percentage and 100 kernels weight. This underscores the indirect influence of these characters on groundnut grain yield. Furthermore, these yield components related positively with each other. which shows their interrelationship which could act in combination to influence groundnut kernel yield.

The observed positive correlation between crop vigour and 100 kernels weight with number of *Alectra* shoots can be attributed to level of *Alectra* infestation. Ogborn (1987) asserted that vigorous plants support higher parasitic weed infestation. As a parasitic weed *Alectra* plant develops a hanstorium which invades the root of the host plant, thereby creating a conductive bridge that withdraws water and nutrients from the host plant. (Nwoke, 1982).

Therefore, vigorous crop plants have more resources to provide for itself and the parasitic weeds, hence it can support higher parasitic weed population in contrast to

weaker plants which have limited resources. However, when the *Alectra* infestation becomes very heavy it can destroy the vigour of the crop and weaken it to the extent that it results in shedding of leaves in groundnut with resultant yield reduction. This was noted by Kwaga (2004) in a pot experiments conducted in the northern Guinea savanna of Nigeria, who reported negative correlation of crop vigour, with pod yield and with *Alectra* shoots population under heavy *Alectra* infestation. Therefore under light infestation, groundnut can exhibit high crop vigour and high yield, but under heavy infestation crop vigour and groundnut is depressed.

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