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# Correlation Coefficients Between Kernel Yield And Other Characters Of Groundnut (*Arachis Hypogaea* L.) Under Infestation Of *Alectra Vogelii* (Benth) In The Semi-Arid Zone Of Nigeria

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***Abstract :*** *Field Trial was conducted in 1999 and 2000 at Samaru in the northern Guinea Savanna zone of Nigeria to assess the performance of 36 groundnut (Arachis hypogaea L) genotypes to Alectra vogelii (Benth). The trial was undertaken in a field that was naturally infested with Alectra. It was laid out in a randomized complete block design (RCBD) with three replications. The combined data of the two years showed that kernel yield exhibited significantly positive correlation with crop vigour at 9 weeks after sowing (WAS). Crop vigour 12 WAS, Alectra shoots population 9 WAS, Alectra shoots population 12 WAS, number of mature pods, shelling percentage, haulm yield and 100 – kernel weight (r = 0.168*, 0.197**, 0.227**, 0.253**, 0.695**, 0.332**, 0.399** and 0.537** respectively). Plant vigour 12 WAS related strongly positive to number of mature pods and shelling percentage (r = 0.199**m 0.150* respectively). Also kernel weight correlated significantly positive with Alectra shoots population at 12WAS, shelling percentage and haulm yield (r = 0.351**, 0.254**, 0.567** respectively).*
***Key words:*** *Alectra vogelii, correlation, groundnut.*

## I. INTRODUCTION

*Alectra vogelii* (Benth) is a weed that parasitizes on leguminous crops such as groundnut, cowpea, bambara groundnuts, and soybeans (Mambosa and Lagoke, 1991, Kureh *et al.*, (1996). The weed belongs to the scrophulariaceae family. The scourge of the weed can be very devastating and can lead up to 100% loss in yield (Alonge, *et a.*,; 2002; Kwaga, 2004). The parasite depletes the host plant of water and nutrients which results in chlorosis, necrosis and shading of leaves in groundnut crop when infection is severe.Groundnut (*Arachis hypogaea* L.) is an important oil seed crop in Nigeria. Although the crop was an important export commodity in the pre-independence Era, it is now mostly utilized by local industries for the production of vegetable oil. After the extraction of the edible oil, the cake is consumed locally by man or processed into livestock feeds. The kernels are also roasted and taken as snacks. Despite the threat of *Alectra* to the production of groundnut and other legumes; there is paucity of work done on the control of the weed. Farmers find it difficult to control the parasitic weed as it produces large number of seeds and causes up to 75% damage before it emerges, (Singh *et al*., 2002).Various methods have been used for the control of parasitic weeds, however use of resistant varieties has been considered as most economical and environmentally friendly (El – Hiweris, 1987; Lane *et al*., 2002). Although some work has been done in developing *Alectra* resistant cowpea varieties, not much has been done with respect to groundnut (Singh *et al.*, 2002, Kamara *et al.*, 2008).

Correlation is carried out in crop research to determine the relationship between the different plant characters. This can serve to identify the characters that have great influence on crop yield and use them as appropriate traits for selection in crop breeding.

## II. MATERIALS AND METHODS

A field trial was conducted at the experimental research farm of the institute of Agricultural Research (IAR), Samaru ($11^{o}11$'N;, $07^{o}38$'E) in the northern Guinea Savanna ecology of Nigeria in 1999 and 2000 rainy seasons. The soil of the areas is classified as afisol. The soil of the experimental site is loamy in texture with pH of 5.8, total N 0.2 $gkg^{-1}$, P 10.1 mg $kg^{-1}$. Thirty-six groundnut varieties were evaluated, out of which thirty were from International Research Institute for Semi-Arid Tropics (ICRISAT) and six from IAR. The treatments were laid out in randomized complete block design (RCBD) with three replications. The trial was conducted in field that was naturally infested with *Alectra*.

Sowing was done in the first week of July in 1999 and Mid-June in 2000. Two seeds were sawn per hill at the spacing of 75cm by 25cm. The area for each plot was $9m^2$ comprising four ridges that were 75cm apart. Phosphorus was applied as side placement using single superphosphate at the rate of 22kg P $ha^{-1}$ at two weeks after sawing (2 WAS). The trial was hand weeded at 2, 5 and 8 WAS. The last two weeding were done by hand pulling to avoid tampering with the un-emerged and emerged *Alectra* shoots. Emerged *Alectra* shoots were counted weekly from the time the first *Alectra* shoots was observed in the field. The yield was determined from a net plot area of $4.5m^2$ consisting the two inner rows of each plot. Data were analyzed and correlation ran using SAS packages.

## III. RESULTS

The correlation coefficients between kernel yield, other groundnut characters and *Alectra* shoots number in 1999, 2000 and combined data are presented in tables 1-3, Kernel yield had significant positive correlation to plant height (r=0.302**) only in 1999; while it related positively to crop vigour at 9WAS in 1999 and combined data (r = 0.317** and 0.168*, respectively) similarly at 12 WAS, kernel yield exhibited significant positive association with crop vigour in 1999 and combined data (r = $0.254^{**}$ and $0.197^{**}$ respectively). Also in 1999 and combined analysis kernel yield showed positive correlation with *Alectra* shoots at 9 WAS (r=0.192* and 227** respectively). Furthermore, in the two years and the combined data it related positively to *Alectra* shoots number at 12WAS (r = 0.315**, 0.296** and 0.253** respectively). Number of pods per plant had appreciable positive correlation to kernel yield in both years and the combined data (r =0.464, 0.696*** and 0.695**respectively). Similarly shelling percentage exhibited markedly positive association with kernel yield in the two years and the combined data (r = 0.267**, 0.436** and 0.332** respectively). Haulm yield also related significantly positive with kernel yield in both years and the combined analysis (r = 0.434**, 0.716** and 0.399** respectively), Kernel yield also exhibited considerably positive correlation with 100 kernel weight in the two years and the combined data (r = 0.563**, 0.643** and 0.537** respectively).

Plant height correlated significantly positive with crop vigour at 9WAS in 2000 and combined analysis (r = 0.413** and 0.200** respectively). Also plant height showed significant and positive association with *Alectra* shoots number in the two years and combined analysis (r = 0.234**, 0.298** and 284** respectively). In addition to the above characters ,plant height exhibited significant correlation only in 1999 with *Alectra* shoots number only 12 WAS, number of mature pods and shelling percentage (r = 0.267**,0.217* and 257** respectively). Plant vigour at 9WAS had no significant correlation with any character in 2000. However, it related markedly positive with crop vigour at 9 WAS in 1999 and combined data (r = 0.302** and 0.203** respectively). Furthermore, it correlated significantly positive with number of mature pods, haulm yield, 100-kernel weight in 1999 and haulm yield, in the combined data (r = 0.201*, 0.270**, 0.343** and 0.199** respectively). Plant vigour at 12 WAS showed significant positive association with number of mature pods in 1999 and combined data (r = 0.240* and 0.199*** respectively. However it related considerably positive with shelling percentage only in 2000 (r = 0.305**). Furthermore, it exhibited significantly positive correlation with haulm yield in 1999 and combined data (r =0.201* and 0.150* respectively). *Alectra* shoots number at 9WAS related significantly positive with *Alectra* shoots number at 12 WAS in both years and combined data (r = 0.403**, 0.297** and 0.304** respectively). It also related significantly positive with shelling percentage (r = 0.329**) in 1999 only and number of mature pods in combined data only (r = 0.169*). The only other significant relationship exhibited by *Alectra* shoots number was positive association to 100 kernel yield in 1999. Also the only other significant correlation showed by number of mature pods was its positive correlation to shelling percentage and haulm yield in 2000 (r = 0.219 and 0.400** respectively). Shelling percentage related significantly positive with haulm yield in 2000 only (r = 0.220*), and with 100-kernel weight in 2000 and combined data (r = 0.430** and 0.254** respectively). In the two years and the combined data haulm yield related positively with 100 kernel weight (r = 0.583**, 0.630**and 567** respectively.

## IV. DISCUSSION

Kernel yield had positive correlation with vegetative characters; which were plant height, crop vigour and haulm yield. This shows that the vegetative performance of groundnut has great effect on its kernel yield. The foliage of the plant is the source where photosynthesis takes place which lead to the production of assimilates which are transported to kernel which serves as the sink. Also the positive association between kernel yield and number of mature pods, shelling percentage and kernel weight indicate that these characters are yield contributors. As yield attributes they significantly influence in the yield of groundnut, therefore marked increase in these characters has

positive effect in increasing the yield of the crop. Similarly, Tanimu (1996) and Shebayan (1998) reported correlation between kernel and grain yield of bambara groundnut and soybean respectively. Furthermore, the vegetative characters such as crop vigour, haulm yield and plant height also exhibited positive relationship with the yield attributes, number of mature pods and kernel weight. This is a confirmation of their role as yield attributes of groundnut kernel. The positive association between plant height and crop vigour indicate that plant height is an expression of crop vigour except in the case of etiolated growth which could result from the competition or struggle to intercept solar radiation, Higher number of pods can result in greater competition for assimilates and give kernels of lighter weight.

There was observed positive relationship between *Alectra* infestation and kernel yields number of mature pods and kernel weight. As a parasitic weed *Alectra* withdraw water, nutrients from host plants through a conductive bridge created by the *Alectra* plant between it and the host plant. This is expected to deplete the host of resources. Kwaga (2004) observed that *Alectra* shoots population related negatively with groundnut pod yield. These differences can be attributed to the level of infestation. There was greater *Alectra* infestation in the former case than the present one. Ogborn (1987) asserted that vigorous plants support higher parasitic weed infestation. Therefore vigorous plants can support parasitic weed population because they have enough resources for their utilization and still provide for the high population of parasitic weeds. Therefore when *Alectra* infestation is not heavy enough to suppresses the crop vigour and vegetative performance, there could be positive relationship between *Alectra* population and these characters and ultimately associate positively with crop yield.

Table 1: Simple correlation coefficients between kernel yield and other characters of groundnut grown under *Alectra* infestation at Samaru in 1999 rainy season.

| | V1 | V2 | V3 | V4 | V5 | V6 | V7 | V8 | V9 | V10 |
|---|---|---|---|---|---|---|---|---|---|---|
| V1 | 1.000 | | | | | | | | | |
| V2 | 0.302** | 1.000 | | | | | | | | |
| V3 | 0.317** | -0.036 | 1.000 | | | | | | | |
| V4 | 0.254** | 0.098 | 0.362 | 1.000 | | | | | | |
| V5 | 0.192** | 0.234* | -0.029 | 0.003 | 1.000 | | | | | |
| V6 | 0.315** | 0.267** | -0.046 | 0.064 | 0.403** | 1.000 | | | | |
| V7 | 0.464** | 0.217* | 0.201* | 0.240* | -0.025 | -0.009 | 1.000 | | | |
| V8 | 0.267** | 0.257** | -0.095 | -0.071 | 0.329** | 0.142 | 0.072 | 1.000 | | |
| V9 | 0.434** | -0.124 | 0.270** | 0.201* | -0.190* | 0.008 | 0.080 | -0.215* | 1.000 | |
| V10 | 0.563** | -0.042 | 0.343** | 0.119 | -0.001 | 0.269** | -0.038 | 0.087 | 0.583** | 1.000 |

| | | |
|---|---|---|
| V1 | = | Kernel yield |
| V 2 | = | Plant height (9 WAS) |
| V 3 | = | Crop Vigour (9 WAS) |
| V4 | = | Crop Vigour (12 WAS) |
| V5 | = | *Alectra* shoots number (9 WAS) |
| V6 | = | *Alectra* shoots number (12 WAS) |
| V7 | = | Number of mature pods /plant |
| V8 | = | Shelling percentage |
| V9 | = | Haulm yield |
| V10 | = | 100 kernel weight |
| | | |
| * | = | Significant at 5% level of probability |
| ** | = | Significant at 1% level of probability |
| WAS | = | Weeks after sowing. |

Table 2: Simple correlation coefficients between kernel yield and other characters of groundnut grown under *Alectra* infestation at Samaru in 2000 rainy season.

| | V1 | V2 | V3 | V4 | V5 | V6 | V7 | V8 | V9 | V10 |
|---|---|---|---|---|---|---|---|---|---|---|
| V1 | 1.000 | | | | | | | | | |
| V2 | 0.013 | 1.000 | | | | | | | | |
| V3 | 0.127 | 0.413** | 1.000 | | | | | | | |
| V4 | 0.162 | 0.061 | -0.037 | 1.000 | | | | | | |
| V5 | 0.149 | 0.298*** | 0.163 | 0.061 | 1.000 | | | | | |
| V6 | 0.296** | 0.037 | 0.124 | 0.073 | 0.297** | 1.000 | | | | |
| V7 | 0.696** | -0.068 | 0.122 | 0.142 | 0.090 | 0.093 | 1.000 | | | |
| V8 | 0.436** | - 0.052 | -0.090 | 0.305** | -0.044 | 0.074 | 0.219* | 1.000 | | |
| V9 | 0.716** | -0.080 | 0.095 | 0.106 | -0.024 | 0.237** | 0.400** | 0.220* | 1.000 | |
| V10 | 0.643* | -0.169 | -0.001 | 0.141 | 0.158 | 0.392** | 0.184 | 0.430** | 0.630** | 1.000 |

V1 = Kernel Vield
V 2 = Plant height (9 WAS)
V 3 = Crop Vigour (9 WAS)
V4 = Crop Vigour (12 WAS)
V5 = Alectra shoots number (9 WAS)
V6 = Alectra shoots number (12 WAS)
V7 = Number of mature pods /plant
V8 = Shelling percentage
V9 = Haulm yield
V10 = 100 kernel weight
* = Significant at 5% level of probability
** = Significant at 1% level of probability
WAS = Weeks after sowing.

Table 3: Simple correlation coefficient between kernel yield and other characters of groundnut grown under *Alectra* infestation at Samaru in 1999 and 2000 rainy seasons(combined).

| | V1 | V2 | V3 | V4 | V5 | V6 | V7 | V8 | V9 | V10 |
|---|---|---|---|---|---|---|---|---|---|---|
| V1 | 1.000 | | | | | | | | | |
| V2 | 0.121 | 1.000 | | | | | | | | |
| V3 | 0.168* | 0.200** | 1.000 | | | | | | | |
| V4 | 0.197** | 0.086 | 0.203** | 1.000 | | | | | | |
| V5 | 0.227** | 0.284** | 0.081 | 0.048 | 1.000 | | | | | |
| V6 | 0.253** | 0.122 | 0.047 | 0.053 | 0.304** | 1.000 | | | | |
| V7 | 0.695** | 0.064 | 0.119 | 0.199** | 0.169* | 0.020 | 1.000 | | | |
| V8 | 0.332** | 0.106 | -0.089 | 0.034 | 0.113 | 0.108 | 0.098 | 1.000 | | |
| V9 | 0.399** | -0.114 | 0.199** | 0.150* | -0.131 | 0.115 | 0.084 | -0.074 | 1.000 | |
| V10 | 0.537** | -0.128 | 0.111 | 0.087 | -0.087 | 0.352 | 0.054 | 0.254** | 0.567** | 1.000 |

V1 = Kernel Vield
V 2 = Plant height (9 WAS)
V 3 = Crop Vigour (9 WAS)
V4 = Crop Vigour (12 WAS)
V5 = *Alectra* shoots number (9 WAS)
V6 = *Alectra* shoots number $14.5m^2$ (12 WAS)
V7 = Number of mature pods /plant
V8 = Shelling percentage

| | | |
|---|---|---|
| V9 | = | Haulm yield |
| V10 | = | 100 kernel weight |
| * | = | Significant at 5% level of probability |
| ** | = | Significant at 1% level of probability |
| WAS | = | Weeks after sowing. |

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