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Effect of cowpea on growth and yield parameter in a maize-cowpea intercrop

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ABSTRACT: An experiment was carried out during the raining season of the year 2011 at the Teaching and Research Farm of Oyo State College of Education (Now Emmanuel Alayande College of Education, Oyo), Lanlate Campus, to investigate the effect of geometric row arrangement on the growth and yield of cowpea in a maize-cowpea intercrop. There were 1:1, 1:2 and 2:1 maize/cowpea row arrangement with a sole crop of cowpea as control. The experiment was laid on out in a Random Complete Block Design (RCBD) with three replicates, No significant difference among the growth parameter (plant height, number of leaves and number of branches) intercropped and the sole cowpea plants ($p<0.05$). However cowpea intercropped with maize at 1:1 row arrangement recorded highest grain yield per plant and consequently per hectare than those of 1:2 and 2:1 row arrangement, through not significantly difference from them. It is hereby recommend that cowpea and maize should be planted at 1:1 row arrangement.

Keywords: *Row, Arrangement, Maize, Cowpea, Intercropping*;

INTRODUCTION

Maize (*Zea mays*) and cowpea *(Vigna unguiculata)* are important components of traditional mixed cropping system in the tropics because of the associated benefits; notable among which are suppression of weeds, maintenance of soil fertility, protection of soil against soil erosion and soil water losses, insurance against crop failure. Intercropping practice helps to increase profit margin of the farmers, and usually suppress growth of weeds. It also controls pests and diseases occurrence and guides against crop failure (Agbato, 2000).

Several research works have been reported on intercropping. Webster and Wilson (1996) concluded that in most of the experiments on mixed cropping in the tropics, more than one *acre* of pure stand was required to produce the yield of one *acre* of mixed crop and concluded that for the tropical small scale farmer, there was no advantage to gain by replacing the traditional practice of mixed cropping.

Ezello (1999) reported that intercropping maize is one of the most popular mixed cropping combinations under rain-fed agriculture in the tropics. Cultivation of maize in combination with other crops is therefore a widespread practice in Nigeria, most especially in the South-west. It is not uncommon to see crops like legumes, okra, melon, pepper and cassava being intercropped with maize. In intercropping, sowing crops in the normally recommended uniform row distance would afford little or no opportunity for accommodating a companion crop; hence most African farmers grow around 30,000 maize plants per hectare recommended in a monocrop condition (Alofe *et al*, 1988). In general, agronomic recommendation for intercropping maize with cowpea and other food

crops is scanty most especially relating to other row arrangement and optimum population density of the component crop(s).

Maize (*Zea mays L.*) or corn as it is called in the United States of America and ranks second to wheat among the world's cereal crops in term of production (CIMMYT, 1990). This might be due to its lower prices relative to other cereals and a wider range of uses than any other cereal most especially in developing world.

Maize is essentially an important component of the farming systems and the diet of many people in the tropics and can be processed into different products for various end uses both at the traditional level and industrial scale, though a large production of products utilized in developing countries is obtained via traditional processing while industrial processing meets the bulk of the demand in developed countries (Ogieva, 1998).

Maize is the most highly distributed cereal in the World used for human and animal feeds as well industrial purposes. Maize and cowpea are widely grown in mixed cropping system of the tropics.

The objective of this project work is to assess the effects of geometric row arrangement on the growth and yield performance of cowpea in a maize-cowpea intercrop.

MARERIAL AND METHOD

The experiment was carried out at the Teaching and Research Farm of Oyo State College of Education, Lanlate Campus during the raining season of year 2011.

The experimental design used was Randomized Complete Block Design (RCBD) with three replicates. Plot size was 3m X 3m ($9m^2$). There were five treatments. Sole Cowpea, 1:1 Cowpea/Maize alternate rows, 1:2 Cowpea/Maize alternate rows, 2:1 Cowpea/Maize alternate rows and Sole Maize

Swan-1 yellow maize and Ife-brown cowpea varieties were used.

Prior planting, the experimental land was mechanically prepared by ploughing and harrowing after which a composite soil sample was taken for pre-planting soil analysis. The plots were later laid out and treatments were randomly assigned onto the plots.

The planting of Maize and the Cowpea were simultaneously done on 16th July, 20011 at a spacing of 60cm and 30cm between and within rows respectively for both crops.

Two weeding regimes were carried out at 2^{nd} and 5^{th} weeks of planting. NPK 15:15:15 fertilizer was applied to maize at 400kg/ha. Cowpea plants were sprayed with Cypermenthrin at (1.0lit/ha) at both flowering and podding stages.

Five (5) plants each of maize and cowpea were randomly sampled in each plot for data collection on the following parameters; Number of leaves, Plant height, Number of branches, Number of harvested pods/plant, Number of grain per pod, Grain yield per plant, Grain yield per plot

Data were analyzed using Analysis of Variance and mean values were separated with Duncan Multiple Range Test (2004).

RESULTS AND DISCUSSION

Analysis of the soil (Table 1) shows that the soil was sandy-loamy in texture and slightly acidic (pH 6.0). The Cation Exchange Capacity (CEC) could be rated medium while % Nitrogen, % Organic Carbon and available Phosphorus were found to be low in the experimental site according to the fertility classes (FPDD/MANR, 2002).

Geometric arrangement of intercropped Cowpea and Maize had no significant effect on average plant height number of leaves and branches per plant of Cowpea (P> 0.05) at 3, 6, 9 and 12WAP. However at 9th and 12th WAP, sole stands of cowpea were taller than the intercrops of Cowpea/Maize planted at 1:1 shorter than 1:2 and 2:1 rows. The shortest plants of Cowpea during the period were those from 1:1 Cowpea/Maize.

Cowpea plants in 1:1 Cowpea/Maize row arrangement recorded lowest number of leaves per plant at both 6th and 9th WAP and recorded the highest number of leaves at 12 WAP, though not significantly different from other row arrangement as shown in Table 2.

The non significant of the average number of leaves of cowpea was contrary to observation made by Eagles (1990) who reported that shading had significant effect on Cowpea during intercropping. Though the shading effect delayed shedding of leaves in Cowpea plants of 1:1 Cowpea/Maize row arrangement.

Cowpea showed a sharp dropping of leaves especially in Cowpea planted at 1:2 Cowpea/Maize during the 12WAP due to the crop maturity and senescence. This was similar to Wahua (1993) observation who reported that "Heavy shading of cowpea by intercropped maize at anthesis could have accelerated leaf senescence with attendant losses of lower leaves from the legumes.

In general, the plant in sole crop had the highest average number of branches per plant than the intercropped plants (Table 4). It is being suggested that increase in nutrient supplied at the 6WAP caused the rapid growth of legumes branches. This is contrary to result obtained by Blaser and Brady (1990) who indicated that vigorously growing grasses usually dominate associated legumes and take up larger amount of nutrient.

Moreover, Wahua (1993) also obtained a different results who showed that intercropped cowpea behaved differently their uptake pattern resembled that of sole crops only up to 40 days after planting, after 40 days uptake decreased significantly.

Sole Cowpea plants produced significantly highest number of harvested pods per plant than those that were intercropped with Maize at 1:1 and 1:2 row arrangements (Table 5).

The least number of harvested pods per plant was recorded in Maize/Cowpea intercropped 1:2 row arrangement.

As expected Sole Cowpea plants produced significantly highest grain yield per plant (23g) and consequently per hectare than Cowpea plants intercropped at 1:2 and 2:1 Cowpea/Maize row arrangement (Table 5).

Cowpea/Maize planted at 1:1 row arrangement produced highest grain yield per plant and per hectare than other row arrangements though not significantly different from other intercrops as well as the Sole crops of Cowpea (Table 5).

The least grain yield per hectare was obtained from Cowpea intercropped with Maize at 1:2 Cowpea/Maize row arrangement (0.06tons/ha).

CONCLUSION

The result from the experiment showed that geometric row arrangement of maize-cowpea intercropped had no significant effect on the growth of cowpea in terms of plant height, number of leaves and number of branches per plant.

Grain yield per plant and per hectare was significantly different from cowpea intercropped with maize in 1:2 and 2:1 maize/cowpea row arrangement but not with 1:1 maize/cowpea arrangement.

Also, the intercrops were not significantly different from each other. However, cowpea intercropped with maize at 1:1 row arrangement recorded the highest grain yield per plant and per hectare, which were significantly different from sole crops.

It is recommended that planting of cowpea/maize mixture should be 1:1 row arrangement.

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Appendix

Table 1: Result of the pre-planting Soil Analysis

Parameter	Soil Sample
pH	6.0
Organic Carbon	1.07%
Organic Matter	0.62%
Nitrogen (N)	0.06%
Phosphorus (P)	0.26mg/kg
Potassium (K)	0.23cmol/kg
Sodium (Na)	0.39cmol/kg
Sand	79%
Silt	15%
Clay	6%

Table 2: Effects of geometric row arrangement on plant height of cowpea at 3, 6, 9 and 12 Weeks after planting (cm)

	Weeks after planting			
Treatment	**3**	**6**	**9**	**12**
Sole Cowpea	19.8	41.9	56.7	62.6
1:1 Maize/Cowpea	21.6	39.4	53.5	57.3
1:2 Maize/Cowpea	19.1	40.5	55.2	62.1
2:1 Maize/Cowpea	19.5	37.1	55.9	59.6
	ns	ns	ns	ns

ns= not significantly different from each other at P<0.05

Table 3: Effects of geometric row arrangement on mean numbers of Cowpea leaves at 3, 6, 9 and 12 weeks after planting

	Weeks after planting			
Treatment	**3**	**6**	**9**	**12**
Sole Cowpea	13.6	73.6	84.7	47.0
1:1 Maize/Cowpea	15.4	50.6	71.1	56.0
1:2 Maize/Cowpea	13.8	56.8	92.4	40.5
2:1 Maize/Cowpea	14.2	74.8	73.5	36.6
	ns	ns	ns	ns

ns= not significantly different from each other at P<0.05

Table 4: Effects of geometric row arrangement on mean number of cowpea branches at 3, 6, 9 and 12

	Weeks after planting			
Treatment	**3**	**6**	**9**	**12**
Sole Cowpea	3.6	3.9	4.5	5.3
1:1 Maize/Cowpea	2.4	3.6	4.2	5.1
1:2 Maize/Cowpea	3.3	4.3	4.8	4.8
2:1 Maize/Cowpea	3.3	3.5	4.1	4.2
	ns	ns	ns	ns

ns= not significantly different from each other at P<0.05

Table 5: Effect of row arrangement on pod and grain yield of cowpea

Treatment	**Number of Pod/Plant**	**Grain Yield/Plant (g)**	**Grain yield per Ha (Tons)**
Sole Cowpea	10.7a	23a	0.39a
1:1 Maize/Cowpea	6.7b	17ab	0.26ab
1:2 Maize/Cowpea	5.0c	10b	0.14b
2:1 Maize/Cowpea	8.0ab	10b	0.06b

Means with the same letter(s) in the column are not significantly different from each other at p<0.05

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