Effects of Intercropping Pattern and Planting Date on the Performance of Two Cowpea Varieties in Dalwa, Maiduguri, Nigeria

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ABSTRACT

Field experiment was carried out in Dalwa, Maiduguri to investigate the effects of intercropping pattern and planting date on the performance of two cowpea varieties with sorghum. The experiment was laid in split-plot design each replicated three times including control. The factorial experiment consisted of two varieties of cowpea (Borno brown and Banjiram), two planting dates (early and late planting) and three intercrop patterns (1:1, 1:2 and 1:3). The results showed that cowpea flower count per plant were significantly higher ($p<0.05$) in Borno brown cowpea variety, late planting and 1:1 intercrop pattern. It further showed that cowpea pods count per plant was significantly higher in varieties, early planting date and 1:1 intercrop pattern. Grain yields were significantly higher in both varieties and not significantly different from one another, but higher in early planting date and higher in 1:1 and 1:2 intercrop patterns. Farmers in the Maiduguri Northern eastern region of Nigeria could therefore adopt early planting of the two varieties at 1:1 and 1:2 intercrop patterns.

Keywords: *Variety, planting date, intercropping pattern, flower, pod, grain yield.*

INTRODUCTION

Cowpea (Vigna unguiculata (L.) Walp) is an important grain legume throughout tropics and subtropics, covering Africa, Asia, Central and South America, as well as parts of southern Europe (Mortimore, Singh, Harris and Blade, 1997). It is a primary source of plant protein for human diets, as well as a fodder for farm animals. Cowpea also serves as a cover crop important for nitrogen fixation (Asiwe, Belane and Dakora, 2009). Majority of people in the developing countries including Nigeria are engaged in cowpea production but productivity is low due to insect pests attack (Amatobi, Dike and Oparaeke, 2005). Post flowering insect pests are considered to be largely responsible for the low yield of cowpea in North eastern Nigeria (Sharah and Ali, 2008, Degri, Maina and Richard, 2012). However, cowpea yield in Northern Nigeria can be improved and raised to many fold when insect pests are managed. The use of synthetic insecticides, plant products and cultural controls has been found to be effective in improving cowpea yield in recent years (Amatobi, Dike and Oparaeke, 2005, Sharah and Ali, 2008; Dzamo, Niba and Asiwe, 2010). Cowpea is grown throughout West Africa from wet and dry zones in a variety of crop mixtures but the importance of cowpea as a component crop is greater towards the

northern areas where rainfall is less and soil are poor (Mortimore, Singh, Harris and Blade, 1997). Cowpea is intercropped with millet or sorghum or maize in the Sudan savanna in several diverse and complex patterns with varying interplant distances and planting sequences of the component crops. Cowpea varieties are planted between alternate millet or sorghum or maize rows at a hill distance to check pest infestation and improve soil fertility. Average grain yield under traditional intercropping systems is low though it depends on the variety, weather, pests infestation and pattern involved (Mortimore, Singh, Harris and Blade, 1997). Cowpea respond differently in different intercrop management systems (sole crop + insecticides, sole crop + insecticide; intercrop + insecticides and intercrop + no insecticide).

Cowpea varieties were found to perform well in intercrop plus no insecticide systems across the west African savanna and they have also performed well in farmers fields in Nigeria, Cameroon and other West African countries (Blade, 1992). Intercropping is necessary due to land and capital scarcity and also reduces damage caused by insect pests, diseases and ensure greater yield stability (Ofori and stern, 1987). This study therefore aims at investigating the effects of intercropping cowpea and sorghum (intercrop + no insecticide) on the performance of Borno brown and banjiram cowpea varities and planting date in Dalwa, Maiduguri, Nigeria.

MATERIALS AND METHOD

Field experiment was carried out at Dalwa, Maiduguri situated in the semi arid region of North eastern Nigeria during 2010 rainy season to evaluate the effects of intercropping patterns and planting date in the performance of Borno brown and Banjiram cowpea varieties. The land was cleared, ploughed, harrowed and manually ridged at 0.75m apart, using a tractor. The factorial experiment was divided into plots and sub plots separately by an alley of 2cm. Each plot was measured 4.0m x 3.0m ($12.0m^2$) spaced at 1.0m in between plots. The experiment was laid in a split plots design with variety as main plots. Planting date as sub plot and intercrop pattern as sub-sub plot all replicated three times including control. Borno brown and Bajiram cowpea seeds were purchased from Borno State Agricultural Development Programme (BOSADP).

The seeds were dressed with Allstar 45 WP used for controlling soil borne pests that could feed on the germinating seed. The seeds were sown at 2-3cm depth within rows (intra-row) spacing at 30cm and inter-row spacing of 75cm apart. The cowpea varieties were sown between alternate sorghum rows in different patterns of one row of cowpea to one rows of sorghum (1:1), one row of cowpea to two rows of sorghum (1:2) and one row of cowpea to three rows of sorghum (1:3) when rainfall became established in early August (14/8/2010) and late August (21/8/2010). Gap filling of the cowpea and sorghum were done at two weeks after sowing to maintain the optimum plant population. Weeding was done whenever weeds appeared on the plots to keep the experimental field weed-free. At flowering and podding stages, flowers and pods were counted visually from two randomly selected and tagged cowpea plants and recorded to know the number of flowers and pods per plant from each variety. Also at harvest, the two cowpea varieties

were harvested manually by hand picking the matured and riped pods from each plot. Pods harvested were kept in well labeled polythene bags, allowed to dry; after drying, they were threshed, winnowed put in separate polythene bag and weighed using a weighing balance. Data collected on number of flowers/plant, number of pods/plant and grain yield were subjected to analysis of variance (ANOVA) using statistix version 8.1 and the means of the treatments were separated using least significant difference (LSD) at 5% level of probability.

RESULTS AND DISCUSSION

Effect of intercropping patterns and varieties on yield components: Result presented on the effects of intercropping pattern on the two cowpea varieties on table 1 showed that the number of flowers under Borno brown and intercrop pattern 1:1 (9:33) was significantly higher from the other patterns (1:2 and 1:3) of Borno brown and Banjiram. Intercrop patterns were not significantly different between the two varieties. The number of pods per plant on Borno brown intercropped one to one (1:1) pattern was significantly higher (106.50) than the other patterns followed by Banjiram intercropped 1:1 (76.17), Borno brown intercropped 1:2 (52.00). Borno brown and Banjiram intercropped both at 1:3 patterns produced less pods per plant. Grain yields were significantly different from one another. All Borno brown intercropped patterns (1:1, 1:2 and 1:3) produced more grain yields, than Banjiram intercropped patterns. Banjiram variety intercropped at 1:2 and 1:3 produced more than 1:1 intercrop pattern.

Effects of intercropping pattern and planting date on cowpea grain yield components: Results on the number of flowers produced per plant taken at the flowering and podding stages is presented on table 2. The result showed that there was significant difference among the treatments. Cowpea varieties planted late at 1:1 intercrop pattern produced more flowers than others. It was followed by those planted early at 1:1 pattern, late planting at 1:2 and 1:3 patterns while those planted early at 1:2 pattern had the lowest number of flowers. Highest number of pods per plant was recorded under early planted cowpea at 1:1 pattern (102:17) followed by late planted cowpea at 1:1 pattern (80.50), early planted at 1:2 pattern while late planted cowpea at 1:3 pattern had the lowest number of pods per plant (Table 2). All the means were significantly different from one another. Result on cowpea grain yield taken at harvest is presented on table 2. The result showed that cowpea planted early at 1:2 and 1:3 intercrop patterns produced significantly higher grains than others which were followed by cowpea planted early at 1:1 intercrop pattern. All the cowpea planted late at different intercrop management patterns (1:1, 1:2 and 1:3) produced the lowest grain yields and they were not significantly different from one another.

Effects of planting date and variety on cowpea grain yield components: Table 3 shows the result of the effects of planting date and variety on cowpea grain yield components. The result showed that Borno brown planted late (7.00) produced significantly higher number of flowers while Borno brown and Banjiram planted both early and late (3:33 and 2:11) respectively produced low flowers and the two were not significantly different from

one another. Both Borno brown and Banjiram cowpea planted early produced significantly higher pods (74.00 and 67.11) followed by Borno brown planted late (55.67) and Banjiram planted late (41.89). All the varieties planted at different planting dates were significantly different form one another. Results on cowpea grain yield taken at harvest are presented on table 3. The result showed that Borno brown planted early produced significantly the highest grain yield (812.85 kg/ha) followed by Banjiram planted early (601.30 kg/ha) while both varieties planted late produced significantly the lowest grain yield (351.34 kg/ha and 421.11 kg/ha respectively). The results presented in all the tables indicate that there was significantly difference ($p < 0.05$) between the varieties, planting dates and intercropping patterns. There was no significant difference ($p > 0.05$) from among the variety, planting date and patterns when their interactions were compared. Cowpea (*Vigna Unguiculata)* is grown throughout Africa in a variety of crop mixtures or intercrop patterns. The production of cowpea in mixtures or intercrop patterns is important considering the problem of pests, poor soils and rainfall pattern particularly in the northern regions where the soils are sandy and the rainfall is unreliable (Mortimore, Singh, Harris and Blade, 1997). Cowpea is intercropped with cereals like millet or sorghum or maize in the savanna region in several diverse patterns to improve the performance of the crop (Willey, 1979).

Effects of intercropping patterns and variety on grain yield components: The mean number of cowpea flowers per plant was significantly higher on Borno brown intercrop 1:1 pattern than other intercrop patterns. This implies that one to one intercrop pattern allowed the cowpea to produce more flowers because there was little or no overcrowding, low competition with sorghum and shading of the cowpea (Blade, 1992). The other two intercrop management patterns (1:2 and 1:3) had lower population of flowers per plant due to overcrowding, competition and probably shading of the cowpea plants by sorghum which affect photosensitive crops like these cowpea. The overcrowding and shading of these photosensitive cowpea varieties must have encouraged vegetative growth, build up of flower insect pests like aphids, whiteflies and flower thrips (Craufurd, Summerfield, Ellis and Roberts, 1997).

The significantly higher number of pods per plant recorded under Borno brown and Banjiram intercropped 1:1 pattern was due to the more flowers they produced in this pattern. This finding is similar to the findings of Alghali (1993) who reports that low plant population mixtures and intercrop patterns improve yield stability. All Borno brown intercrop patterns (1:1, 1:2 and 1:3) produced more grain yields per plant because Borno brown tolerate more stress conditions than Banjiram (Willey, 1979). This indicate that Borno brown variety tolerates competition, overcrowding and shading more than Banjiram variety, that is the reason Borno brown generally produced more flowers, pods and grain yields than Banjiram (Terao, Watanabe, Matsunaga, Hakoyama and Singh, 1997, Mortimore, Singh, Harris and Blade, 1997).

Effects of intercropping patterns and planting date on grain yield components: Cowpea varieties planted late produced more flowers than those planted early. This result indicates that early planting made the cowpea to spread and produced more vegetative structures than reproductive structures than the late planting. This is similar to the findings

of Terao, Watanabe, Matsunaga, Hakoyama and Singh (1997) who reported that overcrowding through shading and spreading and early planting are more serious in cowpea production. Early planting and spreading growth can harvest more light and have luxury growth, produce more leaves and expand their leave area than erect growth habit (N'tare and Williams, 1992). Intercropping pattern of 1:1 and planting late produced more pods than other patterns and early planting. This indicates that intercropping at 1:1 and late planting did not allow the crop to spread, produce more vegetative structures but produced more reproductive structures than the early planting at 1:2 and 1:3. It could also be due to shading effect by sorghum in 1:2 and 1:3 patterns as a result of early planting (N'tare, 1990, Odo, 1991, Ofori and Stern, 1987). It also implies that the late planted cowpea did not get enough moisture, light and nutrients to fully grow and produce reproductive structures that could have led to production of more grains (Shackel and Hall, 1984).

Effects of Variety and Planting Date on Cowpea Grain Yield Components: Results on number of flowers, pods and grain yields showed that Borno brown planted late produced more of flowers than early planted Borno brown, Banjiram planted early and Banjiram planted late. This result indicate that Borno brown planted late did not waste time to grow vegetative and spread but responded more to photoperiod to produce reproductive structures. N'tare (1990) reports that late planting reduce time to develop canopy caused by short photoperiod. That is the main reason there were more flowers but less pods and grain yield.

The higher number of pods recorded in Borno brown and Banjiram planted early was due to their ability to develop canopy caused by long photoperiod and more branches which translated to more pods and grain yields. These findings agreed with the findings of N'tare and Williams (1993); Terao, Watanabe, Matsunaga, Hakoyama and Singh (1997). In early planted cowpea varieties under intercrop patterns 1:1 and 1:2, there was no shade effect to inhabit branching, leaves, pods and grains production which became source of nutrient sink that finally resulted to grain yield. This finding is similar to that of Terao, Watanabe, Matsunaga, Hakoyama and Singh (1997) who report that shade in the grain filling stage reduces final seed yield. Therefore, the low pods and grain yield in both the cowpea varieties planted one to two or one to three sorghum rows created shade effect which affected branch initiation stage, inhibited leaves, flowers, pods and stem development which could have produced more photosynthates for grain production.

CONCLUSION

Growing cowpea varieties in mixtures or intercrop at different planting dates were investigated in Dalwa, Maiduguri. The studies showed that Borno brown and Banjiram produced more flowers, pods and grain yields when planted early and intercropped at 1:1 and 1:2 patterns. In these early planting and patterns (1:1 and 1:2), more branches, leaves, flowers and pods caused by long photoperiod, became sources of photosythates sink that finally resulted to grain yield. These intercrop patterns (1:1 and 1:2) minimized the effect of shade in the branch initiation stage which inhibited branching significantly and reduced final grain yield. Cowpea farmers could therefore adopt early planting of the two cowpea varieties intercropped at 1:1 and 1:2 patterns.

Table 1: Effects of intercropping patterns and cowpea varieties on yield components

Treatment	Pattern	NFP	NPP	GY (kg1ha)
Bb *	1:1	9.33	106.50	559.05
Bb *	1:2	2.67	57.83	608.69
Bb *	1:3	3.50	30.17	581.55
Bj *	1:1	2.50	76.17	570.36
Bj *	1:2	3.67	52.00	580.48
Bj *	1:3	2.83	35.33	382.79
SE		1.73	14.22	69.32
LSD P,0.05)		3.58	29.34	143.09

Bb = Borno brown, Bj = Banjiram, NFP = No of flowers/plant; NPP = No of pods/ plant; GY = Grain yield (kg1ha)

Source: Experimentation, 2010

Table 2: Effects of intercropping patterns and planting date on cowpea yield components.

Treatment	Pattern	NFP	NPP	GY (kg1ha)
(early) *	1:1	4.33	102.17	557.77
(early) *	1:2	1.83	64.67	778.22
(early) *	1:3	2.00	44.83	785.24
Late *	1:1	7.50	80.50	384.06
Late *	1:2	4.50	45.17	410.95
Late *	1:3	4.33	20.67	366.67
SE(±)			41.22	69.33
LSD(0.05)			29.34	143.09

** = Planting date, Early planting = 14/08/2010; Late planting = 21/08/2010*

Source: Experimentation, 2010

Table 3: Effects of Planting Date and Variety on Cowpea Yield Components

Treatment	Pattern	NFP	NPP	GY (kg1ha)
Bb *	early	3.33	74.00	812.85
Bb *	late	7.00	55.67	353.34
Bj *	early	2.11	67.11	601.30
Bj *	late	3.89	41.89	421.11
SE		1.42	11.61	56.61
LSD P,0.05)		2.92	23.96	116.83

Bb = Borno brown, Bb = Banjiram

Source: Experimentation, 2010

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