Science World Journal Vol. 16(No 2) 2021
www.scienceworldjournal.org
ISSN: 1597-6343 (Online), ISSN: 2756-391X (Print)
Published by Faculty of Science, Kaduna State University

Full Length Research Article

EFFECT OF LOCATION AND TIME OF INTRODUCING COWPEA ON GROWTH PARAMETERS OF COWPEA IN A MAIZE/COWPEA INTERCROP IN SOUTHERN KADUNA, KADUNA STATE, NIGERIA

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ABSTRACT
Field experiments were conducted during the 2019 rainy season at the Kaduna State University Teaching and Research Farm, Kafanchan (latitude 9.5833^0 N and longitude 8.2869^0 E) located in Jema'a Local Government area and Madakiya, (latitude 9.6899^0 N and longitude 8.2869^0 E) located in Zango Kataf Local Government area, all in Southern Kaduna, Kaduna State, Nigeria. The objective was to investigate the growth parameters of cowpea as influenced by time of cowpea introduction to maize/ cowpea intercrop at two locations in Southern Kaduna. The treatments consisted of four times of introducing cowpea at 8,9,10 and 11 weeks after sowing maize (WASM) and two locations (Kafanchan and Madakiya), laid out in a randomized complete block design with four replications, Results revealed that among the parameters measured, location significantly influenced number of pods/plant of cowpea only. However, location and the interaction between time of cowpea introduction and location did significantly affect the growth parameters of cowpea, however, time of cowpea introduction in maize had significant effects on growth parameters of cowpea. It is therefore recommended that Cowpea should be introduced in maize/cowpea intercrop on the 8th and 9TH WASM in Madakiya and 10th and 11th WASM in Kafanchan as these locations and timings gave significantly better growth than others.

Keywords: Growth, cowpea, maize, intercrop, influence, Southern Kaduna

INTRODUCTION
Cowpea (*Vigna unguiculata* (L)) is one of the most valued leguminous crops grown in the dry savannas of Nigeria covering about 12.5 million hectares with annual production of about 3.3 million tons (FAO, 2005). It is adapted to a wide range of soils ranging from infertile or acid to saline and alkaline soils. The crop requires generally two to three months of evenly distributed rainfall and a dry period for drying of pods. It is drought tolerant like all legumes (Steiner, 1982). Cowpea requires a temperature of not less than 20°C with an optimum range of 18- 32°C for good growth and development. Cowpea is just gaining prominence and gradually graduating to being a major factor among crops that are grown in the zone. Nigeria is said to be one of the world's largest producers of cowpea with an average production of 2.92 million tons, followed by Niger with 1.10 million tons (FAO, 2012). In spite of the economic importance of cowpea, its production is considered risky by many farmers in the Southern part of Kaduna State, where it is highly susceptible to numerous pests and diseases as well as climatic variability (Andrew, 2006). Several cowpea varieties have been developed for the Nigerian savannas but little information exists on the performance of these varieties when relay-intercropped with maize and in different locations. Maize (*Zea mays* L.) however, is perhaps the most completely domesticated of all field crops (Singh et al. 2003) and is known to be a major staple in the farming schedules of most Southern Kaduna farmers. The crop is one of the most important cereals in the dry savannas of Africa, especially West Africa (Singh et al. 2011). In fact, it is one of the most important cereal crops in Nigeria where over 150 million people subsist on it. Several studies have been carried out on yield from intercrops; most of these studies have shown that sole crops yield higher than intercropped ones. Adduced reasons for this observation include: competition for scarce resources like nutrients, sunlight and water. Also there is the ease of efficient utilization of inputs for improved agronomic practices. Despite these facts, intercropping systems continue to manifest in the cropping patterns of peasant farmers in Nigeria. The advantages attributed to mix as opposed to sole cropping include but are not limited to risk aversion, extensive and intensive use of resources (land and labor), greater return per unit land area, reduction of pest and diseases and the possible improvement of soil fertility.

Cereals / legume mixtures, especially maize/cowpea are a common practice in the northern guinea savanna ecological zone of Nigeria (Ofuso-Amin and Limbani, 2007). In terms of land use, growing crops in mixed stands is regarded as more productive than growing them separately. One of the justifications is the belief that some of the nitrogen fixed by the legume would be transferred to the associated crops. The yield advantages of legume- cereal intercropping system over sole have been reported (Pal *et al. (*1993). However, results demonstrated varietal differences in the cowpea response to method of planting. Ibrahim (2008) observed that maize grain yield was not affected by the intercropped cowpea, but cowpea grain yield was reduced by 19% in the sole crop.

The knowledge of the productivity of cowpea and maize in intercrop in any agro ecological zone is pertinent to food security policies for farming families. Since most of the varieties are selected in sole cropping systems, there is need to evaluate their performance in intercropping systems which is very common in Nigeria.
Several studies have been carried out on intercropping of crops; must results from such studies have shown that sole cropping gave high yield compared to intercropping. Reasons for low yields from intercropping obviously are: competition for scarce nutrients, shading sunlight and water. Yield from maize/sorghum showed no significant difference. Intercropping of sorghum and leguminous plant, *Cajanus cajan* showed significant difference in the yield of sorghum because of shading (Singh *et al.* (2003). they recommended relay intercrop system for improved yield in areas with bi-modal rainfall. They found out too, that delay introduction of

cowpea in sorghum/Centro mixture gave high yields for sorghum and Centro. Also, that intercropping of cereal and leguminous plants reduce the effect of the Witch-weed striga in a field known for striga infestation to an almost zero effect. The study revealed that introducing cowpea at 9WASS (weeks after sowing sorghum) gave good result because at this time, sorghum has attained maximum physiological growth and at this time too when sorghum will be physiologically matured for harvesting, cowpea will be in its active growth and development, so there is less competition for water and nutrients and when sorghum is harvested and the residue cleared, it will give cowpea space to harness the energy from the sunlight for maximum photosynthesis production as sole crop and hence the improve yield. Mehdi *et al*. (2009) reported a grain yield decrease when maize population was increased in maize-cowpea intercrops. Muoneke *et al*. (2012) found out in one study that time of introducing cowpea to maize-cowpea intercrop had a significant effect on dry matter and nodules/plant of cowpea sown four weeks after sowing maize. They opined that intercropping offered several advantages to small scale farmers, that by intercropping with appropriate crops at an appropriate sowing date, these may benefit from improved soil fertility, increased productivity and reduce risk of total crop failure. Ibrahim (2008) reported that cowpea plant height, days to 50% flowering, leaf area and leaf area indices were not significantly affected by intercropping in 1997 and 1998. That the mean number of pod/plants, pod weight and seed yield of cowpea varieties were significantly different in maize intercrop. Intercropping according to him also affected plant height, leaf area and leaf area indices of cowpea significantly. The beneficial effects of maize-cowpea intercropping according to Toungos *et al*. (2018), has not been fully exploited. In another study, it was found out that time of introducing cowpea in maize significantly affected both the growth and yield of cowpea (Muoneke *et al*., 20012). They opined that correct combination of intercropping, suitable variety and sowing date that will enhance growth and yield of the two components in intercropping are very necessary. Time of introducing cowpea to maize-cowpea intercrop significantly affected both the growth and yield of cowpea.

MATERIALS AND METHODS

Field experiments were conducted during the wet season (May-October) of 2019 at the Kaduna State University Teaching and Research Farm, Kafanchan (9.5833^{o}N and longitude 8.2907'E), in Jema'a Local Government Area and Madakiya (latitude 9.6899^{o}N and longitude 8.2869^{0}E), in Zangon Kataf Local Government Area of Southern Kaduna, Kaduna State, North Western Nigeria. The two locations enjoy approximately five to seven months (April - October) of uni-modal rainfall with the peak period in August. The treatments consisted of four times of introducing cowpea (8, 9, 10 and 11 weeks after sowing maize (WASM) and two locations (Kafanchan and Madakiya) laid out in a randomized complete block design (RCBD) with four replications.

The maize variety used was the tropical open pollinated, drought resistant and early maturing maize widely cultivated in the areas. The cowpea variety (black eye), is a commercial seeded cultivar that is commonly grown in Southern Kaduna and widely accepted in the Nigerian markets (Toungos et al. (2018). The experimental plots were ploughed and harrowed twice without ridging. The plots measured 20m x 18m (360m^2) were used. The seeds were treated with Apron plus dust shortly before sowing to control soil borne pests and pathogens. Maize and cowpea were planted in rows at two seeds/stand at an intra-row spacing of 25cm and inter-row spacing of 75cm to maintain 53,333 plants per hectare. Planting of maize was carried out on the 6th June, 2019 and cowpea was then relay intercropped on 1st 8th, 15th and 22nd, August, 2019. The cowpea plants were sprayed with Dolphin E.C. at 60ml/10 litres of water to control thrips. Number of primary and secondary branches and days to flowering or each plot were recorded. The data were subjected to analysis of variance to determine the magnitude of the main and interaction effects of the treatments. Duncan multiple range test (DMRT) was used to separate the means of significant treatments. The analysis was done using statistix 10.0 statistical package (1985).

RESULTS

Table 1 shows the effect of treatments on the number of days to flowering ,number of primary branches and number of secondary branches of cowpea during the 2019 rainy season .The effect of location on this parameter was not significant .However, the effect due to time of cowpea introduction was significant (P≤0.05).Cowpea sown at 8 WASM in Kafanchan recorded more number of days to flowering which was statistically similar to all other treatments except for cowpea sown at 11 WASM in both locations. Similarly, the effect of location on the number of primary branches of cowpea was not significant. However, the mean difference due to time of introduction was significant at 1% level. Cowpea sown at 10 WASM resulted in the highest number of primary branches though at par with that recorded for cowpea sown at 9 and 11WASM.The lowest number of primary branches was recorded for cowpea sown at 8 WASM.

Location had no significant effect on the number of secondary branches. But the effect of time of introduction was highly significant. Cowpea sown at 9, 10 and 11WASM recorded higher but statistically similar number of secondary branches. The least number of secondary branches was recorded for cowpea introduced into the maize cowpea/ mixture at8 WASM.

Table 1: Effect of location and time of introduction of cowpea in maize/cowpea intercrop on number of days to flowering, primary branches and secondary branches of cowpea during the 2019 rainy season at Kafanchan and Madakiya

Treatment	Days to flowering	No. of prim branches	No. of sec branches
Location			
Kafanchan	62.8	6.90	5.63
Madakiya	61.9	7.25	6.40
SE(±)	1.74	0.42	0.53
Time of introduction			
8 WASM	65.9a	6.13b	4.88b
9WASM	64.3a	7.63ab	6.63a
10 WASM	62.5a	7.50a	5.88ab
11 WASM	56.9b	7.00ab	6.63a
SE(±)	2.47	0.60	0.74
Interaction (AxB)	*	****	****

Means followed by the same letter (s) within a treatment group. are not significantly different at 5% level of probability using Duncan Multiple Range Test (DMRT).
WASM = weeks after sowing maize; * significant; *** and **** highly significant

Table 2 shows the interaction between location and time of introduction on number of days to flowering of cowpea (P≤0.01) during the 2019 rainy season. Cowpea sown at 8 WASM in Kafanchan took more number of days to flower which was statistically similar to other treatments except for cowpea sown at 11WASM in both locations.

Table 2: Effect of interaction between Location and Time of introduction on Days to Flowering of cowpea

Location	Time of introduction of cowpea (WASM)			
	8	9	10	11
Kafanchan	66.5a	64.5ab	63.0a-c	57.3bc
Madakiya	65.3a	64.0ab	62.0a-c	56.5c
SE(±)		3.50		

Means followed by the same letters are not significantly different at 5% level of probability according to the Duncan Multiple Range Test (DMRT).
WASM = weeks after sowing maize.

The interaction between location and number of primary branches of cowpea (Table 3) was significant. The highest number of primary branches was recorded at 9 WASM in Madakiya beyond which prolonging the time of introduction resulted in the production of fewer number of primary branches. This was however statistically similar to the number of primary branches recorded at 10 WASM at Kafanchan.

Table 3: Effect of interaction between location number of primary branches/plants of cowpea

Location	Time of introduction of cowpea (WASM)			
	8	9	10	11
Kafanchan	4.3c	4.8c	9.3ab	9.3ab
Madakiya	8.0b	10.5a	5.8c	4.8c
SE(±)		0.85		

Means followed by the same letters are not significantly different at 5% level of probability according to the Duncan Multiple Range Test (DMRT).

Table 4 shows the effect of interaction between location and time of introduction of cowpea on the number of secondary branches of cowpea during the 2019 rainy season. The highest and statistically similar number of secondary branches of cowpea was recorded at 8 and 9 WASM in Madakiya, this was however statistically similar to that recorded at 10 and 11 WASM in Kafanchan compared to other treatments during the year of study.

Table 4: Effect of interaction between location and time of introduction on number of secondary branches of cowpea.

Location	Time of introduction of cowpea (WASM)			
	8	9	10	11
Kafanchan	3.5d	5.3b-d	7.0ab	6.8a-c
Madakiya	6.3a-c	8.0a	4.8cd	6.5a-c
SE(±)		1.05		

Means followed by the same letters are not significantly different at 5% level of probability according to the Duncan Multiple Range Test (DMRT).
WASM = weeks after sowing maize.

DISCUSSION

The growth parameters of cowpea grown as intercrop with maize in Kafanchan and Madakiya in 2019 rainy season showed that location had a non-significant effect on the growth parameters of cowpea introduced into maize cowpea intercrop. This could be explained by the fact that the two locations and indeed most other locations in Southern Kaduna share similar environmental characteristics since they all lie in the Southern Guinea savannah zone. The significant interaction recorded between location and time of introduction of cowpea on number of days to flowering (Table 2). contradicts the work of Ibrahim (2008) who reported in a study to investigate yield performance of some cowpea varieties under sole and intercropping with maize at Bauchi, that cowpea plant height, days to 50% flowering, leaf area and leaf area indices were not significantly affected by intercropping in 1997 and 1998. The findings in this work showed that time of introducing cowpea in mixture of maize/cowpea intercrop significantly affected the growth of cowpea supports an earlier report by Muoneke *et al. (2012)* where it was found that, time of introducing cowpea in maize significantly affected both the growth and yield of cowpea.
In conclusion, for better growth, cowpea should be introduced in maize cowpea intercrop at 8 and 9 WASM in Madakiya and at 11WASM in Kafanchan areas of Southern Kaduna State of Nigeria.

REFERENCES

Andrews D.J. (2006). Responses of Sorghum varieties to Intercropping. *Exp. Agric;* 10: 57-63.

Blade, S. F. and Terao, T (1993). Summaries of Review Papers 35 – 40. Crop Improvement Division, IITA, Ibadan, Nigeria.

Food and Agricultural Organization FAO (2005). Cowpea production data base for Nigeria, 1990-2004. http://www.faoststat.fao.org/

Food and Agricultural Organization (FAO; 2012). Grassland species index; Vigna unguiculata. http:/www.Fao.org/ag/AGPdoc/Gbase/data/pf00090m

Ibrahim, H.M; (2008). Yield Performance of some Cowpea Varieties under Sole and Intercropping with maize at Bauchi, Nigeria *African Research Review*, vol. 2(3), August, 2008. Pp. 278-291.

Medhi. D., Ahmad, G., Baratali, S. and Mahmood, R. (2009). Effect of Intercropping Maize (Zea mays L.) with Cowpea (Vigna unguiculata L.) on green forage yield and Quality Evaluation. *Asian Journal of Plant Sciences,* Volume 8 (3)

Muoneke, C.O., Ndukwe, O. O., Umana, P.R., Okpara, D. A. and Asawalam, D.O, (2012). Effect of relative Sowing time on growth and Yield of of vegetative Cowpea (Vigna unguiculata L WALP.) and Maize (Zea mays L.) in vegetable Cowpea/Maize Intercropping system. *Journal of Agricultural Science and Environment*, vol. 12 No1.

Ofusi-Amin, J; and Limbani, N. V. (2007). Effect of intercropping on the growth and yield of Cucumber and okra. *Int. J. Agric. Biol.* 9(4):594-597

Pal, U. R.; Oseni, T. O. and Norman, J. C. (1993). Effect of Component Densities on the Productivity of Soybean/Sorghum Intercrop. *Journal of agronomy and Crop Science*. 170: 66 – 70.

Seran, T.H. and Brintha, I. (2010). Review on Maize Based Intercopping. *Journal of Agronomy*. 9:135-145.

Singh, R. S. P. (1981). Studies on Spatial Arrangement in Sorghum Legume Intercropping System. *Journal of Agricultural science*, Cambridge, 97: 655 – 661 .

Singh, S. P. and Ahuja, K. N. (1990). Intercropping Grain Sorghum with Fodder Legume under Dry land Condition of North – West India. *Indian Journal of Agronomy*, 35(3): 287 –296.

Singh B.B, Ajeigbe H.A, Tarawali S.A, Fernandez-Rivera S, Musa A. (2003). "Improving the production and utilization of Cowpea as food and fodder". *Field Crops Research* 84: 169-150.

Singh, A., Baoule, A.L., Ahmed, H.G., Aliyu, U., and Sokoto, M.B., (2011). Influence of Phosphorus on the performance of Cowpea (*Vigna unguiculata* (L.) *Indian Journal of Agronomy*, 18 (2): 83 – 89.

Statistix (1985). Statistics 10 data analysis software for Researchers www.ststistix.com retrieved on 28/10/2020.

Steiner KG (1982). Intercropping in Tropical Smallholder Agriculture with Special Reference to Trenbath B.R (1976). Processes Determining Intercrop Productivity and Yields of Component Crops. *Field Crops Res.,* 34: 247-271.

Toungos, M.D., Zambua, B.W., and Babayola, M. (2018). The Performance of Maize- Cowpea Intercropping as affected by Variety and Cropping Patterns in Mubi, Northern Guinea Savanna of Nigeria. *Int. J. Innovative Food, Nut. & Sust. Agric.* 6(3):54-60