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INFLUENCE OF VARIETY, CROP ARRANGEMENT AND WEED CONTROL TREATMENTS ON THE VEGETATIVE GROWTH AND YIELD OF COWPEA GROWN IN MIXTURE

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ABSTRACT
Three years field studies were conducted in 2000, 2001 and 2002 rainy seasons at Samaru in the Northern Guinea Savanna of Nigeria to determine the effect of weed control treatment on the vegetative growth and yield of cowpea. The treatments consisted of two varieties of cowpea (Kanannado (local) and SAMPEA 7 (Improved) and two herbicide combination (Metolachlor + Metobromuron 2.5 + 2.5kg a.i l./ha (Galex) and metolachlor + prometryne 2.0 + 2.0 a.i. l/ha (Codal), hoe weeded at 3 and 6 WAS and weedy check. Kanannado gave more vigorous plants than Sampea-7. Weed control treatment with all herbicides depressed shoot height. Canopy spread was not affected in weed control treatment except in 2001 where both herbicides depressed canopy spread due to insufficient rainfall. Metolachlor + Metobromuron at 2.5 + 2.5kg a.i l/ha depressed yield of cowpea in all the years of study.

KEY WORDS: Variety, Crop Arrangement, Weed Control

INTRODUCTION

Intercropping is an important agricultural technique that improves diversification of food supply (Francis, 1985) and ensures high economic returns (Norman *et al*., 1982). It also suppresses weeds particularly when short statured bushy cowpea varieties are used (Zimdahl, 1999). These varieties have the potential to intercept incident radiation reaching the soil surface (Liebman, 1988). Cowpea cultivars with a prostrate and dense crop canopy act as live mulch, suppressing weed germination and growth (Mashingaidze, 2004), This reduce the frequency of weeding and labour cost (Akobundu, 1993). Intercropping results in efficient land utilization and improved yields (Mashingaidze, 2004). Cowpea (*Vigna unguiculata* (L) walp) is an important legume crop in Nigeria. It is the source of more than half of the plants protein in human diet in most African countries. As food, it is eaten in form of dry seeds, green pods and the leaves as part of special dish in Africa. Cowpea is also used as fodder and cover crop. It can fix its own nitrogen thus improves soil fertility by leaving a fixed soil nitrogen deposit of up to 60 – 70kg/ha for the succeeding crop. As important as the crop is, the production is still low due to insufficient information on existing varieties, soil problem, climatic factors, effects of weed interference and poor weed control. This prompted the current study with the aim of determining the effect of variety, crop arrangement and weed control treatment on the vegetative growth and yield of cowpea.

MATERIALS AND METHODS

Three field experiments were conducted during the 2000, 2001 and 2002 rainy seasons at Samaru, Zaria in the Northern Guinea Savanna of Nigeria. The soil of the three different experimental sites was sandy loam. The experiments in the three years were laid out in a split plot design with three replications. The treatments consisted of two varieties of cowpea (Kanannado and SAMPEA-7), crop arrangement (alternate row 1:1 and alternate stand 1:1) and two herbicide combinations (Metolaclor + Metobromuron 2.5 + 2.5ai./ha at 5.0 l/ha (Galex) and Metolachlor + Prometryre 2.0 + 2.0 ai./ha at 4 l/ha (Codal). Hoe weeded at 3 and 6 WAS and weedy check. The weed control treatments were allotted to sub plots and applied pre-emergence and the cowpea variety and crop arrangement allotted to main plots. The herbicides were applied with CP3 knapsack sprayer in a spray volume of 250 litre/ha using a green deflector nozzle at a pressure of 2.1kgm-^{2} one day after planting.

The gross plot consisted of eight ridges of 3 meter length giving a total of 18m^2, while the net plot consisted of six ridges of 3 meters length giving an area of 13.5m^2. The land was marked and divided into appropriate number of plots. The seeds of maize and cowpea were planted at 75cm inter-row and 25cm intra-row spacing. Three seeds were planted per hole and later thinned to two plants per stand two weeks after sowing. Data were collected on crop vigour score (CVS), shoot height, crop dry matter, date to 50% flowering, canopy spread and grain yield.

The data were subjected to analysis of variance as described by Snedecor and Cochran (1964) comparison of the treatment was done using Duncan Multiple Range Test (DMRT) (Duncan, 1955).Weeds that Predominant on the experiments were identified in the cause of the study.

RESULTS

The effect of variety on cowpea crop vigour score was significant in 2000 where Kanannado gave more vigorous plants than SAMPEA-7 (Table 1). Crop arrangement was

not significantly affected by variety in all the years of study (Table 1). Weed control treatments had significant effect on crop vigour score of cowpea. In 2000, all herbicide treatments and hoe weeded control gave more vigorous and comparable plants while in 2001 and 2002, hoe weeded control gave more vigorous plants which was also comparable with plants treated with metolachlor + prometryn at 2.0 + 2.0kg a.i/ha at 4l/ha. Weedy check gave the least vigorous plants in all the years of study (Table 1).

TABLE 1. Effects of variety, crop arrangement and weed control treatment on crop vigour score[1] of cowpea at 9 WAS[2] in maize/cowpea intercrop during the 2000 to 2002 rainy seasons at Samaru

		Crop vigour score		
Treatment	Rate(kg a.i./ha)	2000	2001	2002
Variety (V)				
Kanannado[4]		9.3a[3]	8.3	7.9
Sampea 7[5]		8.4b	8.6	7.5
SE ±		0.12	0.17	0.23
Crop arrangement (A)				
Alternate row		8.8	8.4	7.6
Alternate stand		8.8	8.5	7.8
SE ±		0.12	0.17	0.23
Weed Control (WC)				
Metolachlor + metobromuron (Galex)	2.5 + 2.5	9.0a	8.3b	7.6b
Metolachlor + prometryne (Codal)	2.0 + 2.0	8.9a	8.8ab	8.3ab
Hoe weeded at 3 and 6WAS[3]		9.5a	9.3a	8.8a
Weedy Check		8.1b	7.3c	6.1c
SE±		0.17	0.23	0.32
Interaction				
V x A		NS[6]	NS	NS
V x W		NS	NS	NS
A x W		*[7]	NS	NS
V x A x W		NS	NS	NS

1. Crop vigour score (0-10) where 0=dead plants, 10=most vigorous plant. 2.Weeks After Sowing
3. Means followed by the same letter(s) within the same column or treatment group are not significantly different at 0.05 level of probability using Duncan Multiple Range Test (DMRT).
4. Local cowpea variety. 5. Improved cowpea variety. 6. Not significant. 7. Significant

TABLE 2: Interaction between crop arrangement and weed control treatment on cowpea crop vigour score at 9 WAS[1] in maize/cowpea intercrop during the 2000 rainy season at Samaru.

Treatment		Crop arrangement (A)	
	Rate(kg .i./ha)	Alternate row	Alternate stand
Herbicides			
Metolachlor + metobromuron	2.5 + 2.5	8.3a[2]	9.2a
Metolachlor + prometryne	2.0 + 2.0	8.8a	9.1a
Hoe weeded at 3 and 6WAS		9.00a	9.5a
Weedy Check		7.5b	7.5b
SE±		0.65	0.34

1. Crop vigour score (0-10) where 0 = dead plants, 10 = most vigorous plants. 2. Weeks After Sowing. 3. Means followed by the same letter(s) within the same column or treatment group are not significantly different at 0.05 level of probability using Duncan Multiple Range Test (DMRT).

The interaction between crop arrangement and weed control treatment was significant on crop vigour score in 2000 (Table 2). All herbicide treatments and hoe weeded control irrespective of the arrangement gave more vigorous crop than the weedy check. The effect of weed control treatments on canopy spread of cowpea is shown in table 3. In all the years of study Kanannado gave significantly wider canopy than SAMPEA-7. Crop arrangement did not have significant effect on canopy spread. Weed control had significant effect on canopy spread of cowpea in all the years of study (Table 3). In 2000 and 2002, all herbicide treatments and hoe weeded control gave wider canopy than the weedy check except in 2002 where the weedy check gave comparable canopy spread with the herbicide treatments and hoe weeded control. Interaction between variety and crop arrangement and variety and weed control treatment was significant on canopy spread of cowpea in 2001 (Table 4 and 5).

TABLE 3. Effect of variety, crop arrangement and weed control treatment on canopy spread of cowpea at 12 WAS[1] in maize/cowpea intercrop during the 2000 to 2002 rainy seasons at Samaru

		Canopy spread (cm)		
Treatment	Rate (kg a.i./ha)	2000	2001	2002
Variety (V)				
Kanannado[3]		85.2a[2]	106.1a	93.0a
Sampea 7[4]		69.9b	74.9b	82.2b
SE ±		2.68	0.51	1.75
Crop arrangement (A)				
Alternate row		77.42	91.1	90.1
Alternate stand		79.75	89.9	85.2
SE ±		2.68	0.51	1.73
Weed Control (W)				
Metolachlor + metobromuron (Galex)	2.5 + 2.5	81.4a	92.1b	90.2a
Metolachlor + prometryne (Codal)	2.0 + 2.0	86.6a	91.1b	92.5a
Hoe weeded at 3 and 6WAS[3]		89.0a	94.3a	95.2a
Weedy Check		53.3b	84.5c	92.7a
SE±		3.79	0.72	2.45
Interaction				
V x A		NS[5]	*[6]	NS
V x W		NS	*	NS
A x W		NS	NS	NS
V x A x W		NS	NS	NS

1. Weeks after Sowing. 2. Means followed by the same letter(s) within the same column or treatment group are not significantly different at 0.05 level of probability using Duncan Multiple Range Test (DMRT).
3. Local cowpea variety.4. Improved cowpea variety. 5. Not significant. 6. Significant at 5% level of probability using DMRT.

TABLE 4. Interaction between variety and crop arrangement on canopy spread of cowpea at 12 WAS[1] during the 2001 rainy season at Samaru.

	Crop arrangement (cm)	
Treatment	Alternate row	Alternate stand
Variety (V)		
Kanannado[3]	107.5a[2]	104.6a
Sampea 7[4]	74.6b	75.2b
SE ±	0.87	

1. Weeks after sowing. 2 . Means followed by the same letter(s) within the same column or treatment group are not significantly different at 0.05 level of probability using Duncan Multiple Range Test (DMRT).. 3. Local cowpea variety. 4 . Improved cowpea variety

TABLE 5. Interaction between cowpea variety and weed control treatment on canopy spread of cowpea at 12 WAS[1] during the 2002 rainy season at Samaru**.**

		Variety (cm)	
Treatment	Rate (kg a.i./ha)	Kanannado[3]	Sampea 7[4]
Weed control			
Metolachlor + metobromuron	2.5 + 2.5	93.5a[2]	88.8a
Metolachlor + prometryne	2.0 + 2.0	94.8a	90.1a
Hoe weeded at 3 and 6WAS		98.7a	91.7a
Weedy Check		85.0b	60.3b
SE±		3.38	

1, Weeks after sowing. 2, Means followed by the same letter(s) within the same column or treatment group are not significantly different at 0.05 level of probability using Duncan Multiple Range Test (DMRT),
3. Local cowpea variety, 4 Improved cowpea variety

Kanannado irrespective of the crop arrangement gave wider canopy spread than SAMPEA-7 (Table 4). Irrespective of the variety used plot treated with Metolachlor + Metobromuron 2.5 + 2.5kg a.i/ha at 5l/ha. Metolachlor + Prometryn 2.0 + 2.0kg a.i/ha at 4l/ha and hoe weeded control at 3 and 6 WAS gave wider canopy spread than the crop left weedy.

Table 6 shows the effect of variety, crop arrangement and weed control treatments on shoot height of cowpea. Shoot height of cowpea was significantly affected by variety in 2000 and 2002, crop arrangement and weed control treatments in 2000 and 2001. In 2000 and 2002, SAMPEA-7 gave taller plants than Kanannado, while in 2000 and 2001, alternate stand arrangement gave taller plants than alternate row arrangement (Table 6).

TABLE 6: Effects of variety, crop arrangement and weed control treatment on shoot height of cowpea at 12 WAS in maize/cowpea intercrop during the 2000 and 2002 rainy seasons at Samaru.

		Shoot height (cm)		
Treatment	Rate (kg a.i./ha)	2000	2001	2002
Variety (V)				
Kanannado[4]		44.9b[3]	52.0	43.2b
Sampea 7[5]		65.5a	52.3	56.3a
SE ±		0.36	0.39	2.82
Crop arrangement (A)				
Alternate row		54.6b	50.9b	51.5
Alternate stand		55.8a	53.5a	48.1
SE ±		0.36	0.39	2.82
Weed Control (W)				
Metolachlor + metobromuron (Galex)	2.5 + 2.5	55.0b	51.8b	48.1
Metolachlor + prometryne (Codal)	2.0 + 2.0	54.4b	51.7b	47.0
Hoe weeded at 3 and 6WAS[2]		56.4a	53.7a	53.6
Weedy Check		54.4b	51.2b	50.4
SE±		0.51	0.55	3.99
Interaction				
V x A		NS[6]	*[7]	NS
V x W		NS	NS	NS
A x W		NS	NS	NS
V x A x W		NS	NS	NS

1. Crop vigour score (0-10) where 0=dead plants, 10=most vigorous plant, 2. Weeks after Sowing
3. Means followed by the same letter(s) within the same column or treatment group are not significantly different at 0.05 level of probability using Duncan Multiple Range Test (DMRT)., 4. Local cowpea variety.5. Improved cowpea variety, 6. Not significant, 7.Significant at 5% level of probability using DMRT.

TABLE 7. Interaction between variety and crop arrangement on shoot height of cowpea at 12 WAS[1] during the 2001 rainy season at Samaru.

	Crop arrangement (cm)	
Treatment	Alternate row	Alternate stand
Variety (V)		
Kanannado[3]	51.8b[2]	52.7b
Sampea 7[4]	54.5a	54.3a
SE ±	0.30	

1, Weeks after sowing, 2. Means followed by the same letter(s) within the same column or treatment group are not significantly different at 0.005 level of probability using Duncan Multiple Range Test (DMRT)., 3. Local cowpea variety, 4, Improved cowpea variety

Weed control treatment had significant effect on shoot height of cowpea in all the years of study. All herbicide treatments and weedy check gave shorter plants than the hoe weeded which gave significantly the tallest plants. Table 7 shows the interaction between variety and crop arrangement on shoot height of cowpea. Irrespective of the crop arrangement SAMPEA-7 gave taller plants than Kanannado.The effect of cowpea variety, crop arrangement and weed control treatment on crop dry matter of cowpea is shown in table 8. The effect of variety on crop dry matter of cowpea was significant in 2000 and 2002 where Kanannado produced more dry matter than SAMPEA-7. Crop arrangement and weed control treatments did not significantly affect crop dry matter of cowpea in all the years of study. Table 9 shows the effect of variety, crop arrangement and weed control treatments on number of days to 50% flowering of cowpea. Crop arrangement and weed control treatments did not have significant effect on number of days to 50% flowering of cowpea in all the years of study. Variety had significant effect on number of days to 50% flowering of cowpea in 2000 and 2001 where Kanannado took longer days to 50% flowering than SAMPEA-7.

TABLE 8. Effects of variety, crop arrangement and weed control treatment on crop dry matter of cowpea at 12 WAS[1] in maize/cowpea intercrop during the 2000 to 2002 rainy seasons at Samaru.

		Crop dry matter (g/plant)		
Treatment	Rate (kg a.i./ha)	2000	2001	2002
Variety (V)				
Kanannado[3]		66.2a[2]	62.9	84.7a
Sampea 7[4]		40.6b	53.2	53.4b
SE ±		3.16	4.95	9.72
Crop arrangement (A)				
Alternate row		56.6	60.0	70.4
Alternate stand		50.2	56.1	67.6
SE ±		3.16	4.95	9.72
Weed Control (W)				
Metolachlor + metobromuron (Galex)	2.5 + 2.5	54.8	57.2	67.4
Metolachlor + prometryne (Codal)	2.0 + 2.0	59.0	58.8	71.1
Hoe weeded at 3 and 6WAS[3]		53.9	60.0	72.2
Weedy Check		45.9	56.2	65.5
SE±		4.47	7.00	13.75
Interaction				
V x A		NS[5]	NS	NS
V x W		NS	NS	NS
A x W		NS	NS	NS
V x A x W		NS	NS	NS

1 Weeks After Sowing, 2. Means followed by the same letter(s) within the same column or treatment group are not significantly different at 0.05 level of probability using Duncan Multiple Range Test (DMRT)., 3. Local cowpea variety, 4. Improved cowpea variety, 5. Not significant

TABLE 9. Effects of variety, crop arrangement and weed control treatment on number of days to 50% flowering of cowpea crop in maize/cowpea intercrop during the 2000-2002 rainy seasons at Samaru.

		Number of days to 50% flowering of cowpea		
Treatment	Rate (kg a.i./ha)	2000	2001	2002
Variety (V)				
Kanannado[2]		51a[1]	52a	52
Sampea 7[3]		43b	43b	52
SE ±		0.09	0.11	0.12
Crop arrangement (A)				
Alternate row		47	47	52
Alternate stand		47	47	52
SE ±		0.09	0.11	0.12
Weed Control (W)				
Metolachlor + metobromuron (Galex)	2.5 + 2.5	47	47	51
Metolachlor + prometryne (Codal)	2.0 + 2.0	47	47	52
Hoe weeded at 3 and 6WAS[4]		47	47	51
Weedy Check		47	47	52
SE±		0.13	0.16	0.15
Interaction				
VxA		*	NS	NS
VxW		NS[5]	NS	NS
AxW		*[6]	NS	NS
VxAxW		NS	NS	NS

1 Means followed by the same letter(s) within the same column or treatment group are not significantly different at 0.05 level of probability using Duncan Multiple Range Test (DMRT)., 2 Local cowpea variety, 3. Improved cowpea variety, 4. Weeks after sowing, 5. Not significant**,** 6 Significant

TABLE 10. Interaction between variety and crop arrangement on the number of days to 50% flowering of cowpea in maize/cowpea intercrop during the 2000 rainy season at Samaru

	Crop arrangement	
Treatment	Alternate row	Alternate stand
Variety (V)		
Kanannado[2]	51.5a[1]	58.6a
Sampea 7[3]	42.8b	43.2b
SE ±	3.00	

1. Means followed by the same letter(s) within the same column or treatment group are not significantly different at 0.05 level of probability using Duncan Multiple Range Test (DMRT).
2. Local cowpea variety, 3.Improved cowpea variety

TABLE 11. Interaction between crop arrangement and weed control treatment on number of days to 50% flowering of cowpea during the 2000 rainy season at Samaru.

		Crop arrangement	
Treatment	Rate (kg a.i./ha)	Alternate row	Alternate stand
Herbicides control			
Metolachlor + metobromuron	2.5 + 2.5	47.3b[1]	47.2b
Metolachlor + prometryne	2.0 + 2.0	47.7a	47.7a
Hoe weeded at 3 and 6WAS[2]		47.7a	47.7a
Weedy Check		47.0b	47.5b
SE±		0.03	

1.Means followed by the same letter(s) within the same column or treatment group are not significantly different at 0.05 level of probability using Duncan Multiple Range Test (DMRT)., 2. Weeks After Sowing

TABLE 12. Effects of variety, crop arrangement and weed control treatment on cowpea grain yield in maize/cowpea intercrop during the 2000 to 2002 rainy seasons at Samaru.

		Grain yield (Kg/ha)		
Treatment	**Rate (kg a.i./ha)**	**2000**	**2001**	**2002**
Variety (V)				
Kanannado[2]		643a[1]	808	732a
Sampea 7[3]		567b	708	653b
SE ±		13.03	18.63	18.26
Crop arrangement (A)				
Alternate row		680a	816a	774a
Alternate stand		530b	699b	612b
SE ±		13.03	18.63	18.26
Weed Control (W)				
Metolachlor + metobromuron (Galex)	2.5 + 2.5	644b	804b	697b
Metolachlor + prometryne (Codal)	2.0 + 2.0	819a	904a	864a
Hoe weeded at 3 and 6WAS[4]		826a	959a	918a
Weedy Check		426c	364c	298c
SE±		18.43	26.34	25.3
Interaction				
V x A		NS[5]	*	*
V x W		NS	NS	NS
A x W		*[6]	NS	NS
V x A x W		NS	NS	NS

1, Means followed by the same letter(s) within the same column or treatment group are not significantly different at 0.05 level of probability using Duncan Multiple Range Test (DMRT)., 2. Local cowpea variety, 3. Improved cowpea variety, 4.Weeks after sowing, 5, Not significant. 6.Significant at 5% level of probability using DMRT.

Variety, crop arrangement and weed control treatments had significant effect on number of days to 50% flowering of cowpea in 2000. Table 10 shows the interaction between variety and crop arrangement on number of days to 50% flowering of cowpea. Irrespective of the crop arrangement Kanannada took more days to reach 50% flowering than SAMPEA-7. The interaction between crop arrangement and weed control treatment on number of days to 50% flowering is shown in table 11. Metolachlor + Prometryn at 2.0 + 2.0kg a.i/ha (4l/ha) and hoe weeded at 3 and 6 WAS gave shorter days to 50% flowering than weedy check and metolachlor + Metobromuron at 2.5 + 2.5kg a.i/ha (5l/ha) which gave longer days to 50% flowering of cowpea.

Table 12 shows the effect of variety, crop arrangement and weed control treatments on the grain yield of cowpea. Variety and weed control treatment had significant effect on grain yield of cowpea in all the years of study except in 2001 where variety did not have significant effect on cowpea grain yield. Kanannado gave higher grain yield in 2000 and 2002 while Alternate row arrangement gave higher grain yield in all the years of study. Metolachlor + Metobromuron at 2.5+2.5 kg ai/ha and hoe weeded at 3 and 6 WAS gave higher and comparable grain yield. This was followed by Metolachlor + prometryn at 2.0 + 2.0 kg a.i/ha 4l/ha. Weedy check gave the lowest grain yield in all the years of the study.

TABLE 13. Interaction between variety and crop arrangement on grain yield of cowpea during the 2001 rainy season at Samaru

Treatment	**Crop arrangement (kg/ha)**	
	Alternate row	Alternate stand
Variety		
Kanannado[2]	752a[1]	533b
Sampea 7[3]	606b	536b
SE ±	18.20	

1, Means followed by the same letter(s) within the same column or treatment group are not significantly different at 0.05 level of probability using Duncan Multiple Range Test (DMRT)., 2. Local cowpea variety, 3. Improved cowpea variety

TABLE 14: Interaction between variety and crop arrangement on grain yield of cowpea during the 2002 rainy season at Samaru.

Treatment	**Crop arrangement (kg/ha)**	
	Alternate row	Alternate stand
Variety		
Kanannado[2]	848a[1]	618c
Sampea 7[3]	900b	607c
SE ±	20.30	

1, Means followed by the same letter(s) within the same column or treatment group are not significantly different at 0.05 level of probability using Duncan Multiple Range Test (DMRT)., 2. Local cowpea variety
3. Improved cowpea variety

TABLE 15. Interaction between crop arrangement and weed control treatment on grain yield of cowpea during the 2000 rainy season at Samaru

Treatment		**Crop arrangement (kg/ha)**	
	Rate (kg a.i./ha)	Alternate row	Alternate stand
Weed control			
Metolachlor + metobromuron	2.5 + 2.5	735b[1]	654b
Metolachlor + prometryne	2.0 + 2.0	917a	722b
Hoe weeded at 3 and 6WAS[2]		921a	738b
Weedy Check		146c	106c
SE±		16.00	

1. Means followed by the same letter(s) within the same column or treatment group are not significantly different at 0.05 level of probability using Duncan Multiple Range Test (DMRT). 2. Weeks After Sowing
2. Medicine. Alternative Veterinary Medicine.

DISCUSSION

This study observed the effect of variety, crop arrangement and weed control treatment on vegetative growth and yield of cowpea. The local cowpea variety (Kanannado) exhibited more vigour compared to SAMPEA-7. The more vigorous plants obtained with Kanannado could be due to the fact that the crop had wider canopy, longer vines and more leaves that trap sunlight used for photosynthesis. Similar observation was report by Willey and Osiru (1972). The local cowpea variety (Kanannado) is successful due to its flexibility in response to competition. Light in the early stages of development will influence the branching patterns, which will in turn determine the source and sink of plant (Blade *et. al*., 1997). The significant effect of crop arrangement on crop vigour score is attributed to the fact that different crop species grown together may sometimes compliment each other, more especially when they differ in their use of growth resources such as light, moisture and soil nutrient. The more vigorous plants observed in plots treated with herbicide could be due to the fact that the crop tolerated the herbicide and so was not toxic to the crop coupled with

the fact that their was less competition between the crop and weeds.

The wider canopy spread observed in Kanannando variety is expected because this character is under strong genetic influence which is often further influenced by environmental factors (Anonymous, 1985). Abubakar (1992) using soyabean as a test crop in his investigation reported that variation in growth characters due to genotype could be associated with the differences in the genetic makeup of the genotypes which ultimately determine their growth habit. The wider canopy observed in plots treated with herbicide could be due to the fact that there is absence of competition between weed and crop for space and nutrients, thus giving the crop chance to express their full growth potential in terms of canopy spread.

The taller plants observed in SAMPEA 7 could be attributed to the genetic makeup of the variety. SAMPEA 7 grows semi-upright while Kanannado is a trailing variety that grows prostrate. Taller plants were observed in alternate stand arrangement due to the fact that there was inter-specific competition for space and presence of shading effect on the crop. The crop struggle to get light a process referred to as photo-tropism. The shorter plants observed in plots treated with herbicides was due to the fact that at this stage (12 WAS) the toxicity of the herbicide has reduced thus the efficacy is no longer felt. This has resulted in competition between the crop and weeds. Rainfall at this stage is heavier and constant which supported the growth of weeds.

The higher dry matter observed in Kanannado could be attributed to the fact that the crop grows prostrate, produced longer vines, more branches, more leaves and associated inherent growth characters in the presence of necessary mineral nutrients and other growth factors. All these together contributed in higher dry matter production compared to SAMPEA 7 which produced shorter vines, fewer leaves and shoots for moderate assimilate production. Similar observation was documented by Blake, *et al* (1997) who reported that the local cowpea variety can spread twice and produce more leaves than the erect variety under shade.

Kanannado took longer days to 50% flowering unlike SAMPEA-7, this is because it is a photoperiod sensitive, late maturing variety while SAMPEA-7 is a photoperiod insensitive variety. These characters are attributed to strong genetic traits often modified by environmental factors.

The higher cowpea grain yield produced by Kanannado can be attributed to the fact that the variety had better ability to exploit environmental resources such as light, nutrients and space. The crop also supported more number of branches which supported more pods than the semi-erect SAMPEA 7. This finding agrees with the report by Willey and Osiru (1972) where differences in the ability of the different cowpea cultivars to exploit environmental resources have accounted for the variations observed among these characters.

In conclusion from the results obtained from this study, planting Kanannado in alternate row combined with the application of Metolachlor + Prometryn at 2.0 + 2.0kg a.i l/ha gives a good growth and yield of cowpea grown in mixture.

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