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Short Communication

Effect of intra-row spacing and weeding frequency on the yield performance of sesame/cowpea intercrop

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Abstract: Field experiments were conducted simultaneously at the Abubakar Tafawa Balewa University Teaching and Research Farm, Bauchi, and Bauchi State Agricultural Development Programme experimental sites, Bauchi (Lat. 10^0 17'N 9^0 49' E, and 609m above sea level), in the Northern Guinea savannah ecological zone of Nigeria during the 2002 wet season to study the response of sesame/ cowpea mixture to weeding frequency and intra-row spacings. The treatments were laid out in a randomised complete block design with three replications. The result showed that the number of capsules per plant, 100-seed weight, capsules and grain yield per hectare of sesame were significantly ($P<0.05$) increased by one weeding frequency only at location I. The parameters were not significantly affected by weeding frequency in location II. The capsules length, number of capsules per plant, capsules and grain yield were significantly ($P<0.05$) affected by intra-row spacings. The capsules and grain yield of sesame increased significantly ($P<0.05$) with decreasing intra-row spacing and conversely capsules length and number decreased with decreasing intra-row spacing. The number of pods of cowpea significantly ($P<0.05$) increased by two weeding frequencies at location I and pod yield per hectare was also increased significantly by twice weeding at location II. All the other parameters such as pod lands, seeds per pod, 100-seed weight and grain yield per hectare were not significantly affected by the treatments. The interaction between the intra-row spacings and weeding frequency were significant in affecting number of seed per capsules and 100-seed weight of sesame at location I, and number of pods and seed per pod of cowpea at location II. Intra-row spacing of 30cm and twice weedings produced the highest number of seed per capsules (68.2) and 20cm intra-row spacings with twice weeding produced the highest 100-seed weight. However, 30cm intra-row spacings with one weeding had highest number of pods (24.3) in cowpea plant and also 30cm intra-row spacing with twice weedings produced the highest seeds per pod in cowpea.

Keywords: Intra-row spacing, weeding, yield, sesame/cowpea.

تأثير المسافات بين الخطوط وتتابع اقتلاع الحشائش على محصول السمسم و اللوبيا المزروعة سويا

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الملخص: أجريت تجارب متزامنة في المزرعة التعليمية و البحثية بجامعة تافاوا باليوا و المواقع التجريبية لبرنامج التنمية الزراعية في بوتشي (خط عرض 10^0 17'N 9^0 49' E, و 609m فوق سطح البحر)، في منطقة غينيا سافانا البيئية الشمالية من نيجيريا خلال الموسم الممطر عام 2002 لدراسة استجابة محصول السمسم و اللوبيا المختلطة لكل من عدد مرات اقتلاع الحشائش و المسافات بين الخطوط. صممت المعاملات بطريقة القطع الكاملة العشوائية مع استخدام ثلاثة مكررات. أوضحت النتائج أن عدد الكبسولات/النبات تزن 100 بذرة، وكان محصول الكبسولات و الحبوب في الهكتار من السمسم *($P<0.05$)* قد زاد معنويا عند اقتلاع الحشائش مرة واحدة في الموقع 1. ولم تتأثر البيانات معنويا بعدد مرات اقتلاع الحشائش في الموقع 2. و قد تأثر معنويا صفة طول الكبسولات وعددها للنبات الواحد ومحصولها بسبب معاملة المسافات بين الخطوط. زاد محصول الكبسولات و الحبوب من السمسم معنويا مع تقليل المسافات بين الخطوط و بالعكس بالنسبة لطول الكبسولات وعددها. زاد عدد قرون اللوبيا معنويا في معاملة اقتلاع الحشائش مرتين في الموقع1 وكذلك زاد محصول القرون في الهكتار بنفس المعاملة في الموقع 2. كل البيانات الأخرى مثل مناطق القرون، عدد البذور في القرن، وزن 100 حبة و محصول الحبوب للهكتار لم تتأثر معنويا بالمعاملات. كان التداخل (التفاعل) بين عدد مرات اقتلاع الحشائش و المسافات بين الخطية معنويا في التأثير على عدد البذور في الكبسولة ووزن 100 حبة من السمسم في الموقع1. وعدد القرون وعدد البذور في القرن من اللوبيا في الموقع 2. أنتجت مسافة 30 سنتيمترا بين الخطوط واقتلاع الحشائش مرتين أعلى عدد من البذور في الكبسولة (68.2)، بينما

أنتجت معاملة مسافة 20 سنتيمترا بين الخطوط مع مرتين اقتلاع حشائش أعلى وزن لـ 100 حبة. غير ان معاملة مسافة 30 سنتيمترا بين الخطوط ومرة واحدة اقتلاع حشائش أنتجت أعلى عدد من قرون اللوبيا (24.3) و أيضا 30 سنتيمترا بين الخطوط ومرتين اقتلاع حشائش أنتجت أعلى عدد من البذور في القرن الواحد من اللوبيا.

الكلمات المفتاحية: المسافات البينية، التعشيب، الإنتاج، السمسم و اللوبيا.

Introduction

Benniseed, also known as sesame, belongs to the family Pedaliaceae. There are nineteen species domesticated in Africa with two distinctive species namely *Sesamum indicum* (L) and *Sesamum radiatum* schum (Irvine 1969). It is the most ancient oil seed crop known and use by men since 235 BC (Weiss 1971). It is cultivation extends from areas where the average rainfall is 1000mm per annum to as low as 400mm during the growing period (Pullen 1962).

Cowpea *(Vigna unguiculata L.Walp)* belongs to the family Fabaceace and Nigeria is the largest producer in the world. (Anbaris and Singh, 1984). Over 80% of cowpea produced in Nigeria is predominantly grown in the savannah zone in mixtures with one or more crops (Raheja, 1986). Little emphasis has been devoted to the production of sesame and cowpea in mixtures despite the importance of cowpea as a component crop in the savannah zone where rainfall is less and soils are poor in fertility status (Singh, 1981).

Cowpea yield loses of 67% and 60% due to weeds were reported in Ghana and Nigeria, respectively (Akobundu, 1980). Sesame is precarious to weed infestation and cost of weed control far exceed that of any other crop pest. Apart from yield reduction, unchecked weed growth serve as reservoir host for pest and diseases (Akobundu, 1980).

Previous studies have shown that increase crop density reduce weed infestation in field and vegetable crops. (Adigun et al, 1994). Therefore, the growing of sesame and cowpea in mixture would serve as an additional alternative source of oil seed crop, improve yield and more advantageous in the maintenance of soil fertility. The objective of this experiment was to ascertain the response of sesame/cowpea intercrop to intra-raw spacing and weeding frequency.

Materials and methods

Field experiments were conducted simultaneously at the Abubakar Tafawa Balewa University Teaching and Research Farm, Bauchi and Bauchi State Agricultural Development Programme Experimental Farm, Bauchi (Lat. 10^0 17'N 9^0 49' E, and 609m above sea level), in the Northern Guinea savannah ecological zone of Nigeria during the 2002 wet reasons to study the response of sesame/cowpea intercrop to intra-row spacing and weeding frequency. The sites of the experiments were previously cropped with maize/cowpea in location I and Groundnut/maize in location II. The experimental site received an annual rainfall of 1000mm per annum and a temperature of 32^0C. The soil chemical analysis indicated the soil to be sandy loam having about 0.18kg total nitrogen.

The treatments consisted of three weeding regimes (zero weeding, one weeding and two weedings) and three intra-row spacings (20, 30 and 40cm) with a constant inter-row spacing of 75cm. maintaining a plant populations of 66,667; 44,444 and 33,333, respectively.

The treatments were laid out in a randomised complete block design with three replications. The gross and not plot sizes were 15 and $10m^2$, respectively.

The parameters assessed after harvest were capsules length, capsules number per plant, number of seeds per capsules, number of pods per plant, number of seeds per pod, 100- seed weight, capsules and pods yield per hectare and grain yield per hectare.

The data collected were statistically analysed using analysis of variance as descried by Snedecor and Cochran (1967). The treatments means were compared using Duncan's Multiple Range Test (Duncan, 1955).

Results

The number of capsules, 100-seed weight, capsules yield and grain yield of sesame increased significantly ($P<0.05$) with increase in weeding regimes from 0 to one in location I, The differences between weeding regimes were not significant in location II (Table 1). The differences between weeding frequencies one and two were similar in all the parameters. The effect of intra-row spacings were significant in affecting capsules length, number of capsules, capsules yield and grain yield (Table 1). Decreasing intra-row spacing significantly ($P<0.05$) decreased the capsules length and number of capsules per plant ($P_{<0.01}$) in location II and I, respectively. Capsules yield and grain yield were significantly increased with decreasing intra-row spacing in both locations. The effect of weeding frequency and intra-row spacing on cowpea yield and yield components is shown in Table 2. The number of pods per plant was significantly ($P<0.05$) increased with increasing weeding frequency in location I (Table 1). Twice weedings increased the number of pods per plant significantly, while the differences between zero and one weeding were similar. The other parameters observed were not significantly affected by weeding frequency. However, 100-seed weight, pod and grains yield per hectare tended to increase with increase in weeding regime.

Similarly, pod yield per hectare in location II, increased significantly ($P<0.05$) with decrease in intra-row spacing. Intra-row spacing of 20cm produced the highest pod yield per hectare while the difference between 40cm and 30cm intra-row spacings were similar. The grain yield per hectare tended to increase with decrease in intra-row spacing in both the locations. However, wider- intra-row spacing tended to produce higher pod length, pod number, seed number and 100- seed weight in both locations which were not significantly different (Table 2).

Interaction between intra-row spacing and weeding frequency significantly ($P<0.05$) affected the number of seeds per capsules and 100- seed weights of sesame in location I only (Table 3). Intra-row spacing of 30cm with twice weedings significantly ($P<0.05$) increased the number of seeds per capsules. Also, 100-seed weight tended to increased significantly ($P<0.05$) with decrease in intra-row spacing up to 20cm. The number of pods per plant and number of seeds per pod of cowpea were significantly ($P<0.05$) affected by the interaction between intra-row spacing and weeding frequency (Table 4). Number of pods per plants of cowpea decreased significantly ($P<0.05$) with decreasing intra-row spacing. At all weeding frequencies number of seeds per pod decreased significantly with decreasing intra-row spacing.

Discussion

The results indicated that weeding operations significantly affected sesame/cowpea intercrop. Weed control operations play a determining role in the quantity and quality of the final yield of crop. The number of capsules, 100-seed weight, capsules and grain yield per hectare were significantly increased in location 1 due to weeding operation while the plots which were not weeded produced lowest yield. The production of low yield could be as a result of insect pests coupled with unchecked weed competition during the life cycle of the crop. Hence, the resultant effects were

empty pods and capsules production. These results confirmed the findings of Akobundu (1981) and Aldrich (1984) who reported similar trend in yield reduction of 55%, 34% and 40% on Maize in Ghana, Kenya and Nigeria, respectively. Similar yield reduction of 67% and 60% on cowpea in Ghana and Nigeria were also reported by (Akobundu, 1980). The results also showed that intra-row spacing affected the productivity of sesame/cowpea mixture. The yield of cowpea and sesame responded linearly with increased crop densities in the mixtures. Except for capsules yield of sesame in location II, the yield components showed inverse relationship with increasing crop densities. The significant increase in grain yield with decreasing intra-row spacing in sesame could be due to increasing number of plant population. The results of this experiment agreed with the findings of Osman (1993) who reported a significant increase in the yield of sesame with increasing intra-row spacing. This result also in agreement with that of Auwalu et al. (1995) who reported that the yield per hectare of sesame increased significantly with decreasing intra-row spacing.

The interaction between intra-row spacing and weeding frequency significantly affected the number of seeds per capsules and 100-seed weight of sesame as well as number of pods per plant and number of seeds per pod of cowpea. This indicated that these yield components of the crops differed significantly at different intra-row spacing and weeding regimes. This could probably be due to less competition for space, light and nutrients which were utilised by the crop in the production of more pods and seeds per pods in the closer intra-row spacing. Based on the results of this investigation, therefore, the yields of sesame/cowpea intercrop were significantly increased with twice weedings and decreasing intra-row spacing up to 20cm in both locations. More so, the closer intra-row spacing is effective in smothering weeds.

Table 1. Effect of weed control and intra-row spacing on yield characters and yield of sesame in locations I and II.

Treatment	Capsule length		No of Capsules		Seeds/capsules		100 seed weight		Capsules Yield/ha (g)		Grain Yield/ha	
Weeding	I	II	I	II	I	II	I	II	I	II	I	II
0	2.8a	3.09	22.3b	38.5a	52.4a	51.4a	2.3b	2.4a	925.6b	801.1a	281.3b	22.2a
1	29a	3.1a	34.9a	43.4a	51.4a	54.2a	2.4a	2.4a	1018.1ab	1016.7a	334.4ab	314.8a
2	3.0a	3.0a	35.2a	48.5a	62.7a	42.8a	2.5a	2.5a	1661.39a	831.8a	475.29a	276.0a
LS	NS	NS	*	NS	NS	NS	*	NS	*	NS	*	NS
CV	6.1	6.3	9.7	-	23.6	-	1.7	4.3	14.2	-	22.6	22.8
Intra-row spacing												
40	2.9a	3.1a	32.7a	48.5a	50.8a	52.0a	2.4a	2.5a	1103.6b	729.3ab	331.1ab	204.4b
30	3.0a	3.1a	30.6ab	44.7a	67.8a	51.7a	2.4a	2.4a	945.2b	894.9a	279.4b	284.6ab
20	2.7	2.8b	26.1b	34.7a	44.1a	44.6a	2.5a	2.4a	1824.5a	1043.3a	495.4a	372.2a
LS	NS	*	**	NS	NS	NS	NS	NS	*	*	*	*
CV	6.1	6.3	9.7	-	23.6	-	1.7	4.3	14.2	-	22.6	22.8

LSD= Least Significant Difference; 0-zero weeding, 1= one weeding; 2= two weedings, LS= level of significance; NS= not significant.*and**=significant at ($P_{=0.05}$) and ($P_{=0.01}$), respectively.
Means followed by the same letter(s) within a treatment group are not significantly different using Duncan's Multiple Range Test (DMRT).

Table 2. Effect of weed control and intra-row spacing on yield characters and total yield of cowpea in locations I and II.

Treatments	Pod Length		Number of Pod		Seed per pod		100- Seed weight		Pod yield/ha		Grain Yield/ha	
Weeding	I	II	I	II	I	II	I	II	I	II	I	II
0	13.7	14.1	10.3b	19.0a	10.8a	8.4a	18.2a	15.4a	748.8a	1384.9a	534.1a	911.4a
1	14.3	14.3	13.9b	19.0a	10.8a	8.89	17.3a	15.8a	872.5a	1726.6a	665.6a	933.4a
2	16.4	14.2	16.3a	19.0a	9.2a	9.5a	17.7a	15.9a	986.4a	1735.6a	680.7a	1313.3a
LS	NS	NS	*	NS	NS	NS	NS	NS	NS	NS	NS	NS
CV	23.3	5.9	29.8	26	-	21.2	12.4	9.6	-	-	-	-
Intra-row spacing												
40	16.2	14.2	14.8a	19.oa	11.4a	9.1a	18.0a	15.8a	716.3a	1222.0b	537.0a	868.9a
30	13.9	14.2	13.4a	21.1a	9.7a	8.9a	18.2a	16.1a	892.9a	1731.5b	688.5a	1119.5a
20	14.2	4.2	12.3a	17.8a	9.7a	8.6a	17.1a	15.1a	998.5a	1903.7a	695.09a	327.2a
LS	NS	NS	NS	NS	NS	NS	NS	NS	NS	*	NS	NS
CV	22.3	5.9	29.8	26	-	21.2	12.4	9.6	-	-	-	-

LSD= Least Significant Difference; 0-zero weeding, 1= one weeding; 2= two weedings, LS= level of significance; NS= not significant.*and**=significant at ($P_{=0.05}$) and ($P_{=0.01}$), respectively.
Means followed by the same letter(s) within a treatment group are not significantly different using Duncan's Multiple Range Test (DMRT).

Table 3: Interaction between intra-row spacing and weeding frequency on sesame at location I.

Treatment	Weeding frequency					
	No of seeds/capsule			100-Seed Weight(g)		
	0	1	2	0	1	2
Intra-row spacing						
40	53ac	54.4ab	57.5a	2.5b	2.4b	2.4b
30	57.5ac	49.5bc	68.2a	2.4bc	2.5b	2.3c
20	48.8c	43.1c	54.4b	2.5b	2.4b	2.7a
LS		*			*	
LSD 0.05		11.2			0.1	

LSD= Least Significant Difference; 0-zero weeding, 1= one weeding; 2= two weedings, LS= level of significance; NS= not significant.*and**=significant at ($P_{=0.05}$) and ($P_{=0.01}$), respectively.
Means followed by the same letter(s) within a treatment group are not significantly different using Duncan'sMultiple Range Test (DMRT)

Table 4: Interaction between intra-row spacing and weeding frequency on cowpea at location II.

Treatment	Weeding frequency					
	Number of Pods/Plant			Number-of Seeds/Pod		
	0	**1**	**2**	**0**	**1**	2
Intra-row spacing						
40	19.6ab	19.9a	19.0b	9.0ab	9.7a	8.6a
30	20.1ab	24.3a	18.8b	8.3ab	8.3a	10.2a
20	19.9ac	15.2c	18.4bc	7.9b	8.4ab	9.6ab
LS		*			*	
LSD 0.05		5.0			1.9	

LSD= Least Significant Difference; 0-zero weeding, 1= one weeding; 2= two weedings, LS= level of significance; NS= not significant.*and**=significant at ($P_{=0.05}$) and ($P_{=0.01}$), respectively.
Means followed by the same letter(s) within a treatment group are not significantly different using Duncan's Multiple Range Test (DMRT).

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