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Research Paper

Effects of groundnut spacing on yield and weed control in the rainforest agro-ecological zone of Nigeria

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Field experiment was conducted at the teaching and research farm, Department of Agricultural Science, Ignatius Ajuru University of Education, to determine the effect of spacing on growth, yield and weed control in groundnut. The spacing's were 25 x 25 cm, 50 x 25 cm, 50 x 50 cm and 100 x 50 cm replicated three times and arranged in a completely randomized design. Result showed that groundnuts spaced at 25 x 25 cm had the tallest plant, highest growth rate and leaf area. Number of flowers increased with spacing until 50 x 50 cm and declined thereafter. Same trend was observed for seed weight or yield per experimental plot. However, when yield was converted to per hectare basis groundnut yield per hectare reduced as planting distance increased. Weed infestation increased with planting distance, groundnut spaced at 100 cm x 50 cm had 10 times more weed density than those spaced at 25 x 25 cm. Spacing at 25 x 25 cm is recommended for effective weed control and optimum yield in groundnut production in the Southern rainforest region.

Key words: Groundnut, spacing, weed control, yield, Rainforest agro ecological zone

INTRODUCTION

Cultural weed control method involves the combination of various farming practices to subdue or reduce weed growth and at the same time encourage the growth of crops using techniques such as crop rotation, spacing, Land preparation, mulching, and intercropping, (Akobundu, 1987; Bakht et al., 2009).These cultural farming practices were not originally aimed at weed control but control weeds when undertaken (Ansa and Iyagba, 1999). Weeds are constraints in tropical crop production resulting in many man-hours hoe weeding farmland in other to enhance crop yield (Akobundu, 1987).

In the same vein, tropical soils are fragile, have low nutrients status (Van Wambelle, 1991; Lal, 1993), impoverished and prone to fertility decline (Mokwunye et al., 1996). The inclusion of legumes in the rotations, in addition to use of crop residue mulch, manures, and compost of organic materials among others are new technologies that can improve the fertility of tropical soils (Schlecht et al., 2006). Groundnut cultivation is common among the peasant farmers in Rivers State, tropical rainforest zone of Nigeria where a local landrace 'Ogbakiri" groundnut is grown. Cultivation of groundnut in this zone will not only satisfy the protein dietary needs of the local people but will also serve as a measure of fertility restoration. Groundnut, like other legumes live in association with rhizobium bacteria that fix nitrogen to the soil (Tisdale and Nelson (1995) and been a cover crop, they protect the soil from soil degradation, and suppress weeds (Akobundu, 1987; Doran, 2002).

Ansa and Adesina, (1998) pointed out that increasing the planting density (by close spacing) per hectare increases crop yield. Also, most researches have reported the effect of spacing and weeding regime but

Table 1. Influence of spacing on groundnut plant height (cm)

Plant height (cm)	Groundnut spacing			
	25 x 25 cm	50 x 25 cm	50 x 50 cm	100 x 50 cm
2 WAP	9.7	9.0	8.7	8.3
4 WAP	13.7	13.1	13.0	12.3
6 WAP	17.0	16.0	15.7	15.0
SD	3.51	3.51	3.51	3.51
SE	2.92	2.92	2.92	2.92

Table 2. Effects of spacing on vegetative characteristics of groundnut.

Parameter	Groundnut spacing					
	25 x 25	50 x 25	50 x 50	100 x 50	SD	SE
No. of leaf	32	33.3	34.7	36	1.7	.87
Average leaf area (cm)	9.5	9.4	9.3	9.1	.17	.85
Total leaf (cm^2)	304	313.03	322.71	327.6	10.48	5.2

literature is scarce on effect of spacing on weed control. This research therefore, seeks to investigate the probability of high groundnut yield through closer spacing, and weed suppression which should enhance the crop yield.

MATERIALS AND METHODS

The experiment was carried out at Ndele, Emuoha Local Government Area of Rivers State. Ndele is situated in the rainforest zone characterized with 2½ months of rainfall less than 25 mm and having 8-9½ months with at least 100 mm rainfall; receiving 120-160 kcal/cum per annum solar radiation which is not limiting to the crop yield.

The experiment was conducted in the teaching and research farm of the Agricultural Science Department, Ignatius Ajuru University of Education. The site was covered with grasses weeds such as *Panicum maximum*, *Cynodon dactylon*, *Pennisetum spp*. The broad leaf weeds included *Chromolena odoratum*, *Eupatorium odoratum* and *Ageratum conyzoides*.

Land preparation

The total experimental site measured 12×9 m. The vegetation was slashed and burnt and stumps dug out. 2 × 2 m raised beds were constructed using hoe and experimental treatment randomly allotted. Local landrace groundnut 'Ogbakiri' groundnut was sourced from local farmers.

Experimental design

Spacing was the only factor of the experiment and the different spacing were 25 × 25 cm, 25 × 50 cm, 50 × 50 cm and 100 × 50 cm. The treatments were replicated three times to give a total of 12 experimental plots arranged in a completely randomized design. Data obtained were subjected to one way analysis and means separated by the Duncan Multiple Range test. Growth parameters measured were plant height, leaf area (LA), taken at 2, 4 and 6 weeks after planting (WAP). Reproductive and yield data taken were number of flowers, number of pods and seed weight.

Weed control

Weed control was assessed by throwing a 0.25 m^2 quadrat randomly 3 times into each plot. Number of weeds and dry weight of weed within the quadrant were counted, weighed and average taken.

RESULTS

Table 1 shows that plant height increased with age of groundnut irrespective of the planting distance. Groundnut plants spaced at 25 ×25 cm were taller than those of other spacing. Plant height also increased with spacing as the closer the planting distance the taller the plant**.** Number of leaves increased slightly as planting distance increased (Table 2). Leaf size decreased slightly the wider the spacing; however total leaf area increased with wider spacing. Thus groundnut spaced at 25 × 25 cm had the least number of leaves but highest leaf area. The wider spacing of 100 × 50 cm produced the highest total leaf area.

The number of flowers, pod yield and grain was significantly varied by spacing ($p>0.05$, Table 3). Yield per hectare increased with shorter or closer planting distance, though groundnut grain yield was highest in the experimental plot where groundnut was spaced at 50 ×

Table 3. Influence of spacing on flower production and seed yield in groundnut.

Treatment (cm)	Total No. of Flower	No. of Pods	Seed weight (g)	Seed (t/ha)
25 x 25	46	96	900 [c]	1400t/ha[a]
50 x 25	53	101	1100 [b]	880t/ha[b]
50 x 50	65	120	1400[a]	650t/ha[c]
100 x 50	46	107	755[d]	151t/ha[d]
SE	15.04	28.87	8.88	5.13

Means with different alphabets in same column are significant different.

Table 4. Effect of groundnut spacing on weed control.

Spacing (cm)	Number of weed	Weed dry weight (g)
25 x 25	1	0.2
50 x 25	2.5	1.1
50 x 50	4.1	1.4
100 x 50	12	3.6

50 cm. When yield was converted to ton per hectare, planting distance of 25 × 25 cm had groundnut yield 2.5 times more than those spaced at 50 × 50 cm and 9 times over those spaced 100 × 50 cm. The difference observed in yield was significantly due to the different spacing.

Effect of spacing on weed control is shown in (Table 4). Groundnut plants closely spaced had fewer number of weed and least weed dry weight. Those spaced at 25×25 cm had weed density 12 times less than those spaced at 1M by 0.5M. The wider the planting distance, the higher the weed infestation.

DISCUSSION

Statistical analysis shows that the variation in growth rate of the groundnut was due to spacing. The height increment of closely spaced groundnut observed in this study is in tangent with the report of Naim et al. (2011) where the peanuts spaced in 10 and 20 cm rows grew taller than those spaced in 30 and 50 cm. In Naim et al. (2011), 20 cm spaced peanuts grew tallest; this is closely related to the 25 x 25 cm spacing used in this work. The resultant increased elongation of closely spaced plants has being shown to be due to competition for light response by the crops (Trenbath, 1974; Farnham, 2001)

Closely spaced groundnut plants had reduced vegetative and lateral development. This observation is in line with Farnham, (2001) who explained that shorter planting distance encourage vertical growth to the expense of lateral growth in other to absorb light and that there is no enough space of horizontal growth. The observation where the more closely spaced groundnut plants had higher yield than the more widely spaced ones is in line with the reports of Akpalu et al. (2012) in Bambara groundnut and that of Ansa and Adesina, (1998) in cowpea where the more closely spaced plants at 25 by 25 cm recorded the highest yield in ton per hectare. All these researches therefore indicate that crop intensification especially of legumes by planting at higher density might increase yield probably because of the fact that they fix Nitrogen for growth and yield.

The closely spaced groundnut covered the ground earlier than widely spaced crops thus suppressing weeds. This is in line with the explanation given by Brown et al. (2005) and Tillman et al. (2006) that crops planted at shorter planting distance form early and full canopy earlier than widely spaced crops.

Conclusion

The experiment was conducted to determine the effect of spacing on growth, yield and weed control in groundnut. Spacing positively affected growth development and yield. Yield and weed control increases with closer spacing or higher plant density. Spacing groundnut at 25 × 25 cm is recommended for higher yield and weed control.

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