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EFFECTS OF PLANTING METHODS, SOWING DATES AND SPACING ON WEED AND THE PRODUCTIVITY OF FINGER MILLET (*Eleusine corocana* L. Gaertn) IN THE NORTHERN GUINEA SAVANNA OF NIGERIA

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ABSTRACT
Two field experiments were conducted during the 2009 and 2010 cropping seasons at the experimental farm of the Institute for Agricultural Research (IAR), Ahmadu Bello University, Zaria (11^0 11^1 N, 07^0 $38^{'}$ E; 636m above sea level) in the Northern Guinea Savanna ecology of Nigeria, to study the effect of planting method, sowing date and spacing on the growth and productivity of finger millet. From the study, planting finger millet by dibbling and planting the crop on the 25 June and 9 July at a spacing of 10 and 15cm gave heavier unthreshed panicles with consequent higher grain yield.

KEY WORDS: Planting methods, sowing date, spacing, and finger millet.

INTRODUCTION

Finger millet (*Eleusine coracana* L. Gaertn) is an important food crop next to rice, wheat and maize. The crop is native to Africa and originates from the highlands of Uganda and Ethiopia. In Nigeria, Finger millet is produced mainly in the Northern part of the country (*Anon* 1996). Generally the Production of millet is still at subsistence level by small scale holders and consumed as staple food and drink in most areas. The crop has high impact on the poor in Africa for food security and source of energy and protein for about 130million people in sub-Saharan Africa (Obilana *et. al.,* 2002). The crop is important because it plays role in both the dietary needs and incomes of many rural households.

Finger millet plays an important role in both the dietary needs and income of many rural households where the crop is grown. Although the crop is not rich in total protein than other cereals, the main protein fraction (eleusinin) has high biological value with high amount of tryptophan, cystine, methionine and total aromatic amino acids (Phenylalanine and tyrosine). All these are crucial to human health and growth and are deficient in most cereals. The two sulphur-containing amino acids, methonine (approximately 5%) and cystine especially, lacking in the diet of millions of the poor who live on starchy foods such as cassava (Anon, 1996). Finger millet is therefore an important prevention against malnutrition, especially kwashiorkor. As a result, children from finger millet eating parts of the country surfer less from nutritional diseases compared to those from banana eating areas. Finger millet is also a rich source of calcium, phosphorus and iron. Some samples contain 0.33% calcium which is 5 – 30 times more than in most cereals. Finger millet taste better than most cereals. It has no major pest problem and so can be stored cheaply for a long time provided it is dried well to low moisture content. These attributes combine to make finger millet a suitable crop for ensuring food security in drought prone areas of the countries that grow it. The straw is used as animal feed and for roof thatching. One of the problems the farmer is faced with in the production of finger millet is time of planting, spacing to be used and planting method. Timely planting of crops generally ensures sufficient time for root development and vegetative growth for optimum harvesting of available soil nutrient and radiant energy. Crops have been shown to escape peak period of weed infestation, competition and damage through proper manipulation of planting time (Thompson and Kelly, 1957), Meaking, 1979 and Shuaibu, 1998). Crop sown late is normally affected by moisture stress hence the attempt to know the best time for planting the crop and the best planting method and sowing date. In the Northern Guinea savanna of Nigeria sowing date and planting method affect the crop population, which must be optimal in order to compete with weeds and absorb nutrient and moisture for good growth and development.

MATERIALS AND METHODS

Field experiments entitled 'Effect of planting method sowing date and spacing on weed and the Productivity of Finger Millet (*Eleusine carocana* L. Gaertn) were conducted for two consecutive seasons (2009 and 2010) at the experimental farm of the Institute for Agricultural Research, Samaru (11^o 11 ^{o} N; 07 ^{o} 38') in the Northern Guinea savanna ecological zone of Nigeria. The experiment comprising of 8 treatments combinations viz, 2 planting method, 3 sowing dates, 3 inter-row spacing were laid out in Randomized Complete Block Design (RCBD) with four replications. The gross and net plot sizes were $9m^2$ and $6m^2$respectively. The experimental field was ploughed, harrowed and ridged. The ridges were later made into flat beds to get the right plot sizes. Planting was done according to the treatments. The physic -chemical characteristics of the soil of the experimental sites are presented in table 1. A total rainfall of 1257.7 and 1040mm was received in 2009 and 2010 respectively. Seeds were planted according to treatments. Five plants of finger millet from the net plot were randomly selected and tagged and used for data collection. Fertilizer was applied

at the rate of 30:30:30 NPK in two equal doses at 3 and 6 WAS. The following observations were recorded during the course of the investigation; Weed dry weight at 9 WAS, plant height 9 WAS, number of panicles/plot, weight of unthreshed panicles, grain yield and 100 seed weight at harvest. All data collected were subjected to statistical analysis of variance (ANOVA) as described by Snedecor and Cochran (1967). Significant differences among treatment means were compared using Duncan Multiple Range Test (DMRT).

RESULTS

Table 1 show the effect of planting methods, sowing date and spacing on weed dry weight and plant height of finger millet at 9 WAS. Planting method, sowing date and Spacing did not have significant effect on weed dry weight in finger millet at in all the years of study except spacing on plant height in all the years of study. Planting finger millet at 10cm inter-row spacing in both years of study and 15cm in 2010 gave significantly taller plants than planting at 20cm inter-row spacing.

Table 2 shows the effect of planting method on panicle number per plot, panicle weight per plot, grain yield and 100- seed weight of finger millet in 2009 and 2010. Planting method and sowing date had significant effect on number of panicle, panicle weight and grain yield in 2009 only. Planting finger millet by broadcast gave higher number of panicles than planting by dibbling method. Planting finger millet on the 25th June gave heavier panicle than planting on the 11th June but comparable with crop planted on July 9th. Planting finger millet at row spacing of 10 and 15cm gave heavier panicle weight than when planted at 20cm. Planting methods and sowing date did not have effect on grain yield and 100 seed weight. Planting finger millet at 10 and 15 cm inter-row spacing gave highest and comparable grain yield. While planting the crop at 10cm gave the heaviest 1000 seed weight in the trial. Planting at 15 and 20cm gave low and comparable 1000 seed weight.

TABLE 1: Effect of planting method, sowing date and spacing on weed dry weight and plant height of finger millet in 2009 and 2010 wet seasons

Treatments	Weed dry weight 9 WAS[1]		Plant height (cm)	
	2009	2010	2009	2010
Planting method				
Broadcasting	1.11	35.33	75.67	70.67
Dibbling	1.11	38.89	71.93	65.96
SE ±	4.507	12.672	8.033	4.096
Sowing date				
11th June	1.27	37.78	74.11	69.00
25th June	0.92	38.33	74.78	68.94
9th July	1.16	35.22	72.50	67.00
SE ±	4.507	12.672	8.033	4.096
Spacing				
10cm	1.19	34.40	82.22a[2]	71.94a
15cm	1.05	37.22	71.67b	70.22a
20cm	1.09	39.61	67.50b	62.78b
SE ±	4.507	12.672	8.033	4.096

WAS-Weeks after sowing

Means in a column of treatments followed by unlike letter(s) are significantly different (p=0.05) level of significant using DMRT.

DISCUSSION

In this study, Planting finger millet by either broadcast or dibbling did not have significant effect on weed dry weight and plant height. This could be due to the initial slow growth rate of the crop. Planting finger millet by dibbling gave higher number and heavier panicles. This could be due to the fact that there were more seeds that were more uniformly distributed with more space and nutrient to enhance good crop establishment and growth compared to broadcast method which had more tendencies of crowding thus higher competition for nutrient which is the major characteristic of broadcast method of planting. De Datta (1981) reported that the number of tillers and panicles per square meter in a rice population are largely a function of planting density or seed rate and grain yield. This has been shown to increase with the number of plants

per unit area as long as there is space in the cultivated field. It is possible that in the broadcast method, competition occurred among the plants for growth resources because the method had more plants per unit area. Planting method did not have significant effect on grain yield and 100-seed weight. Planting finger millet on the 25th June gave higher number of panicles than planting on the 11th and 9th July. This could be due to the fact that at this time the rain is well established and more uniformly distributed to enable good germination and establishment. It is also possible that at this time there was no serious competition between the crop and weeds. Planting finger millet on the 25th June and 9th July gave heavier panicle and higher grain yield than planting on the 11th June. This could probably be due to the fact that at this time the rain is well established giving the crop advantage over the crop sown on the 11th June which also coincide with the period when flush of weeds grow on the field making weed control to be more difficult in finger millet. Planting finger millet planted at 10 and 15cm produced higher number of panicles, heavier panicle weight and higher grain yield.

The higher grain yield and higher number of panicles could be attributed to higher plant population per unit area, reduced competition from weeds due to closer spacing. This agrees with the report by Shinggu *et. al.,* 2009 reported that closer spacing reduced weeds competition and gave high yield.

TABLE 2: Effect of planting method, sowing date and spacing on number of panicle per plot, panicle weight, grain yield and 1000-seed weight of finger millet

	Panicle number		Panicle Weight		Grain yield		1000-Seed weight	
Treatments	2009	2010	2009	2010	2009	2010	2009	2010
Planting method								
Broadcasting	542.8a[1]	565	1885a	2187	1177	1955	2.70	2.67
Dibbling	482.6b	539	1634b	2000	1094	1104	2.74	2.43
SE ±	70.08	94.32	293.57	359.99	294.00	1930.5	9.860	9.860
Sowing date								
11th June	486b	547	1576b	2269	972b	1127	2.67	2.44
25th June	558a	576	1967a	1993	1275a	1164	2.78	2.30
9th July	494b	534	1735ab	2019	1160ab	2297	2.72	2.91
SE ±	70.79	94.325	293.571	359.995	294.002	1930.5	9.860	9.860
Spacing								
10cm	479	621a	1953a	2643a	1346a	1221	2.72	2.47
15cm	517	634a	1735ab	2184b	1218a	1229	2.61	2.56
20cm	543	402b	1590b	1454c	843b	2138	2.83	2.62
SE ±	70.079	94.325	293.571	359.995	294.002	1930.5	9.860	9.860

Means in a column of treatments followed by unlike letter(s) are significantly different (p=0.05) level of significant using DMRT

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