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EFFECT OF SOWING DATE ON DEVELOPMENT AND YIELD POTENTIAL OF LOCAL AND IMPROVED SORGHUM VARIETIES IN A SOUTHERN GUINEA SAVANNA LOCATION, NIGERIA.

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ABSTRACT

The effect of variable sowing dates on the physiological performance and the yield potential of two sorghum varieties (*Sorghum bicolor* L. Moench) was investigated. Results showed significant reduction in time of flowering, blooming and physiological maturity as sowing was delayed. Total dry weight, plant height and leaf number were all reducedin late sowing compared with early sowing, indicating shortened vegetative growth as sowing was delayed. However accelerated flowering and physiological maturity led to significant reduction in the above - ground biomas and grain yield of both varieties. Mean grain yield was relatively higher in the locally adapted variety (IL - I) than in the improved cultivar (SK 5912).

KEY WORDS: Sowing date effect, performance of local and improved sorghum var.

INTRODUCTION

Grain *Sorghum bicolor* L. (Moench) is a typical semi-arid savanna adapted crop species. Marginal rainfall, as low as between 50cm and 63cm annually would support sorghum cultivation provided sowing is well synchronized with even moisture distribution pattern, sowing time in sorghum becomes very critical (Kowal and Knabe, 1972).

Although early sowing would guarantee higher yields, disease and pest attack may affect the yield potential adversely (Andrews, 1973). On the other hand, delayed sowing would significantly reduce yield potential in sorghum since grain filling is likely to occur under relatively adverse soil moisture conditions and intense heat in such situations (Anderws, 1973).

Limited information is available on variable sowing dates with respect to yield potential of grain sorghum as pointed out by Kassam and Anderws, (1975) and Ogunlela, (1982). The work reported here was undertaken to evaluate the physiological and yield performances of local (tall) variety and an improved (dwarf) cultivar of sorghum under Ilorin (Southern Guinea Savanna Zone) climatic conditions.

MATERIALS AND METHOD

The experimental material consisted of a tall local sorghum variety (IL -I) supplied by a local farmer in Ilorin and an improved, dwarf cultivar (SK5912) obtained from the Institute for Agricultural Research, Ahmadu Bello University, Zaria.

Four sowing dates at fortnightly intervals, covering between 18th June and 30th July, 1987, were tested on a cultivated land near the Faculty of Agriculture, University of Ilorin. The soil analysis carried out on the land showed a pH of 6.4; total N, 0.10%; available P, 2.2ppm; exchangeable Kmeq/100a, 0.26 and organic carbon, 3.8%. The experimental layout was a randomised complete block design consisting of three replicates. Seeds were sow at a spacing of 28cm on ridges spaced 75cm apart. Thinning to two plants per stand was carried out four weeks after emergence. Fertilizer (80kg/ha of Diammonium phosphate (DAP) containing 12% nitrogen, 46% phosphorus and 0% potassium) was applied at 8 weeks after emergence. The experimental plots were clean-weeded as often as necessary. Regular spraying with veto 85 wp was carried out to control stem borers. *(Busseola fusca* L).

The following data were collected from a net plot size of $9m^2$.

(a) Heading date, taken as when 5% of the heads had emerged from the flag leaf sheath;
(b) blooming, recorded as when about half the number of plants in a plot has shed their pollen;
(c) physiological maturity, recorded as when black layers had formed at the base of the grain in 50% of the plants in each plot as described by Eastin, (1971);
(d) grain filling phase, recorded as time between 50% bloom and physiological maturity;
(e) total dry weight, determined at 98% days after each sowing date by harvesting four plants per plot randomly and oven - drying the cut herbage to a constant weight at 70°C;
(f) average plant height taken as the mean height (from soil surface to flag leaf) of 20 randomly selected plants per plot at maturity.
(g) average leaf number per plant from 20 randomly selected plant per plot.
(h) grain yield- the panicles of 30 randomly selected plants in the middle rows per plot were threshed and the grains were air dried to an approximately constant weight.

The collected data were subjected to two-tailed analysis of variance on a micro-computer and the mean separation was by LSD at 5% probability level.

RESULTS AND DISCUSSION

The number of days to heading, 50% bloom, physiological maturity and grain-filling for a six-week spread in sowing date in the two sorghum varieties are shown in table 1. In IL-I and SK5912, delayed sowing significantly accelerated heading date after 16th June and 2nd July, respectively. In the two varieties delayed sowing accelerated 50% bloom significantly at the 16th July sowing date physiological maturity of the two sorghum varieties was significantly hastened after the 16th June sowing but the grains produced after the 16th July sowing date did not attain physiological maturity, probably because of moisture stress. With respect to the grain-filling phase, delayed sowing did not show significant differences.

The effect of sowing date on dry weight, plant height leaf number and grain yield in the two sorghum varieties is shown in table 2. In the IL - I variety, there was significant reduction in the above ground biomas as sowing was delayed. In the SK5912 variety, dry matter production of plants on the 16th July sowing date was significantly lower than that on 16th June while sowing on 30th July significantly reduced dry matter as compared to the 16th June and 2nd July sowing.

There was significant reduction in plant height in the two sorghum varieties after the 2nd of July sowing. Leaf numbers were comparable on the 16th June and 2nd July sowing dates and significantly higher than those in the 16th July and 30th July sowing dates which were also comparable.

Yield data in the local variety (IL - I) indicate a significant reduction after the 2nd July sowing date. Seeds sown on the 30th July did not produce harvestable grains.

The responses of the two sorghum varieties to delayed sowing were quite comparable in accelerating heading, blooming and days to physiological maturity at different sowing dates as indicted in table 1. Most African local sorghum varieties as reported by Anderws (1973) are photoperiod sensitive. Such sorghum varieties required shorter days for floral initiation as pointed out by Bunting and Curtis (1968).

Delayed sowing had no effect on the grain filling phase in the two sorghum varieties. This is probably because photoperiod has no direct influence on grain filling as is the case of moisture.

The data in table 2 indicate that delayed sowing resulted in correspondingly significant reduction in dry matter accumulation in both varieties. Since dry matter accumulation is greatly influenced by solar energy and available soil moisture during crop growth, earlier sown plants were exposed to more favourable growth condition that enhanced the above - ground biomas accumulation than those subjected to delayed sowing (Ogunlela, 1982). Perez and Ayala (1980) also reported significantly higher dry matter accumulation in early sown than in late sown sorghum.

Reduction in average leaf number and plant height in the two sorghum varieties were probably a result of shortened vegetative growth phase.

Kassam and Anderws (1975) explained that initiation of terminal inflorescence in sorghum would result in cessation of more leaf development and further increase in plant height.

Grain yield reduction as sowing was delayed was also reported in a previous investigation (Ogunlela, 1982). Mandndra *et al* (1975) also observed that grain yield and dry matter accumulation were usually lower in sorghum when subjected to delayed sowing than in the early - sown crop.

Generally, the rain are steady at about May/June in the Ilorin area of Kwara State. Crops cultivated at about this time usually receive adequate soil moisture than those sown later in the year. However early - maturing sorghum cultivars usually perform better than late - maturing cultivars when both are subjected to delayed sowing (Hume and Kebed, 1981). Also photoperiod sensitivity in many local African sorghum varieties has been implicated in their general performance when subjected to delayed sowing (Curtis, 1968).

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Table 1: The effect of sowing date on heading, 50% bloom, physiological maturity and grain filling in two sorghum varieties.

Sowing Date	IL-I				SK 5912			
	DAS			DAYS Grain-filling phase	DAS			DAYS Grain-filling phase
	Time of heading	Time of 50% bloom	Time of physiolo gical maturity		Time of heading	Time of 50% bloom	Time of physiolo gical maturity	
16 June	121	125	145	20	117	123	145	32
02 July	114	118	137	19	113	118	138	20
16 July	109	114	132	18	108	112	131	19
30 July	109	113	0	0	107	110	0	0
Mean	113.25	117.5	103.5	14.25	111.25	115.75	103.35	15.25
LSD at 50% level	4.81	7.36	5.85	NS	8.39	7.89	3.83	NS

DAS = Days after sowing

Table 2: The effect of sowing date on total weight, plant height, average leaf number and grain yield in two sorghum varieties.

Sowing Date	IL-I				SK 5912			
	Dry weight (g)	Plant height (m)	Average leaf number	Yield (Kg)	Dry Weight (g)	Plant height (m)	Average Leaf number	Yield (Kg)
16 June	271.41	4.0C	19.70	2.438	201.43	1.60	16.30	1.137
02 July	212.32	4.02	18.70	1.911	143.85	1.52	15.00	1.136
16 July	115.43	3.20	14.28	0.995	91.40	13.30	14.36	1.050
30 July	76.20	2.58	13.70	0.000	47.11	0.94	13.03	0.000
Mean	168.84	3.45	16.60	1.34	120.95	1.35	14.67	0.83
LSD at 50% level	36.66	0.23[illegible]	2.176	0.72	80.21	0.18	1.51	0.41