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EFFECT OF SOWING DATE AND NITROGEN LEVEL ON YIELD AND YIELD COMPONENTS OF TWO EXTRA EARLY MAIZE VARIETIES (*Zea mays L.*) IN SUDAN SAVANNA OF NIGERIA

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ABSTRACT

A two year field study was conducted during 2000 and 2001 rainy seasons at Kadawa (11^{0}39'N,08^{0}2'E and 500metre above sea level) in Sudan savanna of Nigeria to study the effect of Sowing dates and nitrogen level on yield and yield components of two extra early maize varieties. The end of June sown maize had the highest cob length, cob diameter and cob weight compare with other dates throughout the period of study except in 2000 where mid-July sowing produced longer and heavier cobs. Application of nitrogen up to 80 kg N ha^{-1} increased the cob length, cob diameter and cob weight in all the two years. Further increase of nitrogen to 120 kg N ha^{-1} did not result in increase in diameter. The optimum grain yields were obtained from the maize sown at the end of June in all the years and mid-July sown maize in 2000. Nitrogen application significantly increase grain yield up to 80 kg N ha^{-1} while further application did not affect the grain yield.

Keywords: maize, sowing, date, nitrogen, yield, early variety, nigeria.

INTRODUCTION

Maize (*Zea mays L.*) is the major item in the diet of many tropical people and it is the main grain used for animal feed in temperate regions, providing over two third of the total trade in feed grains (Purseglove, 1972). In general maize need at least 400-1000mm of well distributed rainfall during growing season if the soil texture is good enough to hold moisture for optimum crop absorption and utilization (Lafitte, 1994).

As different cultivars thrive well under different rainfall intensities, extra early maize is bred for marginal areas whose rainfall pattern cannot support the medium or late maturing varieties (Amoruwa, 1985). The recommended rate of fertilizer for medium and late maturing maize varieties may be too high for optimum performance of extra early maize.

The objective of this investigation was therefore to evaluate the effect of sowing date and nitrogen level on the yield and yield components of two extra early maize varieties in the Sudan savanna of Nigeria.

MATERIALS AND METHODS

The field experiments were carried out under rain fed condition of 2000 and 2001 at Kano State Agricultural and Rural Development Authority (KNARDA) Training School Farm, Kadawa (11 39N, 08 02E and 500m above sea level). The response of the two extra early maize varieties (95TZEE-W and 95TZEE-Y) to four levels of nitrogen (0, 40, 80, 120 kg ha^{-1}) and three different sowing dates (end of June, mid-July and end of July) spaced at weeks intervals starting from end of June for each cropping season were considered. A split plot design was used with three replications. Sowing date constituted the major plot while variety and nitrogen levels were allocated to the subplots. The gross plot consisted of 6 ridges (at 0.7 meters apart) by 3 meters. Three seeds were sown per hole at 25cm between stands. The plants were later thinned to one plant per stand at two weeks after sowing. The two centre ridges by two meters were harvested as net plot.

Nitrogen in the form of urea (46%N) was applied at the rate of 0, 40, 80 and 120 kg ha^{-1} according to the treatment. The application of nitrogen was done in two split doses. The second dose was applied at three weeks after sowing. It was applied in 5cm deep holes and buried between stands. The basal application of P and K (in the form of single super phosphate and muriate of potash) at 19.8 kg P ha^{-1} and 37.4 kg K ha^{-1} was done along with the first dose of the nitrogen at one week after sowing. Weeds were controlled using hoe at 2 and 4 weeks after sowing. The data collected include cob length, cob diameter, cob weight and grain yield. An analysis of variance was done in accordance with Snedecor and Cochran (1967) to determine the response of the data to the treatments. Significantly different means were compared using Duncan Multiple Range Test (Duncan, 1965).

Table-1 presents information on physical and chemical properties of the soil in the farm. The soil texture is predominantly sandy loam with low pH level, organic matter, available phosphorus and nitrogen.

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Table-1. The physical and chemical properties of soils at the experimental site during the period of the experiment.

Mechanical analysis (%)	**2000 wet season**		**2001 wet season**	
	0-15cm	**15-30cm**	**0-15cm**	**15-30cm**
Sand	64	66	70	64
Silt	26	20	18	18
Clay	10	14	12	18
Texture	Sand loam	Sand loam	Sand loam	Sand loam
Exchangeable bases (C. mol kg)				
Ca	3.20	1.00	1.80	1.00
Mg	0.17	0.20	0.52	0.43
K	0.24	0.18	0.11	0.07
H+ Al	1.20	1.14	0.44	0.58
CEC	0.20	0.40	0.10	0.20
Chemical properties				
pH in Water	5.20	4.80	5.20	4.80
pH in 0.01m Cacl	4.60	4.50	4.40	4.10
Organic Carbon (%)	0.25	0.20	0.29	0.37
Total Nitrogen (%)	0.07	0.053	0.065	0.053
Available exchangeable Phosphorus (Mg Kg)	3.14	2.24	5.60	2.80

Means followed by the same alphabet do not differ significantly at 5% level of significance using DMRT.
NS = Not significant.

Table-2. Meteorological conditions of Kadawa during the period of experiment.

Months	**2000**						**2001**					
	Rainfall (mm)	**Temperature**		**Relative humidity**		**Sunshine**	**Rainfall** (mm)	**Temperature**		**Relative humidity**		**Sunshine**
		max	**min**	**a.m.**	**p.m.**	**hours**		**max**	**min**	**a.m.**	**p.m.**	**hours**
May	-	43.7	25.2	67.5	25.3	6.2	56.0	41.6	25.2	69.5	37.0	NA
	-	43.8	26.2	62.3	30.5	8.7	54.0	39.3	24.8	87.1	43.9	NA
	-	41.8	25.0	67.3	37.9	9.0	92.9	39.5	24.5	78.9	39.8	NA
June	-	NA	NA	NA	NA	NA	NA	37.1	24.5	73.0	45.6	NA
	-	NA	NA	NA	NA	NA	15.2	37.4	24.7	73.6	42.3	NA
	-	NA	NA	NA	NA	NA	112.8	3.8	23.2	79.7	54.6	NA
July	-	NA	NA	NA	NA	NA	27.8	36.9	23.6	78.4	49.0	NA
	-	NA	NA	NA	NA	NA	60.0	36.3	23.7	81.2	50.3	NA
	-	NA	NA	NA	NA	NA	126.2	34.5	22.6	79.9	66.5	NA
August	36.7	33.8	22.0	80.0	60.0	6.2	70.0	34.5	20.4	82.0	66.0	NA
	49.3	34.6	22.1	76.0	63.3	4.6	124.0	34.1	23.1	79.7	67.8	NA
	75.8	27.0	21.6	85.0	67.6	7.0	182.5	37.7	25.1	90.9	73.8	NA
Sept.	43.7	36.3	23.5	81.5	67.7	8.4	76.9	33.5	22.5	82.6	65.3	NA
	231.7	34.4	22.0	83.3	64.6	6.5	31.6	35.7	23.2	83.0	55.4	NA
	31.1	35.8	23.2	78.4	64.8	6.4	27.8	35.8	22.9	81.9	56.6	NA
October	36.3	36.1	23.2	83.0	59.7	6.9	00.0	37.2	23.5	79.0	55.1	NA
	-	37.1	22.0	83.3	59.5	9.5	00.0	35.6	21.0	81.6	51.6	NA
	-	5.9	18.4	77.9	55.5	7.6	00.0	37.6	19.1	80.8	43.8	NA

Source: Institute of Agricultural Research (Meteorological Station), Ahmadu Bello University, Zaria, Nigeria.

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RESULTS AND DISCUSSIONS

Table-3 shows the effect of sowing dates and nitrogen level on cob length and cob diameter of extra early maize varieties. There was no significant varietal effect on cob length in the two year of the study. Cob length significantly decreases with delay in sowing date in 2001 whereas in 2000 the maize crop sown at the end of June and mid-July had significantly longer cob than the maize sown at the end of July. Application of nitrogen significantly increased cob length up to 80 kg ha^{-1} beyond which there was no significant response in cob length. There was no significant difference between the cob diameters of the two varieties in the two years of study. In 2000 and 2001 cob diameter significantly decreases with delayed sowing. Application of 120 and 80 kg N ha^{-1} had significantly higher cob diameter in both years.

The effect of sowing date and nitrogen level on cob weight and grain yield of the two extra early maize varieties is presented in Table-4. The effect of variety on cob weight and grain yield was not significant in the two years of study. In 2000, the maize sown at the end of June and mid-July had significantly heavier cob than end of July sown maize. In 2000, cob weight decreased significantly with delay in sowing date. Application of nitrogen significantly increased cob weight up to 80 kg N ha^{-1} beyond which there was no significant increase in cob weight through out the period of study. In 2000 and 2001 there was no significant difference in grain yield between the two varieties. In 2000, grain yield significantly decrease with delay in sowing date whereas in 2001 the maize sown at the end of June and mid-July gave significantly higher yield than end of July sown maize. Grain yield significantly increased with nitrogen application up to 80 kg N ha^{-1} throughout the study period. Further increase to 120 kg N ha^{-1} did not increase grain yield.

The significant reduction in cob length, cob diameter and cob weight with delay in sowing date could be due to the significant increase in the leaf area index of early sown crop which resulted in more light interception and probably higher photosynthesis. Valencia (1999) reported that, yield components decline with delay sowing. Kamel *et al* (1979) also reported that sowing dates have significant effect on weight of ear and ear length. Cob weight, cob length and cob diameter were observed to have increased significantly with nitrogen application and this could be attributed to the positive effect of nitrogen on number of leaves per plant, leaf size, dry matter production, length and number of ears per plant. This is in line with the findings of Carlone and Russell (1987) that nitrogen application significantly affect maize yield components.

The grain yield was observed to have significantly declined with delayed sowing. This could probably be as a result of the effect of yield components on grain yield. The decrease in yield components with delay in sowing date affected the final grain yield. The result agreed with that of Elemo (1991) which stated that the yield components decrease with delay in sowing, hence yield losses owing to delay by three weeks were about 80 kg/ha/day. Grain yield was observed to have increased significantly with nitrogen application. This may be attributed to the significant effect of nitrogen on chlorophyll formation, photosynthesis and assimilate production that resulted in optimum production of yield components which have direct bearing on the final grain yield. Carlone and Russell (1987) reported that grain yield increase by 78.1% as nitrogen rate was increased from 0 to 80 kg/ha.

Base on above findings, it was observed that the best yield and yield components were produced with application of 80 kg N ha^{-1}. On the sowing date however, the optimum yields were observed from the first sowing date (end of June) in all the two years. Therefore the application of 80 kg N ha^{-1} and sowing at the end June are recommended for best performance and optimum yield of extra early maize varieties in Sudan savanna of Nigeria.

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Table-3. Effect of sowing date and nitrogen level on cob length and cob diameter of two extra early maize varieties in Kadawa, Kano State, Nigeria.

Treatment	Cob length (cm)		Cob diameter (cm)	
	2000	**2001**	**2000**	**2001**
Variety				
95 TZEE-W	10.44	10.01	3.45	3.43.43
95TZEE-Y	10.39	10.36	3.39	3.39
SE	0.26	0.21	0.06	0.05
Sowing date				
End of June	11.12a	12.24a	4.14a	4.12a
Mid-July	10.82a	10.10b	3.44b	3.30b
End of July	9.32b	8.20c	2.64c	2.81c
SE	0.28	0.26	0.08	0.08
Nitrogen (kg ha^{-1})				
0	6.6c	7.10c	2.41c	2.80b
40	9.65b	10.22b	3.31b	3.57b
80	12.83a	11.56a	3.95a	3.65a
120	12.51a	11.84a	3.99a	3.63a
Interaction				
D x N x V	NS	NS	NS	NS

Means followed by the same alphabet do not differ significantly at 5% level of significance using DMRT.
NS = Not significant

Table-4. Effect of sowing date and nitrogen level on cob weight and grain yield of two extra early maize varieties in Kadawa, Kano State, Nigeria.

Treatment	Cob weight (gm)		Grain yield (kg ha^{-1})	
	2000	**2001**	**2000**	**2001**
Variety				
95 TZEE-W	49.54	37.96	2600.20	2443.30
95 TZEE-Y	52.60	37.39	2608.80	1780.00
SE	1.77	1.58	100.35	258.35
Sowing date				
End of June	63.32a	59.13a	3557.90a	2902.02a
Mid-July	58.58a	35.66b	2873.70b	2602.60a
End of July	31.33b	18.24c	1381.60c	830.70b
SE	2.17	1.94	122.89	316.41
Nitrogen (kg ha^{-1})				
0	22.04c	7.10c	498.40c	548.30c
40	50.15b	10.22b	2964.30b	1911.70b
80	67.96a	11.56a	3576.50a	3778.50a
120	64.14a	11.84a	3378.30ab	2208.00b
SE	2.50	0.30	141.91	365.36
Interaction				
D x N x V	NS	NS	NS	NS

Means followed by the same alphabet do not differ significantly at 5% level of significance using DMRT.
NS = Not significant

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