

Effect of Planting Date on the Performances of Sunflower (*Helianthus annuus* L.) Varieties in Lafia

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Abstract

The experiments were conducted during 2016 and 2017 rainy season; to determine a befitting planting date and the best variety of sunflower to be planted in Southern Guinea Savanna agro ecological zone of Nigeria. The treatments consisted of three planting dates (15 June, 29 June, 13 July) and three varieties (Samsun-3, Samsun-4, Samsun-5) which were factorially combined and laid in a Randomized Complete Block Design (RCBD) and replicated three times. The results showed that planting date and sunflower varieties significantly increased seedling emergence. Planting at June 29 had the highest percent seedling emergence of 86.82% and 91.36% in both years; this is at par with planting date of July 13 in 2016 and 2017 cropping season. Samsun – 4 variety of sunflower recorded the best seedling emergence percentage of 81.01% and 86.26%; which is higher than the other varieties tested in both years of cropping. Planting dates had a significant increase on all the vegetative growth parameters of sunflower assessed in both years of cropping. Planting on June 29, produced sunflowers with highest number of 16.79 and 17.91 leaves; tallest sunflower plant of 55.49 and 56.78 cm in height; and biggest stem girth of 2.82 and 2.78 cm in both years of cropping. However, all the varieties tested did not show any significant increase on the vegetative parameters of sunflower. Planting date of 29 June recorded significantly the highest seed yield of 659.24 and 678.24 kg ha⁻¹ in both years of cropping. Sunflower varieties on the other hand showed significant increase on only head weight per plant, seed weight per head of sunflower, and seed yield kg ha⁻¹. Samsun – 3 demonstrated its superiority in terms of the heaviest heads (104.82 and 143.37g), seed weight per head (29.32 and 29.24g) and total seed yield of 572.45 and 570.86 kg ha⁻¹ in both years of cropping sunflower. Planting sunflower after June 29 may not produce optimally in seeds yield and Samsun -3 variety showed better quality, but were not significantly different from the other varieties.

Keywords: Planting date, variety, vegetative growth, Sunflower, Southern Guinea Savanna

(Ahmed *et al.*, 2015). The late planting is effective in delaying of emergence,

INTRODUCTION

Sunflower (*Helianthus annuus* L.) occupies the fourth position among vegetable oilseeds after soybean, oil palm and canola in the world (Ahmad *et al.*, 2011). Although sunflower is generally regarded as a temperate crop, it is currently cultivated on approximately 23 million hectares in 40 countries of the world, including some countries in the humid tropical Africa; because the plant is quite rustic and can perform well under varying climatic and soil conditions (Seiler *et al.*, 2008). The major goal of growing sunflower is for its seed that contains oil (36–52%) and protein (28–32%) as reported by Rosa *et al.*, (2009). Planting dates have great influence on vegetative, generative growth and yield of sunflower

flowering, and maturity in some cultivars of sunflower. However, in studies that were conducted in different ecological and climatic conditions, the planting date delayed the growth, reduced the seed yield and quality (oil content) generally (Baghdadi *et al.*, 2014). Ali *et al.*, (2014) observed that the yield and agronomical characteristics of sunflower were notably higher in the early sown crops whereas the late sown crops showed lower yield and growth. In addition, the seed yield, head diameter, the ratio of dehulled/hulled seed weight, 1000 seed weight, oil content of seeds are positively affected by early sowing of sunflower (Abdouet *et al.*, 2011) Therefore, to enhance sunflower growth and yield, it is

necessary to take into consideration the optimum planting date for achieving higher yield. Optimum sowing date of sunflower as early and late season crops is relatively well known to be late May and July – Early August, respectively in the forest–savanna transition zone (Ogunemi, 2000). However, in southern guinea savanna zone; there is still a dearth of documented information on planting date of sunflower. This study therefore seek to investigate the optimum planting date and suitable variety of sunflower in this zone.

MATERIAL AND METHODS

Climate Conditions

The experiments were conducted during 2016 and 2017 rainy season at the research and teaching farm of the college of agriculture, Lafia, Nasarawa state, Nigeria. The study area falls within southern guinea savanna agroecological zone of Nigeria, and is located between Latitude 08.33 N and Longitude 08.32 E. Rainfall usually starts from May – October and the average monthly rainfall figures ranges from 400 -350mm. The months of July and August usually records heavy rainfall. The daily maximum temperature ranges from 20.0°C – 38.5°C and daily minimum ranges from 18.7°C – 28.2°C. The months of February to early April are the months that have the highest maximum temperature while the lowest maximum temperature months are recorded in December and January because of the prevailing cold harmattan wind from the northern part of the country at this period. The relative humidity rises as from April to a maximum of about 75- 90 percent in July (NIMET, 2017).

Soil and Vegetation Conditions

The soil type of the study area composed of highly leached Alfisols with low base saturation. The soil is strongly acidic and has high content of iron and Aluminium oxides hence reddish brown in colour with

very low organic matter content and low total nitrogen and available phosphate. The vegetation of the study area is that of the southern Guinea Savanna with interspersed thickets, grassland, trees, fringing woodlands or gallery forest along the streams. The natural vegetation of the area is made up of grasses and some traces of scattered wild and economic trees like *Vitellaria paradoxa* (Shear butter tree); *Parkia* spp (locust bean tree); *Gmelina arborea* (beechwood); *Anacardium* spp (Cashew trees); *Mangifera indica* (Mango). These trees usually shed off their leaves in the long dry season to conserve the available water.

Experimental Design and Data Collection

The treatments consisted of planting dates (15 June, 29 June, 13 July), three varieties (samsun-3, samsun-4, samsun-5) which were factorially combined and laid in a Randomized Complete Block Design (RCBD) and replicated three times to form thirty six plots. The plot size was 3 m by 4 m plots and 0.5 m between plots. The soil data for this study were collected from soil samples at the depth of 20 cm from experimental plots before planting for analysis. The land was cleared, ploughed and harrowed. Sunflower seeds were obtained from I.A.R (ABU Zaria) and urea fertilizer was purchased from Nasarawa state agricultural development program (N.A.D.P). Weeds were controlled by hand hoeing and insect pest were controlled using sprayed with karate 5EC. The following parameters [% Seedling emergence, plant height, stem girth, number of leaves, days to first flowering, days to maturity, head weight, head diameter, seed weight per head and seed weight per hectare] were assessed in both years.

Data analysis

The data collected were subjected to analysis of variance using GENSTAT, and where there is a significant difference; the means were separated using F-LSD at 5% probability level.

RESULTS

Soil and Manure Analysis

The soil of the experimental site was low in most of the plant nutrient elements, implying that the soil is low in fertility (Table 1). Also, the soil was slightly acidic in nature (6.08, 6.10); high in sand fraction (85.00, 84.00) and also very high in base saturation (87.00, 90.39) in both 2016 and 2017 cropping seasons.

Effect of Planting dates and Varieties on Sunflower Seedling Emergence

The result showed that planting dates and sunflower varieties had a significant effect on seedling emergence of sunflower (Table 1) in both years of cropping. The seeds that were planted on June 29 had the highest percent seedling emergence of 86.82% and 91.36%; this result is at par with planting date of July 13 in 2016 and 2017 cropping season. Samsun – 4 variety of sunflower recorded the best seedling emergence percentage of 81.01% and 86.26%; which is higher than the other varieties tested in both 2016 and 2017 cropping season

Effect of Planting dates and Varieties on Vegetative Growth of Sunflower

Planting dates had a significant effects on all the vegetative growth parameters of sunflower assessed in both years of cropping (Table 2). Planting on June 29, produced sunflowers with highest number of 16.79 and 17.91 leaves; tallest sunflower plant of 55.49cm and 56.78cm in height; and biggest stem girth of 2.82cm and 2.78cm in both years of cropping. However, all the varieties tested do not showed significant effect on the vegetative

parameters except on the stem girth where samsun -3 variety produced the biggest stem girth compared to the other varieties in both years of cropping.

Effect of Planting dates and Varieties on Yield Parameter of Sunflower

The result in (Table 3), showed that planting date had a significant increased on days to maturity, head weight, seed weight per head and seed yield per kg/ha of sunflower; but was not significant to days to 1st flowering and head diameter. July 13 planting date recorded the earliest maturity days of 83.91 and 84.78 days in both cropping season which is at par with Jun 29 planting date. Also June 29 planting date recorded the biggest head diameter of 18.12 cm and 19.18cm; heaviest head weight of 203.13g and 216.34g per plant; highest seed weight per plant and the highest seed yield of 659.24 kg ha⁻¹ and 678.24 kg ha⁻¹ in both years of cropping. Sunflower varieties on the hand showed significant increased on only head weight per plant, seed weight per head of sunflower, and seed yield kg ha⁻¹. Samsun – 3 demonstrated its superiority in terms of the heaviest heads (104.82g and 143.37g), seed weight (29.32g and 29.24g) and total seed yield of 572.45 kg ha⁻¹ and 570.86 kg ha⁻¹ in both years of cropping sunflower.

DISCUSSION

The significant response of sunflower seedling emergence to planting dates may be attributed to availability of adequate soil moisture and required temperature that enhances the germination processes. Also, the vigorous vegetative growth (Plant height, number of leaves and stem girth) of sunflower during the early planting dates could be explained by application of adequate fertilizer and availability of soil moisture, which enabled roots to absorb enough nutrients for plant growth. This result is in line with the report of Lawalet



al., (2011) who observed that earlier application of fertilizer and adequate soil moisture aids nutrient absorption which may result to good growth response of sunflower varieties. Planting date exerted significant influence on all the yield parameters assessed except days to first flowering, while varieties did not show significant difference in both planting season; with the second year cropping showing much improvement compared with first year cropping (Table 3). Sunflower that were planted earlier performed better in most of the yield parameters (head weight/plant, head diameter, head seed weight/plant, seed weight kg ha⁻¹). The luxuriant growth of sunflower that were planted late did not translate to seed production as rain has stopped during their seed filling stage of growth. Whereas, those planted early had their seed filling stage with adequate moisture compared with those planted late. This underscores the relevance of adequate supply of water for good seed production. This is in consonance with the report of Allamet al., (2003). Also, the heads of those sunflowers planted late were smaller with tiny seeds and majority of their achenes toward the centre of the head were hollow; therefore blown away during winnowing. This explains why the late planted sunflowers had large head diameters comparable to the earlier planted but recorded fewer seeds.

CONCLUSION

From this study, it can be concluded that planting sunflower in southern guinea savanna of Nigeria after June 29 may not produce optimally, especially in commercial production. Also, Samsun -3 showed better quality, but were not significantly different from the other varieties.

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Table 1: Laboratory analysis of soils at 0-30cm before cropping in both years

Properties	2016	2017
Mech. Composition		
Clay (%)	11.6	12.6
Silt	3.4	3.4
Sand	85.0	84.0
TCL (USD)	SL	SL
Chemical composition		
pH(H ₂ O)	6.08	6.10
pH(0.01MKCl ₂)	6.00	5.44
T N%	0.04	0.07
% OC	0.64	0.86
% O M	1.10	1.48
Avail. P(ppm)	4.57	12.29
K(mgkg ⁻¹)	0.31	0.38
Mg(cmolk ⁻¹)	1.78	1.28
Ca(cmolk ⁻¹)	3.41	4.83
Na(cmolk ⁻¹)	0.67	0.42
Al + H(acidity)	0.83	0.76
CEC(cmolk ⁻¹)	6.17	7.91
%Base Saturation	87.00	90.39

Table 2: Planting date and Varieties on sunflower seedling emergence

Treatment	% Seedling emergence	
	2016	2017
Planting dates		
June 15	42.91	62.59
June 29	86.82	91.36
July 13	81.64	85.42
LSD(0.05)	9.02	12.26
Varieties		
Samsun – 3	68.02	69.25
Samsun – 4	81.01	86.26
Samsun – 5	67.42	71.54
LSD(0.05)	7.81	5.14

Table 3: Effect of planting dates and varieties on the growth parameters of sunflower at seven weeks after planting

Treatment	Number of leaves		Plant height (cm)		Stem girth(cm)	
	2016	2017	2016	2017	2016	2017
Planting dates						
June 15	14.28	15.23	53.24	54.13	3.12	3.14
June 29	16.79	17.91	55.49	56.78	2.82	2.78
July 13	13.83	14.26	52.26	51.48	2.36	2.14
LSD(0.05)	2.18	2.12	1.18	1.24	0.12	0.24
Varieties						
Samsun – 3	15.45	15.23	57.14	56.97	3.14	3.21
Samsun – 4	16.12	15.48	56.45	57.10	2.22	2.42
Samsun – 5	15.74	16.02	56.67	56.78	2.35	2.56
LSD(0.05)	1.86	1.54	1.89	1.85	0.18	0.22

Table 4: Effect of planting date and varieties on yield parameters of sunflower

Treatment	Days to 1 st flower		Days to maturity		Head diameter(cm)		Headwt/plant(g)		Seedwt/ Head(g)		Seed yield(kg/ha)	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
Planting dates												
June 15	51.02	50.16	90.92	91.24	16.04	16.86	156.32	168.54	31.43	33.23	574.35	589.86
June 29	47.95	48.34	84.03	85.42	18.12	19.18	203.13	216.34	39.72	41.34	659.24	678.35
July 13	48.14	48.56	83.91	84.78	16.12	17.85	105.61	122.21	25.62	25.75	505.35	515.12
LSD(0.05)	Ns	ns	1.07	1.13	2.96	2.95	35.74	34.23	4.32	5.24	65.43	68.65
Varieties												
Samsun – 3	49.92	48.75	85.42	86.17	14.71	15.23	140.82	143.37	29.32	29.24	572.45	570.86
Samsun – 4	47.83	49.42	84.91	85.21	13.42	14.12	102.11	100.49	22.23	23.09	528.05	530.12
Samsun – 5	49.25	48.67	85.32	85.23	14.15	14.21	130.42	133.46	29.21	29.11	544.12	546.53
LSD(0.05)	ns	ns	ns	ns	ns	ns	34.43	30.56	4.24	3.45	56.74	59.45