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Effects of Sowing Date on Growth and Yield of Some Two Varieties of Soybean (Glyxine max) in the Forest-Savannah Agro-Ecology of Nigeria

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Abstract

Field experiment was conducted investigate effects of sowing date on growth and yield of soybean using two selected varieties of soybean (Samsoy 2 and TGX 923-2E) during the late and early rains of the years 2015 and 2016 respectively. In order to determine the optimum date(s) for good growth and yield of soybean, four sowing dates were selected at two weeks interval. For late sowing, 8th (D1 L), 22nd (D2* L) of July and 9th (D3* L) and 23rd (D4* L) of August, 2015, while the planting dates for early raining season were 7th (D1* E), 21st (D2* E) of April and 5th (D3* E) and 19th (D4* E) of May, 2016 were followed. Variables measured were plant height, number of leaves, leaf area, number of branches per plant, number of flowers, and number of pods per plant and grain yield per hectare. Cultivar differences were noticed among the two varieties of soybean which indicated their generic differences. Samsoy 2 matured earlier and produced bigger seeds than TGX 923-2E. TGX 923-2E produced larger leaf area, more flowers, more pod per plant and more seeds per pod than Samsoy 2. Generally plant height, number of pods and the grain yield per hectare decreased with delayed sowing irrespective of season of sowing and variety sowed. Sowing of soybean for good grain yield should not be delayed beyond mid-August for late sowing, while sowing is best done at the onset of rains for early season sowing in forest-savannah agro-ecology of Nigeria.*

Keywords: Climate change; Planting dates; Agronomic parameters; Rainfall distribution pattern; Food sufficiency.

Introduction

Soybean designated as 'miracle bean' has established its potential as an industrially vital and viable oilseed crop in many areas of the world. Soybean now has been established as one of the most important oilseed crop in the world, accounting for more than 50 percent of oilseed produced and 30 percent of the total supply of all vegetable oils. Soybean is a unique two in one crop having both high quality protein (43%) and oil (20%) content. The protein form of soybean is equivalent to that of meat, milk products and eggs in quality [1]. Soybean is of great use for its dietic, industrial, agricultural and medicinal purposes. The Soybean meal is an important part of human food as it is essential in the various preparations *viz*, bread, cakes, muffins, biscuits and pastry from the flour form. As a medicament, soybean is of great importance in diabetic dietary.

Planting date plays a significant role in field crop production. Planting too early or too late may decrease the yield and quality of a crop due to insect, disease, or weed pressure, or from environmental stress such as frost, drought, and high temperature. Time of planting varies depending on the climatic condition of the region and the variety of crop tobe

grown. Previous studies have shown that early or late planting significantly reduced crop yield [2-4]. Planting date is the largest variable with the largest effects on crop yield [5].

Different varieties of soybean are sensitive to change in environmental condition especially at this time of global climate change [5]. There are currently few guidelines available for growers producing soybean. The goal is to determine planting dates that would provide an optimum growing period, decrease chances of frost or drought damage and enhance grain yield. Therefore it is necessary to study the crop-environmental interaction to identify its responses to changing environmental conditions. Planting date is a variable with the largest effect on crop yield. Fine tune management of soybean by sowing date is a good approach to enhance both crop yield and economic benefits. Environmental condition associated with late or early sowing affects crop features related to capturing of radiation and portioning of crop resources. These include less vegetative growth and shortening reproductive phases [6-8]. As variation in soybean sowing date is expected to impact the pattern of soybean growth and development, very few scientific researchers have been carried out towards the area. Therefore, the aim of this experiment is to investigate the effect of planting date on growth and yield of selected varieties of soybean in forest savannah eco-climatic zone of Nigeria.

Materials and Methods

This research was conducted during the late and early seasons of 2015 and 2016 respectively at the post-graduate experimental research farm of the University of Agriculture, Abeokuta (70, 15`N; 30, 25`E). Desert encroachment into the rainforest zones is approaching at a fast rate; thus, many rainforest zones are becoming dry lands, otherwise referred to as forest-savannah transition zone. This area has annual rainfall that ranges between 1500 mm to 2900 mm. The rainfall pattern of the region has distinct dry and wet seasons. The dry season runs from early November to the end of early April, while the wet season is from early April to early November. There are two rainfall peaks in June and in September with dry spell in August. The mean annual temperature ranged between 250°C and 320°C. Relative humidity is high throughout the year and it ranges between 60% and 90%. The Soil of the experimental site was a well-drained tropical ferruginous soil classified as sandy-loam [9]. Soil pre-planting analyses of the experimental sites are presented in table 1. The results of the pre-planting soil test can be said to be sufficient in terms of basic nutrient requirement to support the growth and yield of soybean. The land was ploughed twice and harrowed once during the planting seasons. The experiment was laid out in a spilt plot design with three replications. The main plot treatments were varieties of soybean, while the sub-plot treatments were days of sowing. The recommended planting spacing of soybean (60 cm between rows and 75 cm between plant stands) were followed.

Table 1: Pre-planting soil chemical analysis of two planting seasons (late rains, 2015 and early rains, 2016)

Variety **Day *Season	2015 late season	2016 early season
%Nitrogen	0.1	0.13
%Carbon	1.02	1.3
PH (H_2O)	6.5	5.7
Na (meq/100g)	0.46	0.45
P (ppm)	2.85	2.9
K (meq/100g)	0.61	0.59
Ca (meq /100g)	2.61	2.7

Two selected early maturing varieties of soybean were used; they were Samsoy 2 and TGX 923-2E. Samsoy 2 was developed by Institute of Agricultural Research (IAR), Samaru, Nigeria. It is a product of the cross between Malaysia and Clemison (non-shattering variety). It is erect, compact branching determinate with distinctively deep green broad leaves. TGX 923-2E is a product of multiple cross of (TGX 51 x TGM 280-3), (TGM 479 x TGX 263-1-2) and (TGX 849-3) and has a yellow seed coat. The four sowing dates selected for late raining season were 8th ($D1^*$ L), 22nd ($D2^*$ L) of July and 9th ($D3^*$ L) and 23rd ($D4^*$ L) of August, 2015, while the sowing dates for early raining season were 7th ($D1^*$ E), 21st ($D2^*$ E) of April, 5th ($D3^*$ E) and 19th ($D4^*$ E) of May, 2016. Three seeds per hole were sowed, which was later thinned to two per stand at one week after sowing. Weeding was carried out manually using hoe two weeks after planting and subsequently at two weeks interval.

Growth and yield data collected included plant height, number of leaves, number of branches, leaf area, number of nodes, number of flowers, number of pods per plant, number of seeds per pod, number of pods per stand and dry

weight of seeds per hectare. The data sets were subjected to Analysis of Variance (ANOVA) and significant mean values were separated using Duncan's Multiple Range Test (DMRT) using SAS 2010 at (P=0.05).

Results

Varietal differences were noticed among the two cultivars of soybean used. This may be due to the difference in their genetic composition. Similar observations were made when Pfeiffer and Pilcher [2] worked with twelve introductive lines and were able to divide them into two genetic groups based on physiological performances. Samsoy 2 germinated about 2 days earlier than TGX 923-2E (not presented). Also, Samsoy 2 showed more rapid growth at the early stages of development than TGX 923-2E up till about 20 Days After Sowing (DAS) irrespective of the season of planting. TGX 923-2E grew taller than Samsoy 2 at the vegetative and maturity stages of development during the two sowing seasons. In 2015, the effect of sowing date was not significant but at maturity, plant height increased with delayed sowing. At 40 DAS, Samsoy 2 measured 26.9 cm and 35.1 cm for D1 and D2 respectively while TGX 923-2E measured 25.2 cm and 34.5 cm respectively (Table 2). Similar trend was noticed in soybean sowed in 2016 early rains from emergence to maturity stages. The plant height increased with delayed sowing while the number of leaves decreased with delayed sowing irrespective of the season of sowing.

Table 2: Effects of sowing date on Plant height and Number of leaves selected varieties of Soybean.

Variety *Day *Season	**Plant height (cm) Days After Sowing(DAS)**					**Number of leaves Days After Sowing(DAS)**				
	10	20	30	40	50	10	20	30	40	50
V1* D1* L	10	18.7	23.7	26.9	29.1	5	11	15	37	51
V1* D2* L	12	19.8	24.7	35.1	37.7	5	12	13	35	50
V1* D3* L	10	28.6	33.5	35	37.1	5	10	14	33	47
V1* D4* L	11	29.2	37.5	35.7	41.6	5	12	14	30	43
V1* D1*E	11	19.2	20.4	25.2	28.1	5	11	16	35	50
V1* D2* E	11	20.1	29.8	34.5	36.4	5	11	14	34	49
V1* D3* E	10	26.9	32.6	35.1	37.4	5	10	15	35	46
V1* D4* E	11	28.6	33.4	37.2	43.1	5	11	14	32	45
V2* D1* L	19.2	24.6	28.4	32.9	44.5	5	11	17	32	52
V2* D2* L	18.4	25.6	28.2	36.8	46.6	5	12	15	35	50
V2* D3* L	19	26.2	28.3	34.6	47.2	5	11	14	31	49
V2* D4* L	16.8	24.6	29.5	32.7	47.8	5	10	15	30	45
V2* D1*E	20	25.4	26.1	39.5	45.2	5	11	16	35	55

V2* D2* E	17	26	27.7	38.6	46.1	5	10	14	32	52
V2* D3* E	19	25.3	28.2	36.4	42.9	5	12	14	29	49
V2* D4* E	21	25	28.5	37.2	47.3	5	10	14	27	39
LSD (P £ 0.05)	0.3	1.2	3.4	2.7	3.1	0	0.5	1.2	3,2	5.4

V1* D1* L----- Samsoy 2sowed on 8th July, 2015
V1* D2* L------ Samsoy 2 sowed on 22nd July, 2015
V1* D3* L------ Samsoy 2 sowed on 9th August, 2015
V1* D4* L----- Samsoy 2 sowed on 23rd August, 2015
V1* D1* E--- Samsoy 2 sowed on7th April.2016
V1* D2* E--- Samsoy 2 sowed on 21st April, 2016
V1* D3* E--- Samsoy 2 sowed on 5th May, 2016
V1* D4* E--- Samsoy 2 sowed on 19th May, 2016
V2* D1* L---- TGX 923-2E sowed on 8th July, 2015 V2* D2* L---- TGX 923-2E sowed on 22nd July, 2015 V2* D3* L---- TGX 923-2E sowed on 9th August, 2015 V2* D4* L---- TGX 923-2E sowed on 23rd August, 2015V2* D1*E----- TGX 923-2E sowed on7th April.2016 V2* D2* E---- TGX 923-2E sowed on 21st April, 2016 V2* D3* E--- TGX 923-2E sowed on 5th May, 2016 V2* D4* E---- TGX 923-2E sowed on 19th May, 2016

The leaf area decreased with delayed sowing at all stages of development of the two soybean varieties sowed during the two sowing seasons. The differences in the number of branches per plant are inconsistent and significantly low at the different stages of growth and development of soybean (Table 3)

Table 3: Effects of sowing date on number of nodules per plant and number of flowers per plant of selected varieties of soybean

Variety *Day *Season	No. of Nodules/plant	No. of flowers/plant
V1* D1* L	4.2	56.4
V1* D2* L	8.4	64.8
V1* D3* L	9.6	68.4
V1* D4* L	10.2	92.8
V1* D1*E	3.8	51.3
V1* D2* E	7	60
V1* D3* E	8.3	65.3
V1* D4* E	11.5	82.5
V2* D1* L	4	51.3
V2* D2* L	7	53.5
V2* D3* L	15	56.8
V2* D4* L	11.5	59.8
V2* D1*E	5.2	59.3
V2* D2* E	8	62.4
V2* D3* E	12.6	68.9

V2* D4* E	12.6	70.2
LSD (P £ 0.05)	4.1	4.6

Table 4: Effects of sowing date on number of pods per plant and yield per hectare of selected varieties of soybean

Variety *Day*Season	No. of pods/plant	Yield ha -1 (kg ha -1)
V1* D1* L	78.2	4344.5
V1* D2* L	76	3938.9
V1* D3* L	73.4	3432.1
V1* D4* L	68.1	3142.5
V1* D1*E	45.6	4316.3
V1* D2* E	53.4	2691.6
V1* D3* E	70.3	3280.8
V1* D4* E	76	3659.7
V2* D1* L	47	2209.1
V2* D2* L	49.5	2141.5
V2* D3* L	41.5	3414.6
V2* D4* L	43.5	4322.6
V2* D1*E	45.2	3069.2
V2* D2* E	43.8	2904.1
V2* D3* E	40.1	3148
V2* D4* E	39.8	3029.5
LSD (P £ 0.05)	4.4	747.7

The number of nodules, number of flowers, number of pods/plant increased with delayed sowing irrespective of the variety of soybean during the late rains of 2015 (Table 3). During the early rains of 2013, number of nodules, number of flowers and number of pods/plant increased with delayed sowing irrespective of the variety of soybean (Table 4). During the 2012 late rains, Samsoy 2 sowed on D4 had the highest number of flowers (92.8). During the 2013 early rains Samsoy 2 sowed on D4 had the highest number of flowers (82.5) (Table 4). Cultivar differences were noticed among the two varieties of soybean in terms of grain yield. During the late rains of 2012, Samsoy 2 sowed on D1 produced the highest grain yield (4344 kg/ha) while the lowest was by TGX923-2E (2141.5 kg/ha), However, in 2013 early rains sowing, Samsoy 2 sowed on D1 had the highest grain yield of 4316.3 kg/ha (Table 4). Days to maturity was observed to decrease with delayed sowing during early rains but increase with delayed sowing during late rains. Photoperiodic effects were not unlikely to have contributed to this observed pattern of growth. Soybean is a short-day plant but photoperiod was generally longer during the month of June and July decreasing toward October-November [9]. Board and Hall [10] made similar observation when they investigated the effects of photoperiod on pod maturity. Generally, grain yield decreased with delayed sowing in both planting seasons irrespective of the cultivar used.

Conclusion

This experiment was conducted to investigate the effects of sowing dates on growth and yield of soybean in forest-savannah eco-climatic zone of Nigeria. The results obtained from the experiment indicated that there were cultivar differences for some of the agronomic parameters (leaf area, plant height, number of leaves, number of flowers, days to maturity and grain yield) as a result of difference in their generic composition. For instance, Samsoy 2 matured earlier than TGX 923-2E and produced bigger seeds, while TGX 923-2E showed larger leaf area and more number of flowers than Samsoy 2.

Sowing date affected soybean performance in most parameters measured as it was shown that plant height, number of

flowers, number of pods per plant and ultimate grain yield generally decrease with delayed sowing. Sowing of soybean for good grain yield should not be delayed beyond mid-August for late sowing, while sowing is best done at the onset of rains for early season sowing in forest-savannah eco-climatic zone of Nigeria. The grain yield of soybean sowed during the late rains was higher than those sowed during early rains. The potential yield was reduced possibly by higher rainfall received during early rains than that received during late rains.

References

1. Odhiambo GD, Ariga ES (2001) Effect of intercropping maize and beans on striga incidence and grain yield. Ariga ES 7: 183-186.
2. Pfeiffer TW, Pilcher D (2007) Effects of early and late flowering on agronomic traits of soybean at different planting dates. Crop Science 5: 16-18.
3. Kill KY, Mira K, Nimks C, Yangmun P (2008) Effects of planting date and plant density on growth and yield of soybean in Cheju Island. Korean J Crop Sci 43: 44-48.
4. Rehan J (2012) Effect of planting patterns on growth and yield of different legumes. Pak J Life Soc Sci 2: 132-135.
5. Calvino PA, Sadras VO, Andrade FH (2003) Quantification of environmental and management effects on the yield of late-sown soybean. Field Crops Res 83: 67-77.
6. Board JE, Kang MS, Harvills BG (1999) Path analysis of the yield formation process for late-planted soybean. Agro J 91: 128-135.
7. Boquet DJ (1990) Plant population density and row spacing effects on soybean at post-ptimal planting dates. Agro J 82: 59-64.
8. Kantolic AG, Slafer GA (2001) Photoperiod sensitivity after flowering and seed number determination in indeterminate soybean cultivars. Field Crops Res 72: 109-118.
9. Bello NJ (2006) An investigation of the agro-climatic potentials of the forest-savanna transition zone of Nigeria for the cultivation of sorghum. Expl Agric 33: 157–171.
10. Board JE, Hall W (1994) Premature flowering in planted soybean. Agro J 88: 567-572.