

Evaluation of Maize-Soyabean Intercrop as Influenced by Sowing Date of Soyabean in Northern Guinea Savanna of Nigeria

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Abstract: The study was conducted at Mubi , Adamawa State Nigeria with the objective of evaluating the influence of soyabean sowing date on maize-soyabean intercrop during the 2008 and 2009 cropping seasons. The crops were grown on sandy loam soil in alternate rows typical of the husbandry practices of the area .Results indicate that, variation in soyabean sowing dates influenced the growth and yield of soyabean more than that of maize with early sown soyabean producing more yield than later sown one.Results revealed that, the number of branches per plant , number of pods per plant,1000 grain weight, grain weight per plant and grain yield (kg/ha) of soyabean were significantly ($p=0.05$) higher with SD1 in both years compared to other treatments. It was observed also, that the optimum sowing date for both maize and soyabean that produced the best yield and yield determining characters was SD1 for the 2008 and 2009 cropping seasons. [New York Science Journal 2010;3(10):97-102]. (ISSN: 1554-0200).

Key Words: Maize-soyabean intercrop, Optimum, Grain yield, Sowing date

Introduction

Intercropping is the growing of two or more crops simultaneously on the same piece of land in a manner that permits interactions of the crops in space and dimension. Trendath (1976) pointed out that ,the success of crop mixtures relative to pure stands might be determined by various agronomic practices ,which affect the nature of the interaction between the species and the natural plant growth resources. In Nigeria .as in many other developing countries ,intercropping is dominant (Natarajan and Willey,1980), and varies from one area to another,and even within one locality it may still differ depending on the farmers resources and agro-ecological resources. Cereal and legume intercrop are very popular among small scale farmers,this is primarily to increase the diversity of their product and stability of their annual output through effective use of land and other resources (Faris et al,1983). Farmers have generally regarded intercropping as a technique that reduce risk in crop production, if one member of an intercrop fails,the other survives and compensates in yield to some extent ,allowing the farmer an accepted harvest.The prevailing production practices for maize –soyabean is also basically traditional.In most cases, local maize cultivars are grown in mixtures with soyabean at arbitrary spacings which result in low yields.There is currently paucity of empirical evidence on cultural

manipulations for improving the productivity of the intercropping systems in northern guinea savanna especially as intercropping involving soyabean and maize is a recent development. The demand for soyabean due to its high potentials has continued to increase more than for other crops (Smith et al,1993). Despite its increasing importance ,soyabean has not received enough attention to determine its adaptability to the cropping systems prevalent in northern guinea savanna agro-ecological zone.To convince the small scale farmers on the potentialities of soyabean ,it is therefore necessary to study ways of successfully incorporating the crop into the local cropping pattern (IITA,1995). There is need therefore to conduct some systematic studies on maize-soyabean intercrop to address specific management issues for greater grain production.The objective of this experiment was therefore,to evaluate the influence of soyabean sowing date on maize-soyabean intercrop under rainfed conditions at Mubi in northern guinea savanna area of Nigeria.

Materials and Methods

A field experiment was conducted at Mubi , Adamawa State Nigeria during the 2008 and 2009 cropping seasons to evaluate the influence of soyabean sowing date on maize-soyabean intercrop.The soil of the area was sandy loam and the experimental design was randomized complete block

with three replications. The experimental treatment used were four sowing dates of soyabean viz: SD1 (15th June), SD2 (22nd June), SD3 (29th June), and SD4 (4th July) for 2008 and 2009 respectively. The land for the experimental site was cleared, ploughed and later harrowed to soften the soil before sowing. Each experimental plot measured 3m x 4m (12m) with 1m and 0.5m pathway between each replicate and the plots respectively. The maize seed (TZB -234) and soyabean seed (Samsoy-2) were obtained from Adamawa Agricultural Development Programme (AADP). Weed control was done manually through the use of hand hoe. Data were collected on the following parameters for maize: plant height, number of leaves, days to 50% booting, 1000 grain weight, grain weight per plant, cob length

and grain yield (kg/ha), while for soyabean: plant height, number of leaves, days to 50% flowering, number of branches, number of pods per plant, 1000 grain weight, grain weight per plant, and grain yield (kg/ha). The data collected were subjected to analysis of variance (ANOVA) and means separated using least significant difference at 5% probability level.

RESULTS

The influence of sowing date of soyabean on plant height, number of leaves and days to 50% booting of maize in maize-soyabean intercrop is summarized in Table 1. There was significant ($p=0.05$) effect due to sowing date on plant height of maize at 4, 8 and 12 WAS respectively.

Table 1. The influence of sowing date of soyabean on plant height, number of leaves and days to 50% booting of maize in maize-soyabean intercrop.

Sowing dates	2008						
	Plant Height (cm)			Number of Leaves			Days to 50% booting
	4 WAS	8 WAS	12 WAS	4 WAS	8 WAS	12 WAS	
SD ₁	39.05	160.50	175.35	4.01	9.51	13.25	60.27
SD ₂	34.10	157.00	170.01	3.90	8.96	12.12	53.45
SD ₃	33.40	158.00	167.15	3.95	9.03	11.89	50.28
SD ₄	45.00	171.34	190.11	4.70	8.93	12.32	49.92
LSD (P=0.5)	6.10	7.02	11.50	NS	NS	NS	5.50
				2009			
SD ₁	40.21	159.00	173.81	4.51	8.95	13.01	61.01
SD ₂	33.11	160.51	172.30	3.89	9.01	12.09	57.18
SD ₃	34.24	157.85	164.10	3.97	9.05	12.21	49.02
SD ₄	46.03	173.18	188.10	4.86	9.21	11.95	51.07
LSD (P=0.05)	6.05	18.14	12.03	NS	NS	NS	NS

Key:

SD	-	Sowing Date
SD ₁	-	15 th June, 2008/2009
SD ₂	-	22 nd June, 2008/2009
SD ₃	-	29 th June, 2008/2009
SD ₄	-	8 th July, 2008/2009
NS	-	Non - Significant
LSD	-	Least Significant Difference

Number of leaves at 4, 8 and 12 WAS did not show any significant difference in 2008 and 2009 with SD₁, consistently producing higher number of leaves for the two years of study. Significant ($p=0.05$) difference was also recorded with days to 50% booting where SD₁ in both years recorded the highest number of days to booting compared to other treatments.

Table 2 shows that sowing date of soyabean had significant effect on 1000 grain weight (g) and grain yield (kg/ha) but no significant difference recorded with cob length (cm) for both years.

Table 2. The influence of sowing date of soyabean on 1000 grain weight(g) , grain weight per plant, cob length (cm), and grain yield(kg/ha) of maize in maize –soyabean intercrop.

2008				
Sowing date	1000 grain weight(g)	Grain weight per plant(g)	Cob length(cm)	Grain yield (Kg/ha)
SD1	1015.00	83.04	14.82	1850.00
SD2	980.00	72.10	13.55	1705.00
SD3	1200.00	63.50	12;91	1630.00
SD4	990.00	91.21	13.41	1870.00
LSD(P=0.05)	8.91	12.40	NS	50.25
2009				
SD1	1018.00	85.21	14.01	1862.00
SD2	1001.00	76.00	13.71	1770.00
SD3	1018.00	74.00	13.03	1650.00
SD4	998.00	94.01	13.15	1850.00
LSD(P=0.05)	10.05	13.02	NS	48.02

Plant height and number of leaves of soyabean at 8 and 12WAS were significantly influenced in 2008 and 2009. Similarly days to 50% flowering showed a significant effect due to

treatment effect for both years as presented in Table 3. Contrary to this, plant height and number of leaves of soyabean at 4WAS recorded non-significant ($p=0.05$) difference for both years.

Table 3. The influence of sowing date on plant height (cm), number of leaves and days to 50% flowering of soyabean in maize-soyabean intercrop.

Sowing dates	2008						Days to 50% flowering
	Plant Height (cm)			Number of Leaves			
	4 WAS	8 WAS	12 WAS	4 WAS	8 WAS	12 WAS	
SD1	20.10	48.80	52.20	10.10	38.40	62.01	42.10
SD2	22.51	52.32	56.00	8.92	31.01	52.70	41.00
SD3	23.01	49.30	39.21	9.11	30.00	55.00	49.20
SD4	24.33	60.05	67.00	7.20	27.01	48.11	51.18
LSD(P=0.05)	NS	3.62	4.83	NS	4.62	6.14	1.52
2009							
SD1	21.80	49.30	52.50	9.51	39.20	60.20	40.00
SD2	22.10	58.20	53.01	8.90	32.90	51.60	45.10
SD3	22.10	48.14	60.14	9.00	34.00	54.07	48.20
SD4	22.60	62.25	70.00	7.89	29.45	45.00	50.25
LSD (P-0.05)	NS	3.30	4.74	NS	4.01	6.31	2.01

In both years as presented in Table 4 , number of branches of soyabean ,pods per plant,1000 grain weight ,grain weight per plant and grain yield (kg/ha) were significantly influenced by soyabean sowing date. Consistently higher yield of 1050.17kg/ha with SD1 in 2008 and 1102.00kg/ha

also with SD1 in 2009 were observed for soyabean in maize-soyabean intercrop compared to other treatments. Similarly, higher figures were recorded inSD1 with other yield determining factors compared to lower values recorded with other treatments.

Table 4. The influence of sowing date on number of branches, number of pods per plant, 1000 grain weight (g), grain weight (g) per plant, and grain yield (kg/ha) of soyabean in soyabean in maize-soyabean intercrop.

2008					
Sowing dates	Number of branches	Number of pods per plant	1000 grain weight (g)	Grain weight (Kg) per plant	Grain yield (kg/ha)
SD ₁	20.20	178.40	140.45	184.04	1050.17
SD ₂	17.28	151.30	130.06	126.00	889.01
SD ₃	13.45	141.01	128.00	115.30	870.00
SD ₄	9.02	122.00	105.16	90.15	650.00
LSD (P-0.05)	2.64	28.34	14.21	20.01	201.04
2009					
SD ₁	21.11	171.18	140.30	138.15	1102.00
SD ₂	15.10	157.00	128.90	122.40	982.04
SD ₃	14.52	139.23	125.40	117.10	902.00
SD ₄	10.25	120.18	109.11	99.00	701.14
LSD (P=0.05)	2.15	27.52	13.10	18.13	159.18

Discussion

Crop production in the tropical world is generally characterized by uncertainty in rainfall distribution which has great impact on sowing date trials. It is in this view that Ojanuga (1978) suggested that the extensive land mass in Nigeria makes it mandatory to evaluate the cropping systems according to the peculiar nature of different agro-ecological zones. The present study shows that significant difference was observed in the height of maize at 4, 8 and 12WAS in 2008 and 2009. Similar result was also obtained with days 50% booting for sorghum Table 1. This implies that the vegetative performance of maize was not potentially influenced by soyabean possibly because of leaf and height differences. This findings agrees with (Squire 1990, Adeniyani and Ayoola, 2006) who found that variation in leaf arrangement, difference in leaf inclination and height of the cereal component can result in different transmission of radiation to other component. The maize within maize-soyabean in 2008 and 2009 showed a significant difference for 1000 grain weight(g), grain weight per plant(g) and grain yield(kg/ha) for the four differential sowing dates of soyabean. This result indicates that soyabean had little influence on the yield and yield determining parameters of maize. Soyabean was much shorter than maize and hence offered little aerial competition on their performance. This result is in total agreement with Willey (1976) who observed the effects of

temporal differences in sowing and crop life cycles. Researchers (Futuless and Odo 1998, Odo and Futuless, 2000; Mouneke et al; 2007) have reiterated the need to avoid mutual interference between intercropped crops in order to ensure a better utilization of crop growth resources. However, the effect of soyabean sowing date on the yield of maize varied in 2008 and 2009 and thus the present result should be considered to be stable.

Significant effect were observed on the plant height and number of leaves of soyabean at 8 and 12WAS Table 3. Similar result was obtained with days to 50% flowering for the two years. This result therefore signifies that differential sowing dates can influence the development of soyabean. This result is corroborated by Kalu and Omuor (1991) who found that vegetative and yield variables of crops is potentially influenced by competition of the plant with the second crop in an intercropping system. This influence therefore may be affected by height, leaves, varieties and sowing date.

Table 4 shows a consistently impressive result of the yield and yield determining parameters of soyabean in maize-soyabean intercrop but not comparable to that of maize. This result supports the findings of other authors like Irigavarabu and Randall (1986) who found that maize intercropped with soyabean resulted in soyabean reduction of 11-34% depending on row orientation whereas yield of

maize was enhanced 6-27% depending on row orientation. This therefore implies that sowing date influence differs in the maize-soyabean intercrop. The observation in the present study also showed that soyabean that were planted early performed better than the ones sown late in both 2008 and 2009. Soyabean in the intercrop suffered greater yield depression due to its more disadvantaged position below the maize component. This agrees with Boerma et al ;(1982) who attributed low yield of soyabean in intercrop to lack of good vegetative growth. SD4 in both years recorded the lowest grain yield. This result supports (Wilcox, 1987 and Weaver et al; 1991) who viewed that delay in sowing dates brings about yield penalty. Other researchers like Mohta and De (1980) opined the poor performance of soyabean intercrop with cereal to shading, while the reduction in the cereal component was associated with slow growth at the initial stage which enabled the relatively fast growing soyabean component to compete with the cereal for nutrients and depress its growth and yield.

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References

1. Adeniyani, O. N, and Ayoola, O, T .Growth and yield performance of some improved varieties of soyabean as influenced by intercropping with maize and cassava in two contrasting location in South West Nigeria. *Afr. J. Biotech.* (2006). 1888-1889.
2. Boerma. H,R; Wood, E .D. and Baret, G.B. Registration of Duocrop soyabean. *Crop Science* (1982).22:448-449.
3. Faris, M.H, Burity, H,A; Reis, D.V.D, and Marfa, R.C Economic analysis of soyabean and maize system in monoculture vs associated cropping. *Field crop J.* (1983). 319-335.
4. Futuless, K.N. and Odo, P.E. Effect of different sowing dates of soyabean on growth and yield of sorghum-sooyabean intercrop in a semi-arid environment. *Journal of Applied Science and Management.* (1998). 2:13-19.
5. Gomez, K.A; and Gomez, A.A .Statistical procedures for Agricultural Research. 2nd edition. (1976).
6. Irigavarapu, T.K; and Randall, G.W. Border effects on yield in a strip –intercropped soyabean corn and wheat production system. *Prod. Agric* (1990).9:101-109.
7. International Institute of Tropical Agriculture (IITA) Grain Legume Improvement Program. Part 111 soyabean. Archival Report. IITA, Ibadan. (1995). pp 75.
8. Kalu, B.A, and Omujor, Y.M .Soyabean based cropping system. Paper for the University of Agriculture Makurdi-Nigeria. CEC Training Workshop Service .(1991).No.2:9-16.
9. Mohta, N.K, and De, R. Intercropping maize and sorghum with soyabeans. *Journal of Agricultural Science. Cambridge* (1980).75:117-122.
10. Mounneke, C.O; Ogwuche, M.A.O, and Kalu, B.A. (2007). Effect of maize planting density on the performance of maize-soyabean intercropping system in Guinea Savannah Agroecosystem. *Afr.J.Agric.Res.*2:667-668.
11. Natarjan, M. and Willey, R.W. (1980). Sorghum-pigeon pea intercropping and the effects of plant population density, I. Growth and yield .*Journal of Agricultural Science. Cambridge.*95:51-48.
12. Ojanuga, A.G.(1987). Characteristics of soil of the semi-arid region of Nigeria. pp18-53. In:

- Ecological disasters of Nigeria: Drought and Desertification, Sagua et al;1987; Federal
13. Odo,P.E.and Futules, K,N. (2000). Millet-soyabean intercropping as affected by different sowing dates of soyabean in a semi-arid environment. *Cereal Research Communications*. 28:1-2.
 14. Smith, J; Woodworth, J. B. and Dashiell, K.E. Government policy and farm-level technologies: The expansion of soyabean in Nigeria.IITA Research, No.11 September. (1995)
 15. Squire, G.R. (1990). The physiology of tropical crop production. CAB International, Wallingford UK.pp236.
 16. Trenbath, B.R. (1976).Plant interactions in mixed crop communities.Madison American Society Agronomy.129-169.
 - Min.of Sci.and Tech. Lagos, Nigeria. pp 18-53.
 17. Weaver, D; Akroidge, R.L; and Thomas, C.A. (1991). Growth habit ,planting date and row spacing effect on late -planted soyabean.*Crop Science*.31:805-810.
 18. Wilcox, J.R. (1987). Indeterminate and determinate soyabean responses to planting date.*Agronomy Journal*. 79:1074-1078.
 19. Willey, R.N. (1979). A scientific approach to intercropping Res. P.U. In: Proceedings of International Workshop on intercropping, Hyderabad,India.

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