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Performances of Maize in Maize/Cassava Intercrop as influenced by Four different Times of Planting in Derived Savannah.

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Abstract
The unpredictability and unsteadiness of rainfall occasioned by climate change during cropping season necessitated the investigation of the performance of maize in maize/cassava intercrop planted simultaneously in 2018 at the Federal University of Agriculture, Abeokuta, Nigeria in 2018 cropping season. The experiment was laid out in RCBD and arranged in split plot and replicated three times. The time of planting (May, June, July and August) and cropping systems (sole maize, maize in 419 and 30572 varieties of cassava) constituted the main and subplot treatment, respectively. The intercrop proportion mixture and population adopted in this study was additive series. Number of stand per plot in May was significantly higher than the others whereas the maize planted in June had the highest shelling percentage. Maize planted in May and August produced longest cob whereas those of June were the shortest. The cob length obtained from the intercrop systems were longer than the sole maize. The maize cob length in the various cropping systems responded differently in the different times of planting. The cob diameters obtained from the maize planted in May and August were similar but significantly higher than those of June and July. The relative yield of the intercrop of maize obtained from May produced the highest whereas those of July and August were similar. The grain yield of maize in May planted was higher than the others while the sole maize produced higher grains than those of intercrop. It was concluded that maize planted in May ending plots consistently had the best performance while the maize relative yield in the intercrop showed an indicative of more than LER.

Introduction

Maize (*Zea mays* L) is a major important cereal crop being cultivated in the rainforest and the derived savannah zones of Nigeria (Olaniyi and Adewale, 2012). It is the world's most widely grown cereal and it is ranked third among major cereal crops (Ayisi and Poswall, 1997). On the African continent, it is the most dominant food crop and mainstay of rural diets. Maize can be intercropped with cassava, yam, cowpea etc. Intercropping involves the cultivation of two or more crops at the same time in the same field (Ouma and Jeruto, 2010). It has been reported to increase crop yield and land use efficiency (Amanullah *et al.*, 2006) particularly when intercropped with cassava. Cassava (*Manihotesculenta*L. Crantz) originated from Central and Southern America and has since then spread to various parts of the world (FAO, 2001). It is an important food security crop in tropical areas of the Africa with its edible starch-storage roots (Tewodros and Yared, 2014).

Planting date was reported to affect the growth and yield of maize significantly. To date, the challenge for maize growers is finding the narrow window between planting too early and planting too late (Nielson *et al.*, 2002). Farmers who plant maize early are concerned about rainfall cessation which could cause drought spell. On the other hand, farmers who plant late wonder how late planting might affect the final grain yield (Lauer *et al.*, 1999). Either early planting or late planting can result in lower yield because the probability exists that unfavorable climatic conditions can occur after planting or during the growing season. Norwood (2001) suggested that farmers should plant on more than one planting date in order to safeguard against unpredicted seasons. Various studies show that cassava, maize/cassava intercrop can be planted any time of the year during the rainy season. However, concerted efforts have not been made to plant cassava alone,

intercrop or sole maize separately in each of the month across the major part of the five months (April, May, June, July and August) when the rains commence and become steady. There is, therefore a need to ascertain the performance of sole maize, maize/cassava intercrop and sole cassava sequentially planted in May, June, July and August. The objective of trial is to determine the performance of sole maize and maize intercropped with cassava planted at monthly interval.

Materials and methods

The study was conducted at the Federal University of Agriculture, Abeokuta, Nigeria to investigate effect of time f planting and cropping systems in the performance of maize; Latitude 7^0 14'0'N and Longitude 3^0 25'E. Abeokuta has bimodal rainfall pattern in locate in derived savannah zone of South Western Nigeria. The total annual rainfall was 1403.6 mm in 2018. The site had Latitude 7^0 14'0'N and Longitude 3^0 25'E. The soil had pH of 5.6, N 0.171, P 36.27, K 0.562 and organic carbon 0.52%. The textural class of the site was 72 (sand), 5.5 (clay) and 22.5 (silt). The experiment was laid out in RCBD arranged in split plot. The main and sub plot treatments were Time of planting (May, June, July and August ending) and cropping systems (sole maize, maize intercropped with 419 and maize in 30572 cassava varieties).

The entire experimental plot (97 x 31 m) was ploughed and harrowed whereas the portion (97 x 8 m) dedicated for May planting (i.e. main plot size replicated 3 times) was ridged and planted at May ending. But the portions meant for each other main plot (97 x 7m) of June, July and August was marked out and was re-harrowed and ridged at the end of each month and planted accordingly. The sub plot size (10 m x 7 m) was separated by 2 m between and within replicates. For each planting, 8 ridges were done by tractor but 7 ridges were planted while the 8^{th} ridge served as discard and to also create allowance for the tractor operations with a view to protecting the previously planted plots. The spacing for cassava planting was 1 m x 1 m on ridge irrespective of cropping systems. Two seeds were planted per hole but thinned to one at 2 weeks after planting (WAP) for sole maize at spacing of 75 cm x 25 cm whereas three seeds were planted per hole for maize intercrop with cassava and thinned to two seedlings at 2 WAP at the spacing of 1 m x 1m apart but sandwiched between two cassava stands. Consequently, additive series was adopted for the maize/cassava intercrop mixture. The plot was manually weeded up to November, there after contact herbicide was used to control weed. The rate of 60 kg/ha NPK (15:15:15) fertilizer was applied to maize 4 WAP while 45 kg /ha was applied to cassava at 8 WAP. Data collected on the maize in each treatment at 4 WAP were as follows; plant height (m), cob weight (g), shelling percentage (%) and grain yield/ (t/ha). The data collected were analyzed using GNASTAT 12^{th} edition software and the means of treatments that are significant were separated using Least Significant Difference (LSD) method at 0.05% level of probability.

Results and discussion

Planting date is one of the major management practices that affect the yield of crop through seedling establishment and seed development. The plant height obtained from May ending plots had significant increase from 4 to 10 WAP as compared to other months (Fig 1). Plant heights of maize obtained from sole were outstandingly, higher than those of intercrop (Fig. 2). The taller plants observed in the sole crop of maize compared to intercrop could be due to the competition with companion cassava crop. The growth reduction of intercropped maize might be majorly due to partly interspecific competition between the intercrop components for growth resources (light, water, nutrients, air, etc.) and the depressive effects of cassava. Egbe and Idoko, (2012) made similar observations in their study and attributed it to inter- specific competition for light, nutrients, water, air and other growth resources.

The data obtained from yield and yield component of maize planted in May ending plots had the highest grain yield (1.95 t/ha), number of stand (84.3), cob length (15.2 cm) and cob diameter (47.9 mm) as compared to June, July and August ending plots (Table 1). The higher number of stands of maize plants which resulted higher relative yield observed in May ending plots compared to the other planting times could be attributed bird damage at seedling stage. Besides, the distribution and pattern of rainfall particularly during the short break (i.e. August break) also negatively affected the yield and yield component of maize planted in June and July. These environmental changes associated with different sowing dates (sunshine, temperature) have been reported to have modifying effect on the growth and development of maize plant (Maryam *et al*, 2011). Good timing of planting date is one of the key factors that strongly affect production in rain fed agriculture (Ati *et al*., 2002). The higher stand count and grain yield documented for sole compared to intercrop plots was attributed to the differential spacing adopted for sole and intercrop i.e. replacement series. The interaction of

cropping system and time of planting in May ending plot was significant indicating that maize intercropped with TMS 419 which is a non-branching cultivar responded differently with higher cob length (Fig. 3).

Conclusion

The maize planted at May ending plots gave higher number of stands, relative yield and grain yield. Furthermore, sole maize gave higher grain yield but the Land Equivalent Ratio as indicated by relative yield of the intercrop suggests that intercrop is more productive than the sole.

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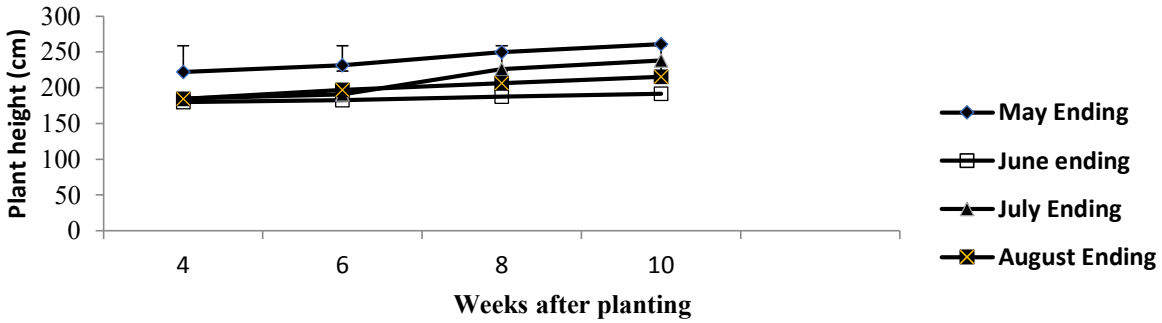

Fig. 1: Plant height of maize as influenced by time of planting in 2018 cropping…

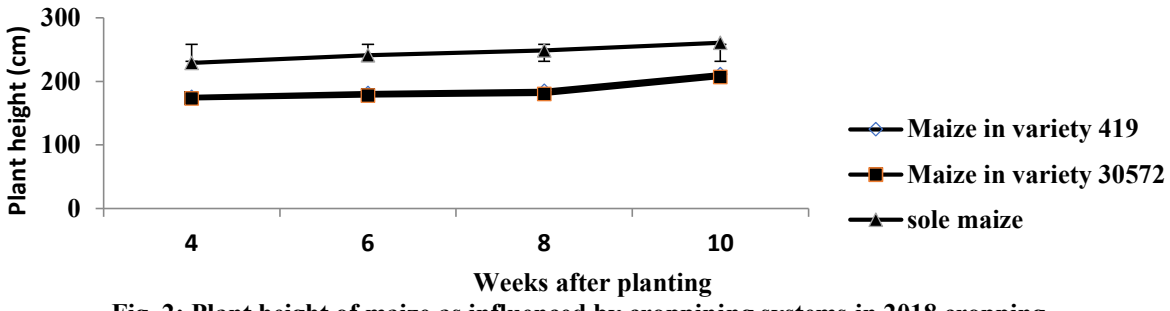

Fig. 2: Plant height of maize as influenced by croppinjng systems in 2018 cropping…

Table 1: Effects of time of planting and cropping systems on agronomic, yield and yield components of maize

Treatment	No of stands maize	Cob height	Shelling %	Cob length (cm)	Cob diameter (mm	Relative yield	Grain yield/ha
Time of Planting (T)							
May Ending	84.3	117.8	0.81	15.23	47.91	0.70	1.95
June Ending	32.2	117.4	0.93	14.01	42.92	0.32	1.21
July Ending	44.2	99.8	0.81	14.61	43.47	0.69	1.39
August Ending	38.7	97.1	0.85	15.12	47.97	0.65	1.40
LSD	26.15	NS	0.05	0.49	1.56	0.27	0.32
Intercrop (I)							
variety 419	36.6	114.4	0.83	15.00	45.17	0.57	1.15
variety 30572	42.3	106.2	0.84	14.83	44.58	0.61	1.20
Sole	70.7	103.5	0.88	14.40	43.88	-	2.11
LSD	22.65	NS	NS	0.43	NS	NS	0.27
T X I	NS	NS	NS	0.86	NS	NS	NS

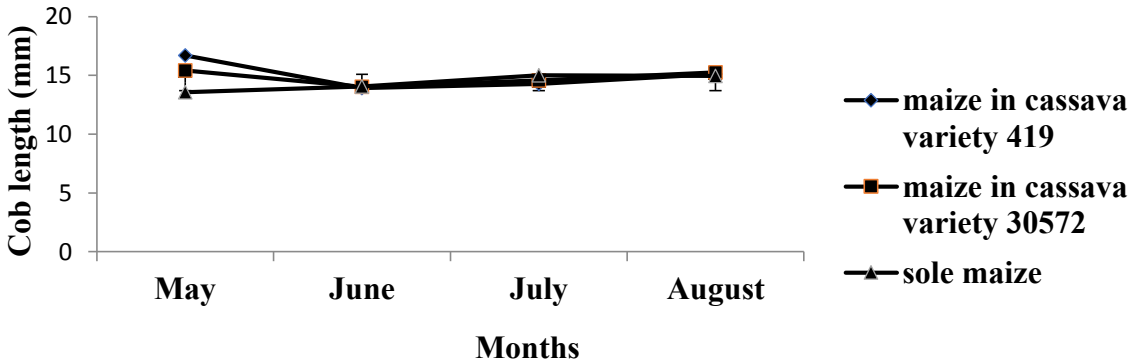

Fig 3: Interaction of cropping systems and time of planting on cob…