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EFFECTS OF LOCUST BEAN TREE (*Parkia bigloybossa*. JACQ) ALLEY CROPPED WITH MAIZE (*Zea mays*. L.) ON EARLY TREE GROWTH AND YIELD OF MAIZE

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ABSTRACT: The interactive effect of (*Parkia biglobossa*) was investigated on the growth and yield of maize (*Zea mays*) over a period of twelve (12) weeks at Ladoke Akintola Research farm Ogbomoso. The experiment was laid out in Radomized Complete Block Design (RCBD) with 3 treatments and 3 replicates. Data collected were plant height, number of leaves, stem girth. Leaf area, canopy diameter, number of branches and were subjected to statistical analysis using analysis of variance (ANOVA) while the means were separated using Ducan's Multiple Range Test DMRT at 5% probability level. There were significant differences in the number of leaves and number of branches of *P. biglobossa* ($p \leq 0.05$) of both sole tree and the intercropped. Intercropping affected stem girth and canopy diameter of the tested tree specie. The values obtained for stem girth with sole *P. biglobossa* (6.5 cm) were significantly higher than the intercropped (3.4cm). Higher numbers of leaves were obtained in maize +*P. biglobossa* intercrop (275.8cm^2) compared to sole *P. biglobossa* (262.4cm^2). Sole maize had higher grain yield (0.98 t/ha) than the intercropped maize + *P. biglobossa* (0.95t/ha) however maize + *P. biglobossa* had the highest percentage shelling (50.4) than sole maize (41.6). It was therefore concluded that there were positive interaction between *P. biglobossa* and maize plant. Hence, it could be recommended that there is need to encourage combination of maize and P. biglobossa at the early growth stage for efficient utilization of available land resources and for conservation of the *P. biglobossa*.

Keyword: intercropping, *Parkia biglobossa*, Maize, interactions.

1. INTRODUCTION

Agroforestry from its name is a combination of two different fields of agriculture and forestry which deals with the co-relation of agricultural practices such as crops or livestock and forest. It contains a lot of products which are formed as a result of combination of two fields for the benefits of mankind as well as for the new development to increase the health and wealth of the population. (Edith Van Walsum 2011).

Agroforestry provides many livelihood and environmental benefits, increasing the assets of poor households with farm grown trees, enhancing soil fertility and livestock productivity on farm grown trees, improving soil fertility and livestock productivity on farms and linking poor households to the market for high value fruits, oils, cash, crop and medicine. Domesticating wild fruit trees such as *Parkia biglobossa* (locust beans) using simple sustainable technologies like nurseries, soil fertility management and domestication program on a multiple land use system basis has allowed small holder farmers to increase their earnings.

Wild fruits are of Africa's nutritional importance. Most of Africa's edible fruits are wild and are food sources for both wild animals and man. It is the fruit of a wild fruit that is usually considered edible, many times the wood, seeds or leaves are not edible. Relatively small number of people regularly eats the fruits of wild fruits trees; still, edible wild fruit trees produce delicious fruit

that can be used for canning and fresh use if the fruits are harvested at the right time of the year. In many tropical countries, rural people traditionally harvest wild range of leafy vegetables, roots, tubers and fruits from the wild because of its taste, cultural uses as food supplement due to food shortage labeled as famine or hunger food, wild fruit have been recognized to have potential to meet food and income security (Guinad and Dechassa 2000; Kebu and Fassil 2006).

Despite the vastness of wild fruit resources, much research work has not been carried out incorporating wild fruit trees and arable crops in agroforestry practices. These may be as a result of lack of information available on domestication of these wild fruit trees and lack of appreciation of agroforestry practices by farmers. Domestication of wild fruit trees can only be possible if integrated with arable crops in a deliberate manner. Therefore investigation is needed on interactive effects of *Parkia biglobossa* and the growth and yield of maize. The objectives of the study were to determine the interactive effects of *Parkia biglobossa* trees on the developmental stages and yield of maize and also to determine the interactive effects of maize on the early growth of the tree.

Parkia in the family *fabaceae* (Alabi *et al*. 2005). Locust beans is a native of Africa and it is an important multipurpose tree of West Africa Savannah land as well as one of the most common species of the parkland agroforestry system. The seeds of *parkia* are used in preparation of Daddawa, protein and fat rich food (Mertz *et al.* 2001). The dried powder is often mixed with water to produce a drink called dozim by the Dagbani tribe and bololo in Hausa (Hall *et al*. 1997). The striking red spherical inflorescences of *P. biglobossa* which appear in the dry are often used by children for games. In West Africa, its bark, roots, leaves, flowers, fruits and seeds are commonly used in traditional medicine to treat a wide diversity of complaints, both internally and externally, sometimes in combination with other medicinal plants. Daddawa is rich in protein, lipids and vitamin B_{10} (Odunfa 1981). Maize (*zea mays)* is an important cereal crop and a source of carbohydrates in human diet in developing countries, it is used as animal feeds worldwide and ranked the third most important cereal crops of the world. It is perhaps the most domesticated of all cereals (Benz 1994). Maize is very nutritious as it is an important source of carbohydrate, protein, iron, vitamin B and known to digest very quickly. The focus of this research therefore is to guage the tolerance level of interactions of maize and the wildfruit trees at their infancy.

2. MATERIAL AND METHODS

The experiment was sited at the Teaching and Research Farm of Ladoke Akintola University of Technology Ogbomoso, Oyo State, Nigeria which falls within the Southern Guinea Savannah Agro-ecological zone of Nigeria. Ogbomoso lies between longitude $4^0$10E and latitude $8^0$10N. This location is cold and dry from November to March and warm and moist from April to October. It is characterized by bi-modal rainfall distribution whereby the early rainy season starts in late March and ends in late July/early August, followed by a short dry spell in August and finally the late rainy season from August to November. The annual mean rainfall is between 1150mm and 1250mm (Olaniyi 2006). Maize (Oba Super) was used and the seed of *Parkia biglobossa* was obtained from National Institute for Horticultural Research and Training (NIHORT), Oyo state, Nigeria.The *parkia* seedswere subjected to pre germination treatment before planted, they were dipped in 100^0C boiling water for ten seconds to enhance germination. They were then soaked overnight before planted the following day in the seed tray. After germination, the seedlings were transplanted at 5 months into polythene bags which was later transplanted to the field with a spacing of 1m x 1m and later intercropped with maize at 0.75m x 0.5m per plot. Three treatments tested were T_1 –sole maize, T_2 – Sole *Parkia*, T_3 – Maize +*Parkia.* Nine beds (9) each 4m by 3m dimension were prepared, one plot was separated from another by 1m and the replicate by 2m, the plot size was 16m by 11m.

Field preparation and cultural practices like clearing, ploughing, watering, supplying and thinning for the tree plants were carried out. Weeding was also done manually using hoe at every 2 weeks. The arrangement pattern for the intercropping is intra row. Data were collected on maize and trees at 2,4,6,8 and 12 (WAP). The data collected were plant height using measuring tape, stem girth with veneer calipers. Leaf area was measured using non destructive methods by Saxena and Singh (1985) using the relation 0.75 (length x width). Number of leaves of maize and tree, number of branches of trees was counted by direct counting of all developed leaves and branches. Number of plant per plant was recorded by physical counting of the plants. Number of cobs per plant was recorded by counting the number of cobs on tagged plants. Fresh weight of cobs

was obtained from each plot and it was weighed with a balanced scale. Dry weight of the cobs was obtained after the cobs were sun-dried and weighed with the help of a balance grain measured with a balance scale. Percentage shelling was obtained by the relation grain yield divided by cob and grain yield multiply by 100. One hundred grain weight were obtained by picking 100 grains and measured with (CAMRY) sensitive scale. The data collected were subjected to analysis of variance (ANOVA) and means were separated using Duncan Multiple Range Test (DMRT) at 5% probability level.

3. RESULTS

3.1 Effects of Alley Cropping of Maize with Parkia biglobossa on Maize Growth

There was no significant difference ($p \leq 0.05$) of *parkia* growth on height of sole maize and maize + *parkia* in all weeks except at 4th WAP where *parkia* had a negative effect on the height of maize (Fig. 1). The growth of *parkia* had positive effect on stem girth of maize at 12th WAP where maize + *parkia* had higher stem girth (7.2cm) than sole maize (6.8cm) while other weeks are not significantly different from each other (Fig. 2). Figure 3 shows there was significant difference in leaf area at 2nd, 4thand 12thWAP where *parkia* tree reduces the leaf area of maize while leaf area at 6 – 10thWAP were not significantly different. Number of leaves where not significantly affected by *parkia* growth unless at 4thand 6th WAP which had adverse effects on the number of leaves (Fig. 4).

3.2 Effects of Alley Cropping of Maize on Growth Parameters of Parkia biglobossa

Effects of maize on the height,stem girth leaf area and number of branches of *parkia* was significant across the weeks. Sole *parkia* had taller plants, more robust stem, broader leavers and number of branches than where they are intercropped with maize except the leaf area at 2WAP which was not significantly different (Fig. 5, 6 and 7). However intercropping *parkia* and maize favours the number of leaves produced by the tree (Fig. 8). Intercropped *parkia* had higher number of leaves at early stage of growth (2-6weeks) when compared with sole maize. Canopy diameter of *parkia* was not affected by maize intercrop unless at 12 WAP(Fig. 9) where intercrop of *parkia* and maize (29.8cm^2) favour the canopy diameter and was significantly different from sole *parkia* (24.4cm^2) sole maize has the highest yield (0.98t/ha) compared with maize + *parkia* (0.95 t/ha) as shown in Figure 11 however, maize + *parkia* has the highest percentage shelling (50.4) than sole maize (41.6) as shown in Table 1. Highest 100 grain weight was recorded in maize + *parkia* (14.6g) and sole maize (14.4g) as shown in (Table 1). Highest number of cobs/hectare was recorded in sole maize which was closely followed by maize + *parkia*

4. DISCUSSION

There is need for development of traditional agriculture through agroforestry which will not only help to maintain and possibly improve the soil fertility to ensure sustainability of traditional agriculture but would also help to provide fuel wood, fruit and timber to rural farmers. In addition, incorporating of trees into the farm land is well recognized under agroforestry system for maintaining soil fertility and productivity.

It was observed from the experiment that the height of maize was not significantly affected except in 4 WAP where sole maize produced taller plant than where they were intercropped with tree. This may be due to competition between the maize and the trees species for nutrients. This was in line with the study of Sangakkara *et al*. (2004) who reported that, competiton among the plant may be from nutrient update and sunlight interception. Also, due to maize architecture, maize grow taller than tree species, which ws in line with the submission of (Zamir *et al*. 2011) that a high stand plant have advantages to competition for light, ariation, nutrient, and consequently compelling the plant to undergo less reproductive planrt but still have competition underground and above ground competition. Competition for the above and below ground resources may arise between trees and crops growing in the same space and soil mass, especially when the trees has more competitive advantage than the crops (Schroth 1999).

The intercropped *parkia* and maize favoured the number of leaves produced by the trees and had a positive effect on the stem girth of maize. *Parkia* intercropped maize had more robust stem girth than sole maize. This was in line with the report of (Namirembe 1999) which stated that soil moisture may reduce stem diameter, plant height and yield of maize in agro-forestry system relative to sole crops.

5. CONCLUSION

1. In the tropic, maize is an important cereal crop and source of carbohydrates in human and animal diet. It is also the third most important cereal crops of the world. Intercropping maize with agro forestry trees is not a new phenominium; it has been in existence since ages. This study confirmed that wild fruit tree like *Parkia biglobossa* has an interactive effects on the growth and yield of maize
2. The differences due to competition were not appreciable because the trees are still youngbut there was significant difference between the sole maize/sole tree and where they are intercropped.
3. Combination of maize and tree at early stage of life is still encouraged to utilize the available land resources as obtained from the result of this experiment.
4. It could be recommended that there is the need to encourage combination of maize and *Parkia biglobossa* at early stage for efficient utilization of the available land resources. However, a further study is required of the effects of maize (oba super) intercropped with *Parkia biglobossa* when the latter has a closed canopy.

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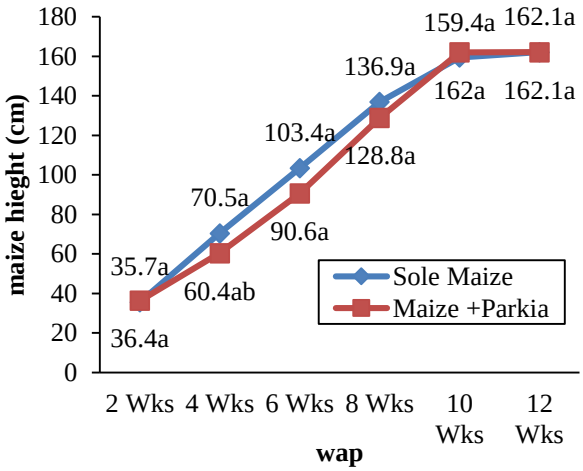

Figure 1: Effects of Alley Cropping of Maize with *ParkiaBiglobossa* on Maize height

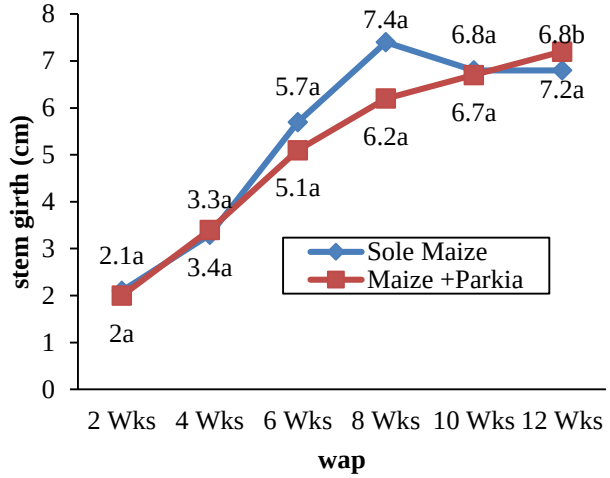

Figure 2: Effects of Alley Cropping of Maize with *ParkiaBiglobossa* on stem girth

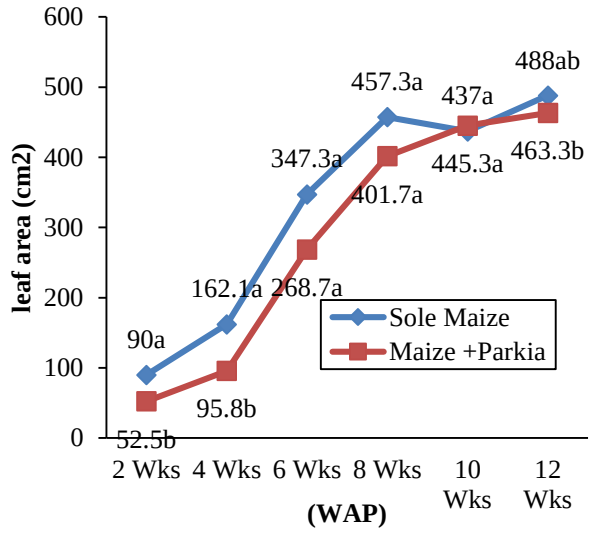

Figure 3: Effects of Alley Cropping of Maize with *ParkiaBiglobossa* on leaf area

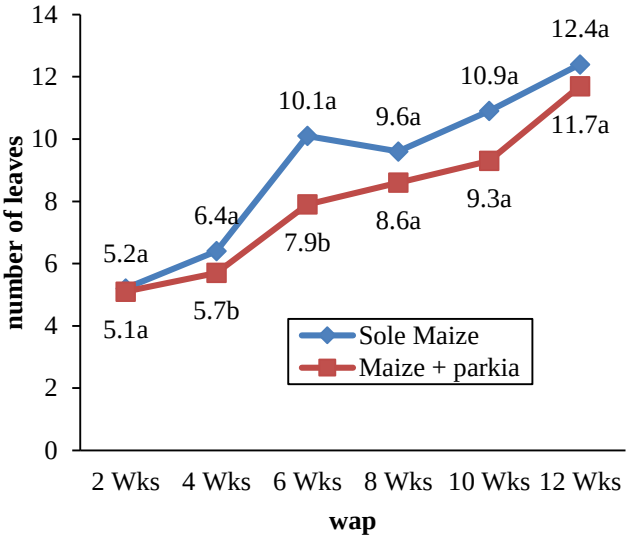

Figure 4: Effects of Alley Cropping of Maize with *Parkia Biglobossa* on number of leaves

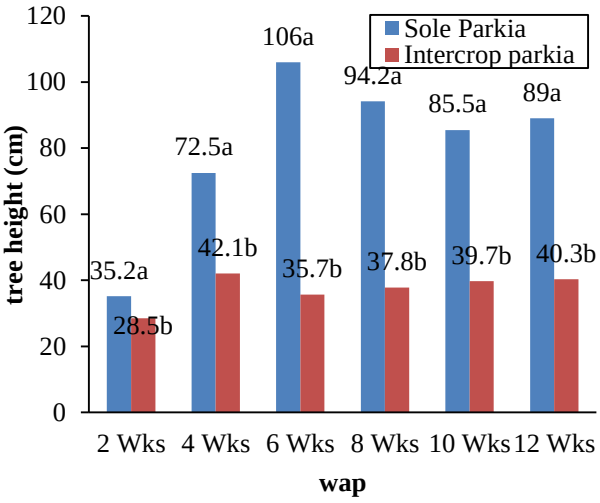

Figure 5: Effects of Alley Cropping of Maize with *Parkia Biglobossa* on tree height

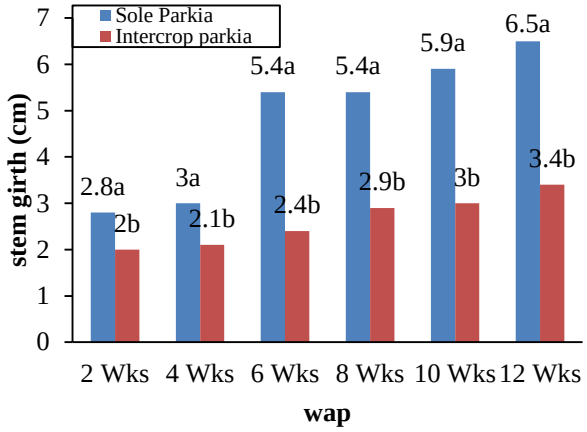

Figure 6: Effects of Alley Cropping of Maize with *Parkia Biglobossa* on stem girth

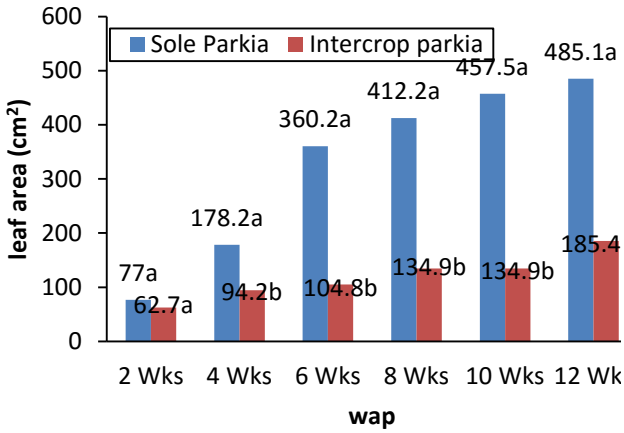

Figure 7: Effects of Alley Cropping of Maize with *Parkia Biglobossa* on leaf area

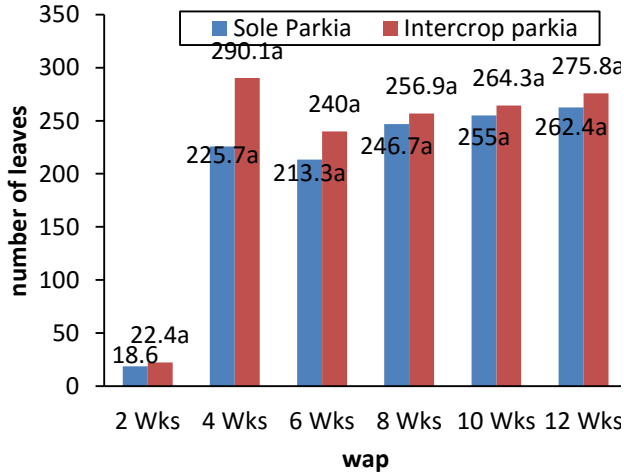

Figure 8: Effects of Alley Cropping of Maize with *Parkia Biglobossa* on number of leaves

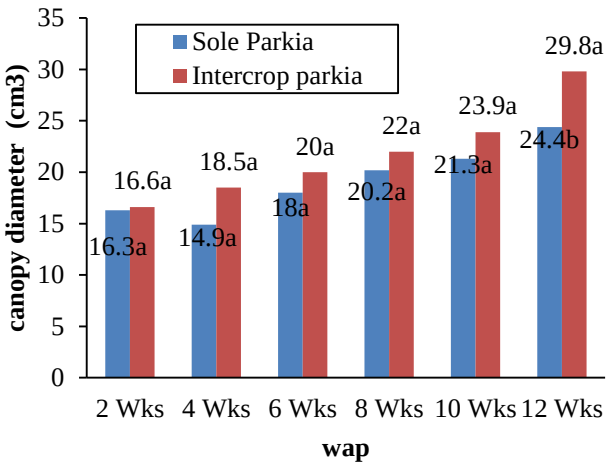

Figure 9: Effects of Alley Cropping of Maize with *Parkia Biglobossa* on canopy diameter

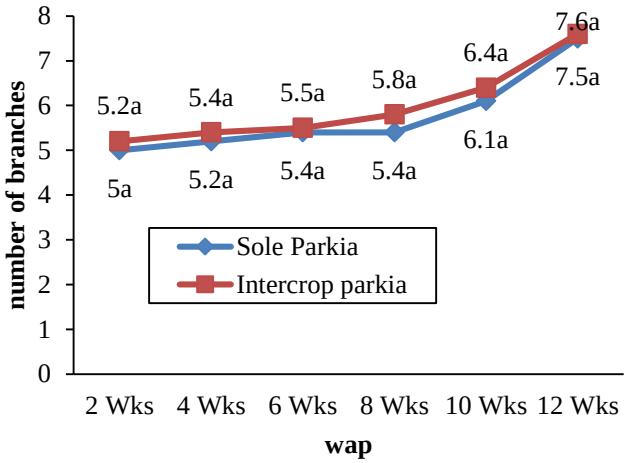

Figure 10: Effects of Alley Cropping of Maize with *Parkia Biglobossa* on number of branches

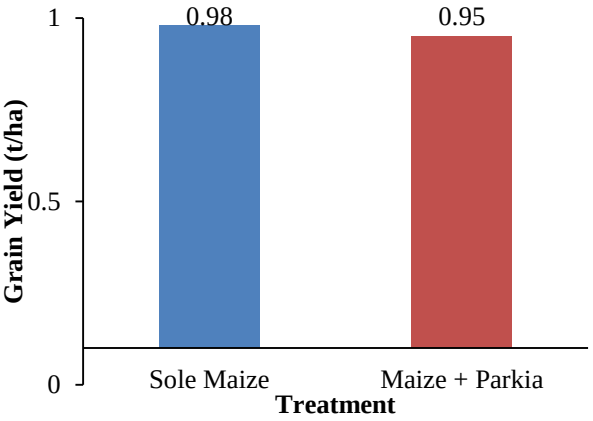

Figure 11: Effects of Alley Cropping of Maize with *Parkia Biglobossa* on number of branches

Table 1: Effects of tree species on the yield component of maize

Treatment	No of cob/ha	Fruit weight (cob+stover)	Cob weight (kg/ha)		% shelling	100 grain wt (g)
			Fresh	Dry		
Sole maize	20,500a	4716.6a	4333.4a	2361.2a	41.6b	14.4a
Maize + Parkia	16166.6b	3488.4b	3250b	1888.8b	50.4ab	14.6a