



## **Influence of Arbuscular Mycorrhizal Fungi (*Glomus clarum*) and Compost on Early Growth Response of *Parkia biglobosa* under a Greenhouse Condition**

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### **Authors' contributions**

This work was carried out in collaboration among all authors. Authors FBM and ONS designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors VOO and FOA managed the analyses of the study. Author OAA managed the literature searches. All authors read and approved the final manuscript.

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### **ABSTRACT**

**Background and Objective:** Arbuscular Mycorrhizal Fungi (AMF) plays a role in the structural stability of soil which governs most soil activities. Stable organic manure such as compost may provide a suitable habitat and energy source for mycorrhizal growth, which is also a benefits in view of soil productivity. The impact of a combination of compost and mycorrhizal on plant growth was assessed in this study. Hence, experiment was conducted to investigate the influence of compost and mycorrhizal on the early growth response of *Parkia biglobosa* under a greenhouse condition.

**Materials and Methods:** In the greenhouse of the Department of Bioscience, Forestry Research Institute of Nigeria. A 2 × 5 factorial experiment in a complete randomized design was conducted; two levels of mycorrhizal (with and without); five levels of compost (10t/ha, 20t/ha, 30t/ha, 40t/ha

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and no amendments) in two (2) kilogram soil under four (4) replications was set up. Laboratory analyses of soil and organic amendment incorporated in the soil were done. Data on growth variables were taken fortnightly. The data was statistically analyzed and mean were separated using Duncan Multiple Range Test (DMRT).

**Results:** The results showed that, there was significant difference ( $p < 0.05$ ) in the plant height of *Parkia biglobosa* between mycorrhizal and non-mycorrhizal plants across all weeks after transplanting (WAT), compost application with the interaction of AMF at 40 t/ha recorded the highest plant height and number of leaves at 16WAT with 35.14 cm and 29.75 respectively, which are relatively comparable to other treatments used, the least plant height and number of leaves were observed when -AMF 0 t/ha (control) was used as an amendment with 23.00 cm and AMF 0t/ha (15.05) respectively. For collar diameter, all the treatments were comparable to one another except + AMF 30t/ha which produced the lowest collar diameter with mean value of 2.97mm.

**Conclusion:** Based on the description of results above, it can be concluded that: The Inoculation of the AMF and compost significantly affect the early growth performance of *Parkia biglobosa*, thus providing optimum soil physical conditions for its growth.

**Keywords:** Inoculation; mycorrhizal; growth parameters; *Parkia biglobosa*.

## 1. INTRODUCTION

Arbuscular Mycorrhizal Fungi (AMF), significantly influence soil fertility and the habitat for microbial communities, soil quality is also improved by increasing the total microbial biomass and species abundance. Soil microbes such as AMF are known to produce polymers that serves as aggregate binding agents [1], while secondary metabolites produced by microorganisms associated in decomposition of organic matter and soil microbial activity can either be stimulating or inhibitory. AMF increases with organic matter addition thereby increasing the concentration of nutrients in the soil and thus affected AMF development and functions [2,3]. The influence of organic matter on AMF also had contradicting results by indicating variable responses due to varying host plants and AMF species [4]. The frequency occurrence of *G. species* declines with increasing organic matter content while some other species like *G. sinousum* and *G. taiwanese* were found lesser than 1.5% [5].

Organic matter improves the soil structure, reduces soil erosion, has a regulating effect on soil temperature and helps the soil to store more moisture, thus significantly improving soil fertility. The depletion of the organic matter content of fragile soils of the humid tropics caused by intensive tillage, hence additions of organic manures such as compost has been recommended [6]. Compost is a very important input material for organic greenhouse production, organic greenhouse production may vary in the level of intensity, but it is generally a system with high turnover rates of organic matter, high inputs

of both nutrients and energy with high production levels. Compost is used as an important source of organic matter and nutrients in greenhouse horticulture, and is an important component of growing media for nurseries. It plays an important role in building a resilient farming system, by providing both the energy sources and the nutrients to sustain soil biodiversity [7].

*Parkia species* in West Africa are commonly used for condiment production. According to Oladunjoye [8] common species within the genus *Parkia* include: *Parkia biglobosa*, *Parkia filicoides*, *Parkia bicolor*, and *Parkia biglobosa*. Sina and Traoré [9] indicated that the various species mentioned above are synonyms. In addition, it is a food species whose importance is recognized both regionally and internationally because in some societies on the African continent it is not an ordinary food item but a therapeutic food and a source of income. *Parkia species* are widely distributed in across savanna belts across West Africa. Unfortunately, the trees which have long gestation period are threatened for different end uses including charcoal production.

Major soils found in Nigeria agro-ecological zones are coarse-textured surface soil with low organic matter and chemical fertility. Aggregates of these soils are weak; they lose productivity fast and do not retain adequate water and nutrients for sustainable production [10]. These characteristics imply that even with the best of soil fertility amendments, soil physical conditions must be managed to achieve sustainable crop production. Therefore, this experiment was conducted to determine the growth response of

*Parkia biglobosa* to AMF (*Glomus clarum*) under the application of compost at different level.

## 2. MATERIALS AND METHODS

An experiment to assess the influence of AMF (*Glomus clarum*) and compost on the growth and soil properties of *Parkia biglobosa* in soil was set up at the Screenhouse of the Department of Bioscience, Forestry Research Institute of Nigeria.

### 2.1 Collection of Soil Samples

Soil samples was collected from farm practical area (FAP), Federal College Forestry, Ibadan. Top soil of 0 – 20 cm depth was used for the experiment. The soil was air dried; grounded and sieved using 2 mm sieve to remove gravel and large plant roots. Soil samples was chemically analyzed for nitrogen and other nutrient content. Two-kilogram (2 kg) soil was weighed in a polyethylene bag and incorporated with organic manure at different levels and mycorrhizal (*Glomus clarum*) was also applied.

### 2.2 Organic Amendments

Compost used for the experiment was analyzed to determine the nutrients content and the phosphorus content was used to determine the quantity of fertilizer to apply to *Parkia biglobosa*. Compost was incorporated into the soil, two weeks before planting for mineralization at different levels.

### 2.3 Raising of Seedlings

*Parkia biglobosa* seeds was collected from the mother tree and raised in a germination basket filled with sterilized river sand for two months, viable seedling were selected based on the uniform treatments provided during the germination period and transplanted into the (two) 2 kg pots mixed with various treatments.

### 2.4 Mycorrhizal Propagation and Inoculation

AMF inoculum of *Glomus clarum* was obtained from Soil Microbial Laboratory University of Ibadan. The spores of *Glomus clarum* were propagated in sterilized sand with corn as a host. 10 grams of AMF inoculum was placed into 2 kg pots filled with the sowing media used for propagation. 3 seeds of corn were placed per pot on the inoculum. The seeds and the inoculum

were then covered with sand. Watering was done before germination started till 2 weeks after germination, the seedlings were then thinned leaving only one (1) seedling in the pot. 10 ml of Hoagland solution without P was applied to the seedling alternate with water for another one(1) month, after which was left for another one (1) month without watering. The corn was harvested with the sand and spores were counted using the wet sieving technique. For inoculation, approximately 20 g of *Glomus clarum* inoculant with 100 spores was placed into a hole in the center of the polybag by placing it below the root of the plants, for non-inoculated plants, 20 g of sterilized soil were used to replace *Glomus clarum* in each polybag in order to provide the same soil condition.

### 2.5 Experimental Design and Treatments Used

The experimental design was a 2 × 5 factorial arranged in a Completely Randomized Design (CRD) with four replicates. The treatments used were as follows; Organic amendments at 5 levels: 10t/ha, 20t/ha, 30t/ha, 40t/ha & no amendments (0) and Mycorrhizal (20 g) flat rate applied to pots (with and without).

### 2.6 Data Collection

The following variables were taken: Plant height (cm) using meter rule, number of leaves by counting, collar diameter(mm) using veneer caliper and dry matter yield (g) using sensitive scale.

### 2.7 Soil Analysis

Soil Total Carbon; The total carbon content in the soil were determined using Walkley-Black wet oxidation method. Soil available phosphorus were determined using Bray and Kurtz method [11]. Total nitrogen of soil sample were determined using dry combustion method. Exchangeable K, Ca and Mg for soils was determined by using modified Shaking Method [12] where 1M of ammonium acetate (NH<sub>4</sub>OAc) was used as reacting reagent. Particle size analysis was done using hydrometer method [13].

### 2.8 Statistical Analysis

Quantitative data was analyzed using the ANOVA procedure and means separated using

the Duncan Multiple Range Test (DMRT) at 5% probability [14].

### 3. RESULTS AND DISCUSSION

**Table 1. Chemical properties of soil and compost used**

Properties		Soil	Compost
pH	(1:2.5)	6.5	5.9
T.N	g/kg	0.27	0.93
Avai.P	mg/kg	19.4	0.02
K	cmol/kg	0.06	0.0004
Fe	mg/kg	269	3.53
Mg	cmol/kg	0.76	0.33
O.C	g/kg	1.34	10.97
Na	cmol/kg	3.19	0.014

Key: OC = Organic carbon, N = Nitrogen, P = Phosphorous, K = Potassium and Mg = Magnesium, Fe = Iron

#### 3.1 Chemical Properties of Soil and Compost Used

The soil pH value was slightly acidic, soil was moderately furnished with P content since the critical value of 8-20 mg/kg [15] The soil was deficient in both potassium (K) and Nitrogen (N) content compared to the critical value of soil required which is at least 1.5 g/kg for N [16] and 0.20-0.40 cmol/kg [16].

#### 3.2 Influence of Arbuscular Mycorrhizal Fungi (*Glomus clarum*) and Compost on the Plant Height of *Parkia biglobosa* Under a Greenhouse Condition

There was significant difference ( $p < 0.05$ ) in the plant height of *Parkia biglobosa* between mycorrhizal and non-mycorrhizal plants across the weeks at 2<sup>nd</sup> WAT-14<sup>th</sup>WAT, except at 16<sup>th</sup>WAT, where there was no variation in mycorrhizal and non-mycorrhizal plants (Table 2). Compost application with the interaction of AMF at 40 t/ha recorded the highest height at 16<sup>th</sup> WAT with 35.14 cm and it is relatively comparable to other treatments, the least plant height was observed when -AMF 0 t/ha was used as an amendment with 23.00 cm. Among the non- inoculated plants, application of -AMF 10 t/ha produces the highest plant height (29.57cm) while -AMF 0 t/ha had the least plant height (23.00 cm). This is in contrast with the results of Abbott et al., [17] who reported that, mycorrhizal colonization in peanut plants was significantly depressed by adding phosphorus, non-significant effect ( $p < 0.05$ ) of mycorrhizal inoculation towards

plant height may be attributed to the incorporation of compost which has high phosphorus content- a limiting factor in the functions of AMF.

#### 3.3 Influence of Arbuscular Mycorrhizal Fungi (*Glomusclarum*) and Compost on the Collar Diameter of *Parkia biglobosa* under a Greenhouse Condition

Compost application with AMF interaction does not influence the collar diameter as presented at all the weeks after transplanting except at 10<sup>th</sup> week in Table 3. At 10<sup>th</sup>WAT, mycorrhizal plants was significantly ( $p < 0.05$ ) different in collar diameter at +Amf 20 t/ha compared to non-mycorrhizal plants -Amf 20 t/ha. Application of compost at +Amf 40 t/ha produced higher collar diameter when compared -Amf 30 t/ha with a mean value of 3.59 mm and 1.99 mm respectively at 10<sup>th</sup> WAT. However, At 16<sup>th</sup>WAT all the treatments were comparable to one another except -AMF 30t/ha which produced the lowest collar diameter with mean value of 2.97 mm (Table 3).

#### 3.4 Influence of Arbuscular Mycorrhizal Fungi (*Glomusclarum*) and Compost on the Number of Leaves of *Parkia biglobosa* under a Greenhouse Condition

There was significant difference at 8<sup>th</sup>, 10<sup>th</sup> and 12<sup>th</sup>WAT among inoculated plants at 40 t/ha and non-inoculated plants at 40 t/ha (Table 4). Interaction of AMF and compost produces the highest leaves number at these significant weeks with mean value of 21.89, 23.29 and 26.12 respectively. At 2<sup>nd</sup>, 4<sup>th</sup> and 6<sup>th</sup>WAT there were no significant differences in all the treatments used. All treated pots were comparable to one another at both inoculated and non-inoculated treatments. This is related to the results reported by Abdullahi and Sheriff [18] that no significant difference ( $p > 0.05$ ) in number of leaves per plant due to mycorrhizal inoculation at 4 weeks after transplant (WAT) was observed. There was no significant difference ( $p > 0.05$ ) in number of leaves due to the compost application (Table 4). However, at 16<sup>th</sup>WAT, interaction of AMF and compost 40 t/ha produced highest number of leaves with a mean value of 29.75 when compared with control at -AMF 0 t/ha (15.05) and -AMF 0 t/ ha (15.11) but comparable with other treatments of compost rates. Similar result was

reported by Yusif et al. [19] who found no significant difference ( $p>0.05$ ) in number of leaves among compost rates.

### 3.5 Dry Matter Yield of the Plant after Harvesting

There was no variation in the dry matter yield of leaves, root and stem presented in Table 5. However, The highest dry matter yield was recorded when +Amf 40 t/ha was used as an amendment for the leaves, stem and root while the lowest dry matter yield was observed in -Amf 10 t/ha for leaves with a mean value of 0.85 g, -Amf 40 t/ha for stem with a mean value of 0.31 and +Amf 30 t/ha for roots with a mean value of 0.76 g. Mycorrhizal inoculated plants had higher

shoot and leaves dry matter yields compared to non-mycorrhizal inoculated plants (Table 5). This could be attributed to the ability of mycorrhizal to improve absorption of nutrients. The result agrees with the findings of previous researchers including Al-Karaki et al. [20] who reported increase shoot dry matter yields with mycorrhizal inoculation in wheat plants (*Triticum aestivum* L.). Shoot dry matter yields increased with increasing rate of compost application, with +Amf 40 t/ha of compost producing significantly ( $p<0.05$ ) higher shoot dry matter yields. However, +Amf 40 t/ha of compost application rate was found to be comparable with +Amf10 t/ha and +Amf 30 t/ha of compost application rate for shoot dry matter yields.

**Table 2. Influence of Arbuscular Mycorrhizal Fungi (*Glomus clarum*) and Compost on the Plant Height (cm) of *Parkia biglobosa***

Treatments	2WAT	4WAT	6WAT	8WAT	10WAT	12WAT	14WAT	16WAT
+Amf 0	20.18 <sup>abc</sup>	23.38 <sup>abc</sup>	24.12 <sup>ab</sup>	26.38 <sup>abc</sup>	26.00 <sup>cd</sup>	30.38 <sup>a</sup>	31.62 <sup>a</sup>	31.68 <sup>abc</sup>
-Amf 0	15.03 <sup>bc</sup>	15.25 <sup>cd</sup>	16.12 <sup>bc</sup>	18.17 <sup>d</sup>	19.00 <sup>d</sup>	19.00 <sup>b</sup>	20.17 <sup>bc</sup>	23.00 <sup>abc</sup>
+Amf 10	12.62 <sup>c</sup>	14.89 <sup>d</sup>	19.67 <sup>c</sup>	27.60 <sup>bc</sup>	29.17 <sup>abc</sup>	32.71 <sup>b</sup>	33.12 <sup>c</sup>	34.93 <sup>c</sup>
-Amf 10	18.80 <sup>a</sup>	20.12 <sup>bcd</sup>	26.82 <sup>a</sup>	29.67 <sup>ab</sup>	28.33 <sup>abc</sup>	29.00 <sup>ab</sup>	29.14 <sup>abc</sup>	29.57 <sup>abc</sup>
+Amf 20	22.10 <sup>a</sup>	25.15 <sup>ab</sup>	27.25 <sup>a</sup>	27.85 <sup>abc</sup>	28.75 <sup>abc</sup>	30.38 <sup>a</sup>	31.33 <sup>ab</sup>	31.48 <sup>abc</sup>
-Amf 20	20.73 <sup>abc</sup>	21.10 <sup>bcd</sup>	20.32 <sup>ab</sup>	22.88 <sup>abc</sup>	24.21 <sup>abc</sup>	21.38 <sup>ab</sup>	22.38 <sup>abc</sup>	26.00 <sup>abc</sup>
+Amf 30	18.00 <sup>abc</sup>	18.95 <sup>bcd</sup>	19.25 <sup>bc</sup>	22.18 <sup>abc</sup>	23.25 <sup>abc</sup>	24.38 <sup>ab</sup>	25.50 <sup>abc</sup>	26.50 <sup>abc</sup>
-Amf 30	21.00 <sup>abc</sup>	21.25 <sup>bcd</sup>	23.15 <sup>abc</sup>	24.58 <sup>abc</sup>	26.15 <sup>abc</sup>	27.67 <sup>ab</sup>	28.50 <sup>abc</sup>	28.50 <sup>abc</sup>
+Amf 40	25.25 <sup>a</sup>	27.88 <sup>a</sup>	28.13 <sup>ab</sup>	30.23 <sup>a</sup>	30.50 <sup>a</sup>	31.64 <sup>ab</sup>	32.53 <sup>abc</sup>	35.14 <sup>ab</sup>
-Amf 40	20.23 <sup>abc</sup>	20.88 <sup>bcd</sup>	21.88 <sup>abc</sup>	23.60 <sup>bcd</sup>	23.10 <sup>cd</sup>	23.00 <sup>a</sup>	23.19 <sup>abc</sup>	24.88 <sup>bc</sup>
LSD at 5%	4.67*	5.08*	4.94*	5.98*	4.88*	6.14*	5.98*	6.43

Means followed by the same letters are not significantly different from each other at  $P \leq 0.05$ ; according to DMRT, \* = significant at  $P \leq 0.05$ , WAT= Weeks After Transplanting. (+AMF (inoculated with *Glomus clarum*), - AMF (non-inoculated), compost (0t/ha, 10t/ha, 20t/ha, 30t/ha, 40 t/ha)

**Table 3. Influence of arbuscular mycorrhizal fungi (*Glomus clarum*) and compost on the collar diameter (mm) of *Parkia biglobosa* under a greenhouse condition**

Treatments	2WAT	4WAT	6WAT	8WAT	10WAT	12WAT	14WAT	16WAT
+Amf 0	2.69 <sup>ab</sup>	2.38 <sup>abc</sup>	2.38 <sup>abc</sup>	2.43 <sup>abc</sup>	2.63 <sup>b</sup>	2.97 <sup>abc</sup>	3.09 <sup>abc</sup>	3.65 <sup>abc</sup>
-Amf 0	2.01 <sup>ab</sup>	2.62 <sup>abc</sup>	2.76 <sup>abc</sup>	2.67 <sup>abc</sup>	2.67 <sup>ab</sup>	2.89 <sup>abc</sup>	3.11 <sup>abc</sup>	3.64 <sup>abc</sup>
+Amf 10	2.18 <sup>ab</sup>	2.53 <sup>abc</sup>	2.53 <sup>abc</sup>	2.87 <sup>abc</sup>	2.87 <sup>ab</sup>	3.05 <sup>abc</sup>	3.17 <sup>abc</sup>	3.93 <sup>abc</sup>
-Amf 10	1.78 <sup>ab</sup>	2.22 <sup>abc</sup>	2.69 <sup>abc</sup>	2.76 <sup>abc</sup>	3.45 <sup>ab</sup>	3.69 <sup>abc</sup>	3.69 <sup>abc</sup>	3.73 <sup>abc</sup>
+Amf 20	1.83 <sup>a</sup>	1.83 <sup>bc</sup>	1.99 <sup>abc</sup>	2.18 <sup>ab</sup>	2.18 <sup>c</sup>	2.56 <sup>abc</sup>	2.98 <sup>abc</sup>	3.11 <sup>abc</sup>
-Amf 20	1.38 <sup>ab</sup>	1.86 <sup>bc</sup>	2.07 <sup>abc</sup>	2.11 <sup>abc</sup>	2.65 <sup>b</sup>	3.00 <sup>abc</sup>	3.04 <sup>abc</sup>	3.22 <sup>abc</sup>
+Amf 30	2.08 <sup>ab</sup>	2.08 <sup>bc</sup>	2.42 <sup>abc</sup>	2.67 <sup>abc</sup>	2.93 <sup>b</sup>	2.99 <sup>abc</sup>	3.17 <sup>abc</sup>	3.83 <sup>ab</sup>
-Amf 30	1.25 <sup>ab</sup>	1.25 <sup>bc</sup>	1.45 <sup>bc</sup>	1.61 <sup>ab</sup>	1.99 <sup>bc</sup>	2.54 <sup>abc</sup>	2.63 <sup>abc</sup>	2.97 <sup>abc</sup>
+Amf 40	2.42 <sup>b</sup>	2.73 <sup>abc</sup>	3.12 <sup>abc</sup>	3.50 <sup>abc</sup>	3.59 <sup>a</sup>	3.91 <sup>abc</sup>	3.92 <sup>abc</sup>	4.05 <sup>abc</sup>
-Amf 40	2.17 <sup>ab</sup>	2.43 <sup>abc</sup>	2.79 <sup>abc</sup>	2.45 <sup>abc</sup>	2.95 <sup>c</sup>	3.11 <sup>abc</sup>	3.13 <sup>abc</sup>	3.49 <sup>abc</sup>
LSD at 5%	0.57	0.63	0.65	0.71	0.81*	0.92	1.03	1.10

Means followed by the same letters are not significantly different from each other at  $P \leq 0.05$ ; according to DMRT, \* = significant at  $P \leq 0.05$ , WAT= Weeks After Transplanting. (+AMF (inoculated with *Glomus clarum*), - AMF (non-inoculated), compost (0t/ha, 10t/ha, 20t/ha, 30t/ha, 40 t/ha)

**Table 4. Influence of arbuscular mycorrhizal fungi (*Glomusclarum*) and compost on the number of leaves of *Parkia biglobosa* under a greenhouse condition**

Treatments	2WAT	4WAT	6WAT	8WAT	10WAT	12WAT	14WAT	16WAT
+Amf 0	9.75 <sup>abc</sup>	9.60 <sup>a</sup>	10.14 <sup>a</sup>	10.44 <sup>b</sup>	10.67 <sup>bc</sup>	13.94 <sup>bc</sup>	15.11 <sup>bc</sup>	15.11 <sup>abc</sup>
-Amf 0	10.5 <sup>abc</sup>	8.75 <sup>a</sup>	10.01 <sup>a</sup>	11.02 <sup>b</sup>	11.0 <sup>bc</sup>	11.33 <sup>bc</sup>	15.15 <sup>abc</sup>	15.05 <sup>abc</sup>
+Amf 10	11.50 <sup>abc</sup>	10.15 <sup>a</sup>	11.67 <sup>a</sup>	11.67 <sup>b</sup>	13.33 <sup>abc</sup>	13.33 <sup>abc</sup>	18.67 <sup>abc</sup>	16.75 <sup>abc</sup>
-Amf 10	10.05 <sup>abc</sup>	8.09 <sup>a</sup>	11.15 <sup>a</sup>	13.33 <sup>b</sup>	13.33 <sup>abc</sup>	14.1 <sup>bc</sup>	22.33 <sup>abc</sup>	17.70 <sup>abc</sup>
+Amf 20	11.50 <sup>abc</sup>	14.75 <sup>a</sup>	15.55 <sup>a</sup>	15.55 <sup>b</sup>	17.57 <sup>abc</sup>	19.00 <sup>abc</sup>	20.75 <sup>abc</sup>	21.25 <sup>abc</sup>
-Amf 20	11.75 <sup>abc</sup>	10.75 <sup>a</sup>	11.25 <sup>a</sup>	13.75 <sup>b</sup>	13.75 <sup>bc</sup>	12.25 <sup>bc</sup>	14.5 <sup>bc</sup>	18.75 <sup>ab</sup>
+Amf 30	11.00 <sup>abc</sup>	10.51 <sup>a</sup>	12.17 <sup>a</sup>	12.17 <sup>a b</sup>	12.35 <sup>abc</sup>	15.22 <sup>abc</sup>	15.95 <sup>abc</sup>	19.43 <sup>abc</sup>
-Amf 30	10.75 <sup>abc</sup>	10.25 <sup>a</sup>	11.01 <sup>a</sup>	16.50 <sup>a b</sup>	16.19 <sup>bc</sup>	23.33 <sup>ab</sup>	23.67 <sup>abc</sup>	27.98 <sup>abc</sup>
+Amf 40	11.50 <sup>a</sup>	11.75 <sup>a</sup>	14.33 <sup>a</sup>	21.89 <sup>a</sup>	23.29 <sup>a</sup>	26.12 <sup>a</sup>	26.41 <sup>ab</sup>	29.75 <sup>abc</sup>
-Amf 40	10.75 <sup>abc</sup>	11.98 <sup>a</sup>	13.66 <sup>a</sup>	13.87 <sup>b</sup>	16.70 <sup>c</sup>	22.25 <sup>b</sup>	25.10 <sup>b</sup>	29.70 <sup>bc</sup>
LSD at 5%	4.89	4.66	4.50	5.67*	6.22*	6.69*	6.61	6.72

Means followed by the same letters are not significantly different from each other at  $P \leq 0.05$ ; according to DMRT, \* = significant at  $P \leq 0.05$ , WAT= Weeks After Transplanting. (+AMF (inoculated with *Glomusclarum*), - AMF (non-inoculated), compost (0t/ha, 10t/ha, 20t/ha,30t/ha,40 t/ha)

**Table 5. Dry matter yield (g) of the plant after harvesting**

Treatments	Leaves (g)	Stem(g)	Root(g)
+Amf 0	1.27 <sup>ab</sup>	0.64 <sup>a</sup>	0.86 <sup>ab</sup>
-Amf 0	1.43 <sup>a</sup>	0.69 <sup>a</sup>	1.19 <sup>ab</sup>
+Amf 10	1.46 <sup>abc</sup>	0.63 <sup>a</sup>	1.41 <sup>ab</sup>
-Amf 10	0.85 <sup>a</sup>	0.49 <sup>a</sup>	1.69 <sup>ab</sup>
+Amf 20	1.12 <sup>abc</sup>	0.91 <sup>a</sup>	1.59 <sup>ab</sup>
-Amf 20	1.41 <sup>a</sup>	0.67 <sup>a</sup>	1.38 <sup>ab</sup>
+Amf 30	1.07 <sup>bc</sup>	0.71 <sup>a</sup>	0.76 <sup>ab</sup>
-Amf 30	1.53 <sup>a</sup>	0.59 <sup>a</sup>	0.94 <sup>a</sup>
+Amf 40	1.58 <sup>ab</sup>	1.00 <sup>a</sup>	1.76 <sup>ab</sup>
-Amf 40	1.15 <sup>a</sup>	0.31 <sup>a</sup>	1.61 <sup>ab</sup>
LSD at 5%	0.49	0.37	1.13

Means followed by the same letters are not significantly different from each other at  $P \leq 0.05$ ; according to DMRT, \* = significant at  $P \leq 0.05$ , WAT= Weeks After Transplanting. (+AMF (inoculated with *Glomusclarum*), - AMF (non-inoculated), compost (0t/ha, 10t/ha, 20t/ha,30t/ha,40 t/ha)

**Table 6. Physical and chemical properties of the postharvest soil**

Treatment	N (g/kg)	P mg/kg	K cmol/kg	Ca cmol/kg	Mg cmol/kg	Na cmol/kg	Cu cmol/kg	O.C g/kg
+Amf 0	0.15	0.73	0.002	11.37	0.76	2.72	2.4	1.69
-Amf 0	0.15	3.85	0.002	14.17	1.11	3.13	3.7	1.78
+Amf10	0.15	12.53	0.002	10.78	0.93	2.44	3.3	1.76
-Amf 10	0.08	1.14	0.002	13.97	1.43	2.86	4.4	0.94
+Amf 20	0.13	11.31	0.002	10.57	0.76	2.30	2.8	1.49
-Amf 20	0.17	12.40	0.002	9.58	1.29	2.87	4.3	1.94
+Amf 30	0.05	0.37	0.003	11.38	0.96	2.80	3.0	1.39
-Amf 30	0.11	1.46	0.003	15.76	1.23	3.11	4.3	1.72
+Amf 40	0.12	1.79	0.003	12.57	1.39	3.09	3.0	1.50
-Amf 40	0.11	4.54	0.003	13.37	0.95	3.10	3.80	1.28

O.C = Organic carbon, Cu= copper, N= Nitrogen, P= Phosphorus, K= Potassium, Ca= Calcium, Mg= Magnesium and Na= Sodium

### 3.6 Physical and Chemical Properties of the Post-harvest Soil

The analysis of the soil before and after the experiments could also be comparable to one another as no variation was observed. The application of mycorrhizal and compost boosted the mineralization of the soil after the amendments (Table 6).

## 4. CONCLUSION

Based on the description of results above, it can be concluded that: The Inoculation of the AMF and compost significantly affected the early growth performance of *Parkia biglobosa*, thus providing optimum soil physical conditions for it growth.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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