African yam bean (*Sphenostylis stenocarpa*) intercrop enhances growth of micro-propagated plantain (*Musa* sp. AAB cv. Agbagba)

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Introduction, context and objectives

Plantain (*Musa* spp. AAB) contributes immensely to food and nutrition security in sub-Saharan Africa (SSA), where it is cultivated and utilized as a major starchy staple (IITA, 2000). It also provides calcium, vitamins A, B, C, minerals such as potassium and phosphorus, phenolic compounds and dietary fibers (Adegunwa et al., 2019) [Fig. 1]. Currently, there is a high demand for micro-propagated plantain plantlets (*Musa* spp. AAB) in Nigeria (Akinyemi et al., 2018).

Fig. 1 Plantain fruits (photo: NIHORT, Nigeria).

Micro-propagated plantain plantlets are preferred by farmers because they are cleaner, healthier and uniform when compared to the traditionally propagated ones. However, most of the agricultural soils are nutrient-depleted (Ndubuisi and Kelechi, 2021), a more bio-friendly way to enrich soil-nutrients is intercropping with leguminous crop such as African yam bean (*Sphenostylis stenocarpa*) [AYB]. The objective of this study is to provide more information on how three different accessions of AYB intercrop influence the early growth parameters of plantain (*Musa* sp. AAB cv. Agbagba).

Materials and Methods

Forty eight micro-propagated plantain plantlets were planted on the loamy sand experimental field in a 3 m x 2 m spacing and intercropped with three different accessions of AYB seeds collected from GRC, IITA, Nigeria (TSs-1, TSs-4, and TSs-6) in a randomized complete block design. Micro-propagated plantain suckers without AYB served as the control. Data were collected on plantain pseudostem height (cm), leaf length (cm), leaf area (cm^2), leaf number, and pseudostem girth (cm) monthly until 6 months after planting (MAP). Data were subjected to Two way analysis of variance and means were separated using Duncan's multiple range test at $p<0.05$ with statistical programs.

Results

- At 6 MAP, the average plantain pseudostem height for TSs-4 was 41.8 cm, TSs-6, 39.4 cm, and TSs-1, 38.2 cm (Figure 2A-D and Figures 3A). However, the least average pseudostem height of 28.0 cm is observed in the control at $p<0.05$.
- The average pseudostem girth significantly increased to 8.27 cm in TSs-4, and 8.07 cm in both TSs-1 and TSs-6 (Figure 2A-D and Figures 3B). The lowest average pseudostem girth of 6.1 cm was resulted in the control at $p<0.05$.
- The average number of leaves, TSs-6 was 12.4, TSs-1 and TSs-4 both had 10.3 (Figure 2 A-D and Figure 3C). The least average number of leaves 8.1 were observed in the control.

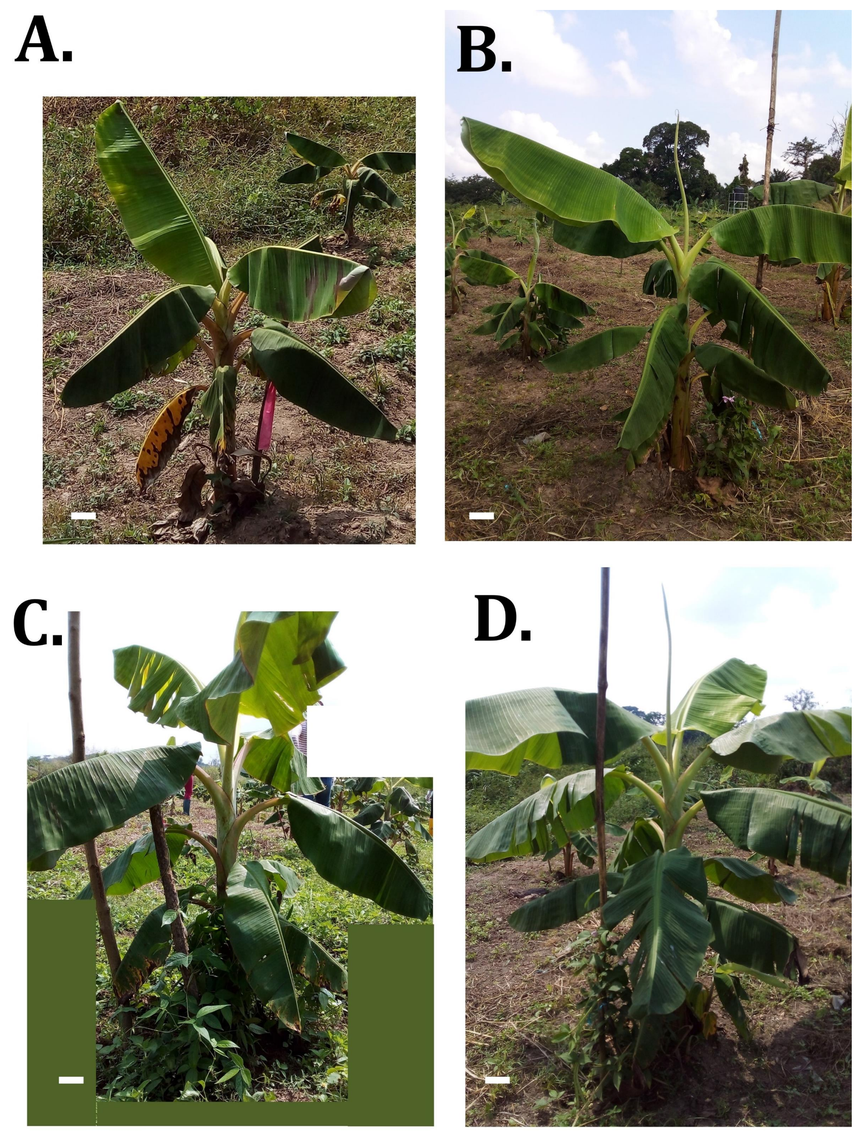

Fig. 2 Early stages of growth appearances of the micro-propagated plantain plantlets with the three different accessions of AYB TSs-1, TSs-4, and TSs-6 intercrop at six months after planting (6 MAP) (A.) control micro-propagated plantain plantlets without AYB (B.) micro-propagated plantain plantlets with AYB TSs-1 (C.) micro-propagated plantain plantlets with AYB TSs-4 (D.) micro-propagated plantain plantlets with AYB TSs-6. All scale bars = 10 cm.

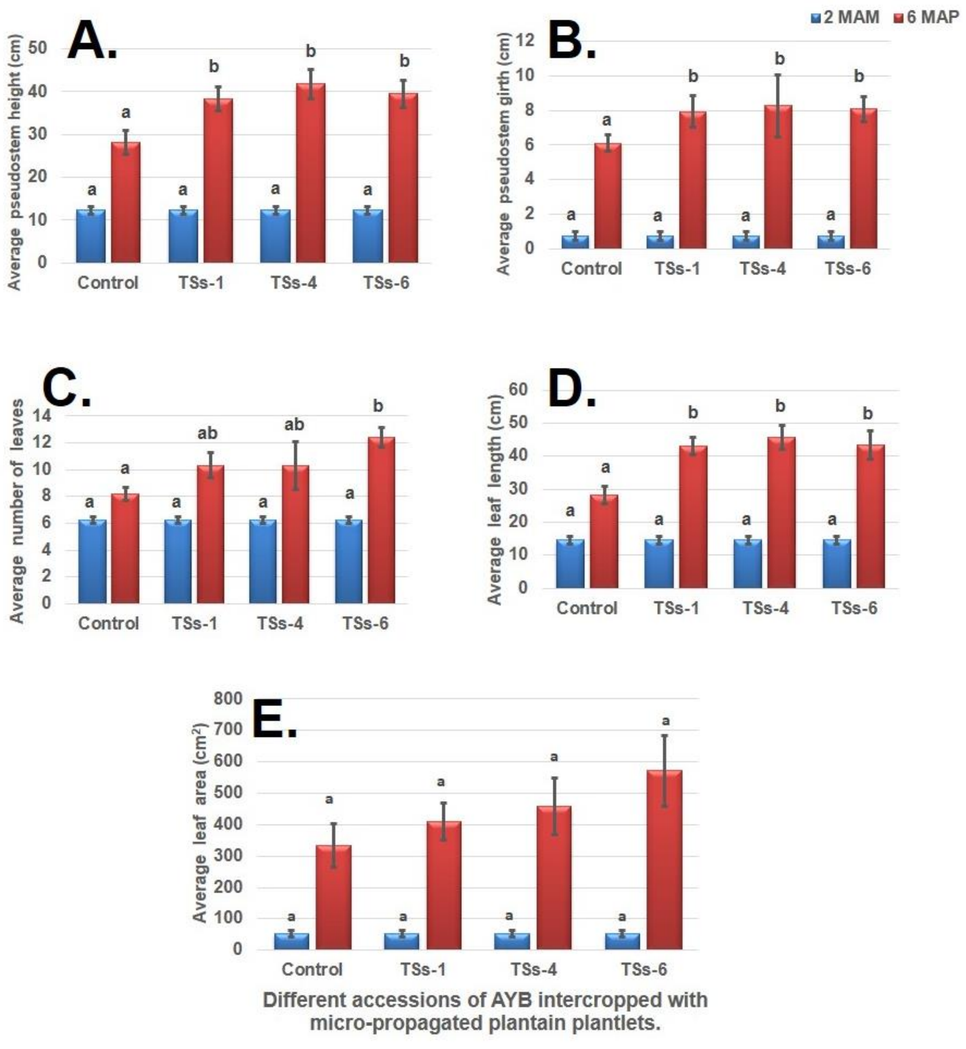

Fig. 3 Influence of the three different accessions of AYB TSs-1, TSs-4, and TSs-6 intercrop on the growth parameters of micro-propagated plantain plantlets from two months after micro-propagation (2 MAM) compared at six months after planting (6 MAP) (A.) the average micro-propagated plantain pseudostem height (cm) (B.) the average pseudostem girth (cm) of the micro-propagated plantain (C.) the average number of leaves of the micro-propagated plantain (D.) the average leaf length (cm) of micro-propagated plantain (E.) the average leaf area (cm^2) of micro-propagated plantain. Letters with the same alphabets are not significantly different at $p>0.05$.

- TSs-4 had an average leaf length of 45.8 cm, TSs-6, 43.2 cm, and TSs-1, 43.1 cm (Figure 3D) whereas it was 28.1 cm in the control at $p<0.05$.
- The lowest average leaf area of 416.8 cm^2 was observed in the control (Figure 3E), whereas it was 580 cm^2 in TSs-4, 541.7 cm^2 in TSs-6, and 511.9 cm^2 in TSs-1 at 6 MAP (Figure 3E).

Conclusions and perspectives

Micro-propagated plantains intercropped with African yam bean accessions had higher early growth performance than the control. Hence, African yam bean could be integrated in organic mass production of plantain crops.

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