



Effect of Biochar and Legume Biomass on *Brachiaria brizantha* cv. *Xaraés* Growth Parameters in Benin



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Introduction

- Livestock plays a major role in nutrition security, people's welfare, and resources conservation and management.
- In Benin, due to forage scarcity particularly during the dry months, meat and milk production are consistently declining.
- Therefore, improving forage quality and productivity through the use of biochar and green manure of *Gliricidia sepium* and *Mucuna pruriens* is key for boosting livestock production in Benin and at the same time conserving soils.



Fig.1. *Mucuna pruriens*, b- *Gliricidia Sepium*, c. *Brachiaria brizantha*; d- Biochar.

Table1: Effect of the different treatments on the growth parameters and biomass of *B. brizantha* cv. *Xaraés*

Treatment	Height (cm)	Number of leaves	internodes	Total biomass (t DM/ha)
T0	47.1 ± 17.71 ^d	13.3 ± 4.69 ^b	3.80 ± 2.57 ^b	3.9 ± 1.80 ^c
T1	57.1 ± 8.58 ^{cd}	15.6 ± 5.64 ^b	6.1 ± 1.92 ^{ab}	7.1 ± 2.15 ^{bc}
T2	69.5 ± 10.3 ^c	16.9 ± 4.77 ^b	5.9 ± 1.25 ^{ab}	6.7 ± 1.41 ^{bc}
T3	86.3 ± 8.70 ^b	18.3 ± 5.08 ^{ab}	6.4 ± 1.06 ^{ab}	13.6 ± 1.80 ^{ab}
T4	60.9 ± 11.50 ^c	15.5 ± 4.67 ^b	5.9 ± 1.53 ^{ab}	8.4 ± 0.21 ^{bc}
T5	79.3 ± 14.25 ^b	16.5 ± 4.21 ^b	6.5 ± 1.25 ^{ab}	11.6 ± 0.79 ^b
T6	82.7 ± 13.13 ^b	17.5 ± 4.70 ^{ab}	6.1 ± 1.62 ^{ab}	12.1 ± 1.86 ^b
T7	103.8 ± 17.12 ^a	22.9 ± 5.82 ^a	7.5 ± 1.19 ^a	20.3 ± 5.65 ^a

Results

- The combination of biochar and green manure (T7) showed greater performance with 57 % higher plants (103.8 cm) compared to the control (T0, $p < 0.05$).
- The average number of secondary roots (18.47); leaf length (40.63 cm); leaf width (2.27 cm); number of internodes (7.47); number of tillers (3.07 ± 1.44), number of secondary roots (3.80), and total biomass (20.3 t DM/ha) were significantly higher for T7 treatment than un-amended treatment ($p < 0.05$).
- Total biomass of T7 averaged 20.3 t DM/ha higher than that of T0 (3.9 t DM/ha).
- The green manure of legumes incorporated in the soil significantly improved the growth and biomass of *B. brizantha* and this improvement is strengthened by the biochar amendment.

Treatment	Leaf width (cm)	Leaf length (cm)	Number of tiller	Number of secondary roots
T0	1.9 ± 0.23 ^b	31.8 ± 7.69 ^{bc}	1.2 ± 1.01 ^b	1.4 ± 1.83 ^b
T1	2.0 ± 0.14 ^b	26.1 ± 6.31 ^c	1.7 ± 1.62 ^{ab}	2.7 ± 2.13 ^{ab}
T2	1.9 ± 0.18 ^b	35.0 ± 8.7 ^{ab}	1.7 ± 1.35 ^{ab}	1.7 ± 1.85 ^{ab}
T3	2.3 ± 0.20 ^a	38.8 ± 4.40 ^a	2.7 ± 1.11 ^{ab}	3.0 ± 1.56 ^{ab}
T4	1.9 ± 0.26 ^b	28.9 ± 6.35 ^{bc}	1.7 ± 1.44 ^{ab}	2.6 ± 2.13 ^{ab}
T5	2.1 ± 0.18 ^{ab}	33.7 ± 3.85 ^{ab}	2.7 ± 1.44 ^a	3.1 ± 1.16 ^{ab}
T6	2.1 ± 0.23 ^{ab}	39.0 ± 4.08 ^a	2.3 ± 1.16 ^{ab}	2.5 ± 1.51 ^{ab}
T7	2.3 ± 0.29 ^a	40.6 ± 6.16 ^a	3.1 ± 1.44 ^a	3.8 ± 1.57 ^a

The means in the same column followed by different letters differ significantly at the 5% level. T0: *Brachiaria* alone; T1: Biomass of *Mucuna* 2 t/ha; T2: Biomass of *Gliricidia* 2 t/ha; T3: Mixture of the two legumes at 2 t/ha (1 t/ha *Mucuna* + 1 t/ha *Gliricidia*); T4: 300 kg dry matter (DM)/ha biochar; T5: 60 kg DM/ha biochar + 2 t/ha *Mucuna*; T6: 60 kg DM/ha biochar + 2 kg/ha *Gliricidia*; T7: 60 kg DM/ha biochar + 2 t/ha (1 t/ha *Mucuna* + 1 t/ha *Gliricidia*).

Materials and methods

- The experiment was set up in a randomized complete block design consisting of three blocks, each containing eight experimental treatments:
- T0: *Brachiaria* alone; T1: Biomass of *Mucuna* 2 t/ha; T2: Biomass of *Gliricidia* 2 t/ha; T3: Mixture of the two legumes at 2 t/ha (1 t/ha each); T4: 300 kg dry matter (DM)/ha biochar; T5: 60 kg DM/ha biochar + 2 t/ha *Mucuna*; T6: 60 kg DM/ha biochar + 2 kg/ha *Gliricidia*; T7: 60 kg DM/ha biochar + 2 t/ha (1 t/ha *Mucuna* + 1 t/ha *Gliricidia*).
- Plant height, total biomass, leaf length and width, internodes, secondary roots, and tiller production were measured on five randomly selected plants of *B. brizantha* per treatment.

Conclusion

- Biochar and green manure significantly improve the growth and biomass of *B. brizantha* cv. *Xaraés*.
- Our findings could be used for intensifying forage production in Benin in the current context of animal sedentarization.
- This will increase the production of milk and meat and improve food security.
- This approach is also beneficial for soil restoration in the degraded drylands tropical climate of northern Benin.
- Further studies should evaluate the quality of forage produced and their effect on soil fertility and protection, milk quantity and quality and meat production.

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