Optimising Nitrogen release in an agroforestry system

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Abstract

Nitrogen release through litter decomposition is a major source of nutrient return into the soil for improved crop production. This study was carried out to investigate rate of leaf litter decomposition and nitrogen release of three agroforestry species- *Annona muricata* L., *Senna siamea* (Lam.) and *Cola nitida* (Vent.). The study provided information on nitrogen release pattern of each species and appropriate method of litter application to enhance decomposition.

Keywords: Agroforestry species, Litter decomposition, Nitrogen release

1. Introduction

The global increase in human population and urbanisation have necessitated significant demand for improved yield in agricultural crops production to meet the needs of the populace. Leaf litter in agroforestry system produces organic matter, an important factor in soil formation, and nutrient cycling process (Onyekwelu et al., 2006; Solanki and Arora, 2015).

Therefore, this study investigated rate of leaf litter decomposition and nitrogen release pattern of three agroforestry species- *Annona muricata* L., *Senna siamea* (Lam.) and *Cola nitida* (Vent.) with a view to improving soil fertility for increased food production.

2. Materials and method

2.1 Location of the experiment

The study was carried out in Akinyele Local Government Area, Oyo state, Nigeria (Fig. 1). Abscised leaves of *C. nitida*, *A. muricata* and *S. siamea* on the experimental site were collected.

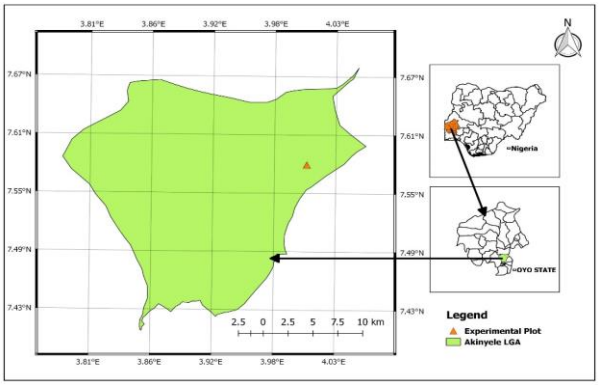

Fig. 1: Map of Akinyele L.G.A. showing the experimental site

2.1.1 Leaf litter decomposition

Oven-dry leaf litters of each species was put in 432 litterbags of 23g each. Two litter application methods- soil surface placement (SSP) and soil incorporated placement were used in a 3x2 factorial in RCBD. Initial nitrogen content, decay constant and half-lives were determined using standard procedures. Decomposition rates and nitrogen release pattern were measured fortnightly for 24 weeks after litter placement. Data collected were subjected to descriptive statistics and ANOVA at $\alpha_{0.05}$.

3. Results

Initial N content decreased from *C. nitida*<*A. muricata* < *S. siamea*. In SSP, decay constant and half-lives for *A. muricata* and *S. siamea* (0.004) (24.8) were significantly higher than *C. nitida* (0.005) (19.8) while *C. nitida* and *S. siamea* (0.002) (49.5) were significantly higher than *A. muricata* (0.003) (33.0) in SIP. Decomposition rates and nitrogen release patterns are shown in figures 2-5.

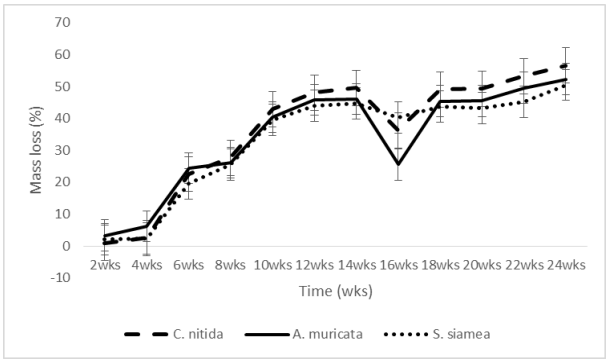

Fig 2: Litter decomposition using soil incorporated placement

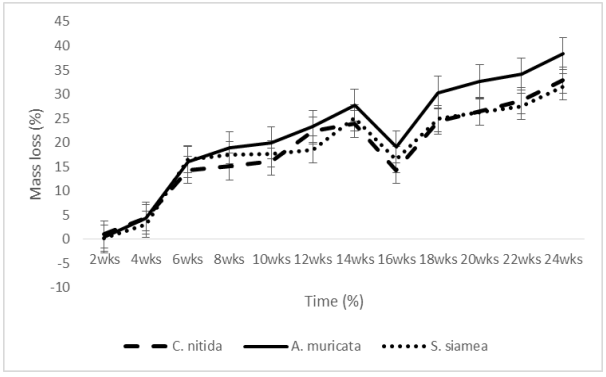

Fig 3: Litter decomposition using soil surface placement

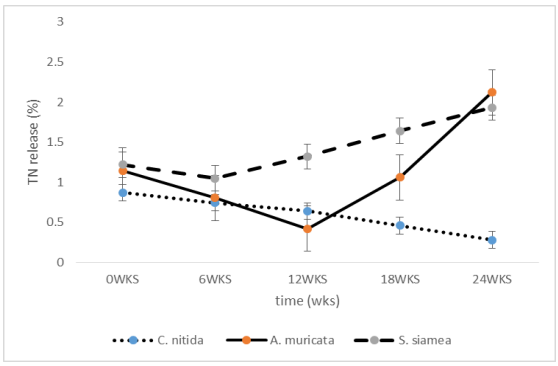

Fig. 4: N-release pattern in soil surface placement

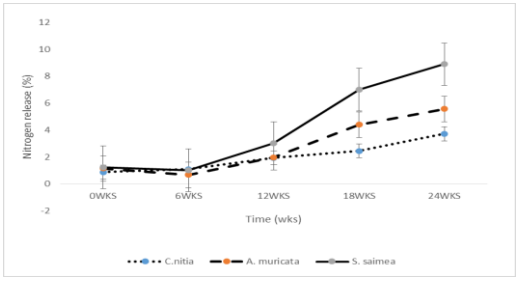

Fig. 5. N-release pattern in soil incorporated placement

Conclusion

These species could be effective in source of nitrogen in an agroforestry system.

Acknowledgements

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References

Onyekwelu J C Mosandi R and Stim B 2006 Productivity, site evaluation and State of Nutrition of *Gmelina arborea* plantation in Oluwa & Omo Forest Reserves, Nigeria *Forest Ecology and Management* **229:** 214-227

Solanki R B and Arora S 2015 Leaf litter dynamics in Agroforestry system affecting microbial activity in Saline Soils. *Journal of Soil & Water Conservation* **14(4):** 333-339.