Influence of Termites on Stability and Reactivity of Phosphorus in East African Savanna

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Introduction

Termites are major ecosystem engineers in African savanna creating soil heterogeneity and nutrient hotspots in the form of mounds. Plant productivity in African savanna is limited by cycling of phosphorus (P) and nitrogen (N) (Augustine, 2003). Our objective was to determine the influence of termite mounds on soil P distribution and reactivity. We hypothesized that the termites increase the phosphorus availability on the termite mounds.

Experimental

Forty two composite samples from the centre, edge and 5m away from the termite mound were collected up to 10 cm depth. Soil phosphorus forms ^{31}P were determined on alkali extracts using Avance III 500 MHz at McKnight Brain Institute, University of Florida. Total P was determined using ashing method. Available P determined using Mehlich-1 method.

Results and Discussion

All sites near the termite mound soil P was dominated by orthophosphate, phosphomonoesters, phosphodiester (DNA) and pyrophosphate while in contrast, off mound soil P was dominated by orthophosphate and phosphodiesters. This indicate that termite promote both P availability and stability (Fig. 1; Table 1)

Figure

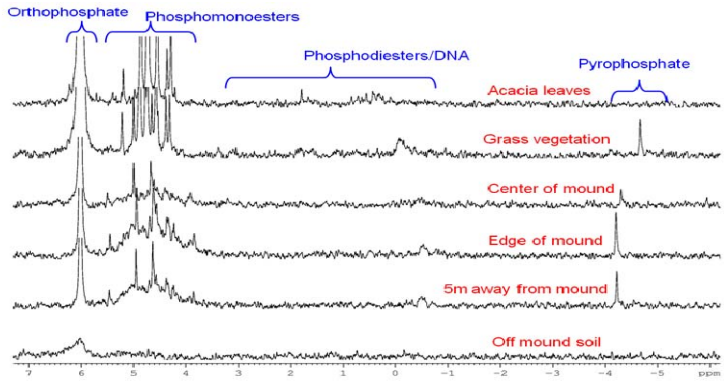

Fig 1. ^{31}P spectra with functional groups referenced using 85% phosphoric acid

Table 1. Recovered P fractions using NMR (in parentheses are the percentages)

	TP	NaOH -P	Ortho-P	Phosphomonoester	DNA	Pyrophosphate
		mg kg^{-1}		%		
Acacia	1812	1606.8	77	20	3	-
Grass	1011	1010	75	20	3.5	1.5
Centre	370	121.68	61	31	5	3
Edge	290	65.38	35	59	3	3
5M away	210	53.88	39	55	2	4
Off mound	140	30.58	55	35	10	-

Conclusion

The presence of termite mounds in the savanna promote short term availability of P to plants through orthophosphate as well as long term P availability through pyrophosphate. Phosphorus heterogeneity created by termite mound potentially influences plant productivity and feed quality to livestock and wild animals.

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References

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