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The 21st International Grassland Congress / 8th International Rangeland Congress took place in Hohhot, China from June 29 through July 5, 2008.

Proceedings edited by Organizing Committee of 2008 IGC/IRC Conference

Published by Guangdong People's Publishing House

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Legume biomass quantity requirement for maize production with reference tomucuna green manure in Kenya

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Key words : Legume biomass quantity , maize yield

Introduction *Mucuna pruriens* , a potential on-farm legume source of nitrogen , has low biomass production that varies with agro-ecological and niche conditions (Mureithi and Gitahi , 2004) . This limits its capability to meet maize N requirement . The objective of this research was to determine effect of different application rates of mucuna green manure biomass on maize grain yield during application season .

Materials and methods Treatments investigated were : mucuna green manure applied at rates of 0 , 30 , 60 , 120 , 240 and 480 kg N ha⁻¹ equivalent to 0 , 1 . 5 , 3 , 6 , 12 and 24 t DM ha⁻¹ of biomass ; and inorganic fertilizer-urea at 0 , 30 , 60 and 120 kg N ha⁻¹ . The experimental design was a randomized complete block with four replications , and planting period 2002-2005 .

Results Nitrogen source failed to show significant effect on maize grain yield , regardless of application rate (Table 1) . Maize with no fertilizer and that applied with mucuna green manure at 30 kg N ha⁻¹ had comparable grain yield . Maize applied with mucuna at rate of 60 kg N ha⁻¹ showed significant increase in grain yield over the control during long rains , but failed to achieve the same in short rains (Table 1) . Application of mucuna green manure at rates of 120 , 240 and 480 kg N ha⁻¹ caused consistent and significant increase in maize grain yield over the control (Table 1) . Mucuna green manure application rates in excess of 120 kg N ha⁻¹ showed little or no further harmonious improvement in maize yield (Table 1) .

Table 1 Effect of mucuna green manure and inorganic fertilizer-urea application rate on maize grain yield during application season , at Mosochi , Kisii , southwest Kenya (2002-2005)* .

	Treatment(Nitrogen , kg N ha ⁻¹)	Maize grain yield (t · ha ⁻¹)				
		Short rain	Long rain	Short rain	Long rain	Short rain
		2002	2003	2003	2004	2004
Rainfall (mm)		638	1654	850	999	844
	0	1 . 07	2 . 07	0 . 90	1 . 09	0 . 70
Mucuna green manure	30	1 . 30	3 . 13	0 . 99	1 . 52	0 . 72
	60	1 . 14	3 . 08	1 . 52	2 . 38	0 . 97
	120	1 . 62	3 . 96	3 . 01	3 . 55	1 . 53
	240	1 . 68	3 . 13	2 . 08	3 . 51	1 . 48
	480	1 . 39	3 . 13	2 . 36	4 . 12	1 . 29
Inorganic fertilizer-urea	30	1 . 46	2 . 83	1 . 40	2 . 41	0 . 68
	60	1 . 55	3 . 23	1 . 42	2 . 27	0 . 90
	120	1 . 32	3 . 59	1 . 95	2 . 07	0 . 47
Mean		1 . 39	3 . 13	1 . 62	2 . 55	0 . 97
Nitrogen source F test		ns	ns	ns	ns	*
LSD Nitrogen source		0 . 20	0 . 45	0 . 43	0 . 70	0 . 36
Nitrogen rate F test		*	*	*	*	*
LSD Nitrogen rate		0 . 35	0 . 56	0 . 53	1 . 01	0 . 47
% C . V Treatment		17 . 3	11 . 8	22 . 6	27 . 2	33 . 3

* F= Fischer test ; * = Differences significant at $p \leq 0 . 05$ and , ns= non-significant at $p \leq 0 . 05$; LSD= Least significant difference .

Conclusions Legume biomass from mucuna applied at 120 kg N ha⁻¹ equivalent to 6 t DM ha⁻¹ of the green manure showed consistent significant increase in maize yield over the control , in all seasons . Therefore , application rates less 120 kg N ha⁻¹ could require supplementation with inorganic fertilizer N used in combination , if notable increase in yield is to be expected .

Reference

Mureithi , J . G . and Gitahi , F . M . 2004 . Legume screening database and instructional manual . Legume Research Network projects . Kenya Agricultural Research Institute (KARI) , 23 p .