On farm evaluation of legumes biomass for the management of *Striga* in Iringa district, Tanzania

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Abstract

A mother-baby trial using farmers' groups was set up to evaluate the effect of legumes biomass in the management of *Striga* in Iringa district, Tanzania. A randomised complete block design was used in the experimental lay-out. Two maize genotypes namely Situka and IR-Maize and six selected legumes (cowpeas, chickpeas, green gram, mucuna, canavalia and sunhemp) were used. Preliminary results indicated that short crop rotations using maize and cowpeas or sunhemp have the highest potential for reducing *Striga* infestation and increasing maize productivity against chemical herbicides.

Key words: Fertility, legumes, *Striga asiatica,* Tanzania, Witch weed, *Zea mays*

Résumé

Un essai mère-enfant à l'aide des groupes d'agriculteurs a été mis en place pour évaluer l'effet de la biomasse des légumineuses dans la gestion de *Striga* dans le district d'Iringa, en Tanzanie. Un dispositif en blocs aléatoires complets a été utilisé dans le plan expérimental. Deux génotypes de maïs à savoir le Situka et le maïs- IR et six légumineuses sélectionnées (le niébé, les pois chiches, les haricots velus, pois mascate, canavalia et haschisch) ont été utilisées. Les résultats préliminaires indiquent que la rotation courte des cultures en utilisant le maïs et le niébé ou le haschisch ont le plus grand potentiel de réduction de l'infestation de *Striga* et d'augmentation de la productivité du maïs comparativement aux herbicides chimiques.

Mots clés: Fertilité, légumineuses, *Striga asiatica*, Tanzanie, mauvaise herbe, *Zea mays*

Background

Striga is considered one of the major biological constraints to maize production in Tanzania especially for resource-poor households and infertile areas. Chemical herbicides and soil fertility improvement through addition of nitrogenous fertiliser

are known to manage striga. These methods however are unaffordable and unsustainable for most small-scale and subsistence farmers. There is therefore need for Striga management measures that are effective but affordable by the small scale subsistence farmers such as those in Tanzania. To explore measures with such potential, an on-farm research was carried out to evaluate the agronomic suitability of selected legumes to edaphic and climatic conditions and their effectiveness in reducing *Striga* occurrence, severity and seed bank in the soil in Iringa district.

Literature Summary

Striga infestation is most problematic on nutrient-depleted soils with low organic matter content (Ransom *et al*., 1990). Iringa soils were described by Msaky *et al.* (2010) to be of low fertility, very low organic carbon and nitrogen. Soil infertility in Iringa is the result of continuous cropping, crop residual removal, leaching and soil erosion without concurrent replenishment (CP-URT, 2000). Cover crops, green manures and integrated nutrient management are low cost technologies widely used to alleviate the decline in soil fertility (Nandwa, 2003). These measures benefit crops through addition of nutrients into the soil, weeds suppression and soil structure improvement.

Study Description

Two maize genotypes namely Situka and IR-Maize and six selected legumes (cowpeas, chickpeas, green gram, mucuna, canavalia and sunhemp) were used. *Striga* seed counts were conducted in the laboratory prior to sowing of legumes in the first year/season. Data on legumes were used to evaluate the best adaptable to the Iringa environment. Produced biomasses were incorporated into the existing plots where maize was grown in the second year/season to employ a short term rotation system. Before maize planting in the second season, laboratory *Striga* seed counts were repeated and data were used to depict the effectiveness of different legumes and IR-Maize in the reduction of *Striga* seed bank through germination suicide.

Research Application

Preliminary data (Table 1), indicated cowpeas and sun hemp (edible and non-edible, respectively) as the best legumes in short rotation with maize in the edaphic and ecology of Iringa district. Results indicated significant treatment effects (p>0.05).

Results

Results of *Striga* seed count before and after application of legume biomass treatments indicated that legumes biomass reduced *Striga* seed bank and population through germination suicide significantly (P>0.05) between year one and year two.

Table 1. Total legume biomass and total grain yield per hectare (tons).

Legumes	Total biomass/ha (tons)	Grain yield/ha (tons)
Cow peas	39.70[a*]	2.7283[a]
Chick Peas	10.04[c]	0.4667[c]
Green gram	16.08[c]	0.9617[b]
Velvet beans	29.83[b]	0.000[d]
Canavalia	2.92[d]	0.000[d]
Sun hemp	34.08[ab]	0.000[d]
P-value**	<0.001	<0.001
LSD (P=0.05)	6.649	0.235
SE	5.622	0.199
CV (%)	25.4	28.7
Site		
Mangalali	22.24	0.66
Kiwere	21.98	0.72
P-value	0.858	0.354
LSD (P=0.05)	3.021	0.127
CV (%)	19.8	26.5
Legumes x site		
P-value	0.004	0.117
Mean	22.11	0.69

*Means within a column belonging to the same classification (Legumes or site) followed by the same letterare not significant different; **significance level.

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