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Full Length Research Paper

Influence of *D. dichotomum* planting time on *S. hermonthica* incidence and sorghum growth and yield

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Abstract

***Striga* poses major constrains to sorghum production in Africa. The study was conducted in pots at Gezira Research Station, Sudan during the seasons 2006/07 and 2007/08 to investigate the Influence of *D. dichotomum* planting time on *S. hermonthica* incidence and sorghum growth and yield. Results showed that *D. dichotomum* planted 60 days prior to sorghum was more effective in suppressing the parasite.**

Keywords: Sorghum, Plant Species, *S. hermonthica, D. dichotomum*.

INTRODUCTION

Striga spp. (witchweeds) belongs to the family Orobanchaceae (Matusova *et al*., 2005). They are an endemic problem in Africa's cereal and legume crops (Ejeta *et al*., 1993). About 40 *Striga* species are reported worldwide. Most of them are found in Africa (Kroschel, 2001; Kroschel and Müller- Stöver, 2004). Economically important *Striga* species are reported from more than 50 countries, especially from East and West Africa and Asia (Aly, 2007). About 21 million ha of the area under cereals in Africa is estimated to be infested by *Striga* causing an annual grain loss of about 8 million tons (Gressel *et al*., 2004).

At least 11 of these species parasitize crops and pose one of the most severe biological constraints to agriculture in low- input farming systems especially in the African Savanna (Parker and Riches, 1993).

S. hermonthica is common throughout northern tropical Africa and extends from Ethiopia and Sudan to West Africa. It also extends from the western Arabian region southwards into Angola and Namibia (Gethi and Smith, 2004). *S. asiatica* has a wider distribution and is found throughout semi-arid areas of tropical and subtropical Africa, Asia and Australia (Gethi and Smith, 2004). *Striga* is most prevalent where plants are grown under moisture stress or where soil fertility is low (Gethi and Smith, 2004).

In Sudan, the parasite is widely distributed throughout the whole country causing serious crop losses to subsistence crops i.e sorghum and millet (Ismail, 1979). Dawoud *et al*. (2007) reported that the parasite is listed as one of the most harmful weeds and constitute a major threat to sorghum production.

Worker in ICIPE, Khan *et al.* (2000, 2001, 2002, 2006, 2007 and 2008) demonstrated that intercropping maize or sorghum with the fodder leguminous weeds *Desmodium uncinatum* (Jacq.) DC. And *D. intortum* (Mill.) Urb, significantly reduced *S. hermonthica* infestation and increased grain yield. *Desmodium* spp., apart from successful suppression of *Striga* and increasing grain yield by several fold, are repellent to the stem borers {*Busseolo fusca* (Noctuidae)} and *Chilo partellus* (Pyralidae), excellent nitrogen fixers (100- 180 kg nitrogen/ ha), preserve soil moisture and are high value fodders (Khan *et al*., 2002). Intercropping with *Desmodium* spp. Represents a platform technology around which new income generation components such as livestock keeping can be built. At present, intercropping with *Desmodium* spp. To combat *Striga* and insect pests in maize is adopted by over 6 thousand farmers in western Kenya and eastern Uganda (Khan, Z.R., 2006, Personal contact). However, in Kenya in Lake Vectoria basin, where the technique of intercropping

Table 1. Influence of *D. dichotomum* planting time on *S. hermonthica* incidence and sorghum growth and yield (season, 2006/07)

Time of *Desmodium* planting prior to sorghum planting	*Striga* infested		*Striga* free	
	+ *Desmodium*	- *Desmodium*	+ *Desmodium*	- *Desmodium*
a/ *Striga* population density (plants/pot)				
0	1	1	-	-
30	1	2	-	-
60	1	2	-	-
90	1	1	-	-
SE±		0.21		
b/ Sorghum height (cm):				
0	20.7	26.3	34.5	38.0
30	26.7	31.3	46.8	43.5
60	44.3	27.3	43.0	37.6
90	36.4	38.1	33.2	44.4
SE±		5.11		
c/ Sorghum dry weight (g):				
0	0.55	0.53	0.83	1.62
30	0.34	0.53	1.50	1.85
60	3.34	0.81	2.50	2.50
90	1.49	1.5	0.94	2.76
SE±	0.46			

+ and – with and without *Desmodium* planting.

Table 2. Influence of *D. dichotomum* planting time on *S. hermonthica* incidence and sorghum growth and yield (season, 2007/08)

Time of *Desmodium* planting prior to sorghum planting	*Striga* infested		*Striga* free	
	+ *Desmodium*	– *Desmodium*	+ *Desmodium*	– *Desmodium*
a/ *Striga* population density(plants/pot)				
0	3	3	-	-
30	1	3	-	-
60	1	2	-	-
90	1	2	-	-
SE±		0.29		
b/ Sorghum height (cm):				
0	22.8	24.2	45.5	40.6
30	30.3	21.9	32.4	26.7
60	37.1	19.3	44.1	33.8
90	36.4	23.5	33.3	30.9
SE±		4.9		
c/ Sorghum dry weight (g):				
0	0.36	0.54	4.70	5.69
30	1.48	0.55	1.91	1.85
60	4.7	0.40	4.82	2.98
90	4.04	0.82	4.07	3.08
SE±		1.19		

with *Desmodium* spp. is most successful, bimodal rains are predominant. The perennial *Desmodium* species survive once established.

In Sudan, different *Desmodium* spp viz *D. dichotomum* (Klein) DC. , *D. adsendens* (SW.) DC. , *D. iasiocarpum* (Beauv.) DC. and *D. repandum* (Vahl) DC were reported, mainly in the rain -fed areas (Andrews, 1952). The most common species is *D. dichotomum*. They are considered as weeds of minor importance in the rain fed areas.

The main objective of this was to investigate the Influence of *D. dichotomum* planting time on *S. hermonthica* incidence and sorghum growth and yield

MATERIALS AND METHODS

Plastic pots, 20 cm i.d. and 18 cm high, with drainage holes at the bottom were filled with clay soil (Gezira soil) and river sand mixed in the ratio of 2:1. The experiment was conducted under artificial *Striga* infestation. Artificial infestation of soil was accomplished by mixing *Striga* seeds (1 gram) with 1 kilogram soil followed by subsequent dilutions with *Striga* free soil to give the required infestation level (0 – 10 mg per pot). *Striga* seeds at 0 and 10 mg were mixed with the top 6 cm soil in each pot. The pots were either sown or not sown to *D. dichotomum* (10 plants per pot) at 0, 30, 60 and 90 days prior to sorghum (cv. Arf Gadamak) planting. At sorghum planting *D. dichotomum* was cut at ground level. The pots were irrigated regularly. Treatments were arranged in a Complete Randomized Block Design with 4 replicates. *Striga* count, sorghum height and shoot dry weight were recorded at harvest. The experiment was repeated twice.

RESULTS AND DISCUSSION

In the first season, *Striga* emergence was low, irrespective of *D. dichotomum* population density and planting time (Table 1). Under *Striga* infestation *D. dichotomum* planted 30 days prior to sorghum or planted on the same day as sorghum had no effects on sorghum height and dry weight. However, *D. dichotomum* planted 60 days prior to sorghum significantly increased sorghum plant height and dry weight (Table 2). *D. dichotomum* planted 90 days prior to sorghum had no significant effects on sorghum height and dry weight. In absence of *Striga*, *D. dichotomum* planted in the same day as sorghum had no effects on sorghum plant height. However, sorghum dry weight was reduced by 49% (Table 20). *D. dichotomum* planted 30, 60 and 90 days prior to sorghum had no effects on sorghum height and dry weight.

In the second season, *D. dichotomum* planted 30 and 60 days prior to sorghum reduced *Striga* emergence, albeit not significantly (Table 2).

Under *Striga* infestation *D. dichotomum* planted 30 and 90 days prior to sorghum, resulted in non- significant increase in sorghum height and dry weight. However, *D. dichotomum* planted 60 days prior to sorghum substantially increased sorghum height and dry weight (Table 2).

Pot experiments revealed that the *D. dichotomum* planted 60 days prior to sorghum was more effective in suppressing the parasite. This result could be attributed to the fact that as leguminous plants, *Desmodium* spp. may fix nitrogen and thus improve soil fertility. Nitrogen fixed by legumes has been pointed as an important factor contributing to *Striga* control. The means by which levels of nitrogen suppress *Striga* are not clearly understood. However, the main effects of nitrogen fertilization could be via reduction of stimulant exudation, direct damage to *Striga* seeds and seedling in the soil, reduced osmotic pressure in the parasite relative to the host and increased shading by the crop (Parker and Riches, 1993).

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