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Effect of intercropping sorghum and groundnuts on density of *Striga hermonthica* in The Gambia

(*Keywords:* Intercropping sorghum and groundnuts; Effects on soil temperature and emergence of *Striga hermonthica*; The Gambia)

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Abstract. Two intercropping trials were established in 1985–1986 to compare the effects of inter-row intercropping, intra-row intercropping, and sole cropping of sorghum and groundnuts on emergency of *Striga* shoots on sorghum. Intra-row intercropping reduced density of *Striga* significantly when compared with sole cropping of sorghum. This effect appeared to be soil temperature-mediated. Soil temperatures in intra-row intercropping were 2 °C lower and closer to the minimum threshold of 30 °C than in sole sorghum during the peak period of germination.

Introduction

Germination of *Striga* is temperature dependent with the optima between 30° and 35°C (Parker, 1984). As such, provision of shade at the basis of the host crop might lower soil temperatures and possibly reduce germination and subsequent emergence of *Striga*.

Several agronomic possibilities exist for influencing soil temperatures of cereal crops. Those that appear to be technically feasible on small scale farms are mulching, dense planting and intercropping. Mulching can be accomplished by seeding directly into the residue of a previous crop or into natural vegetation just killed by spraying or slashing. While it may be inappropriate to recommend seeding into previous crop residue because farmers use crop residue for fencing and as food for livestock, some traditional farmers practice intercropping of sorghum and groundnuts. The two crops are usually alternated on rows with the cereal crop not only exposed but also the cereal crop rows are too far apart to form a complete canopy.

Some legumes including soyabeans, bambarra groundnuts (Garris and Wells, 1956; Parkinson *e al.*, 1985), haricot beans and groundnut (Pieterse, 1985) are known to act as 'trap' crops by inducing *Striga* seed into suicidal germination. Such legumes will have an added advantage in reducing the density of *Striga* when used as intercrops in cereals.

An experiment was carried out with the objective of investigating the effect of intra-row and inter-row intercropping of sorghum and groundnuts on soil temperatures and emergence of *Striga*.

Materials and methods

A randomized complete block designed experiment with two replicates was established at the Sapu Agricultural Research Station in 1985 and 1986. The treatments were as follows:

(1) Sole sorghum — planted in rows 75 cm apart and 30 cm between hills in same row.
(2) Sole groundnut — planted in rows 75 cm apart and 10 cm between hills in same row.
(3) Sorghum alternating with groundnuts in single rows — spacing of crops are as in (1) and (2).
(4) Sorghum intercropped with groundnuts within same rows. Sorghum was spaced 30 cm apart between hills. Two hills of groundnuts were planted 10 cm apart between two sorghum hills in same row.

The plot size was 20 × 20 m. Local varieties of sorghum, Samba Jabo, and groundnut, S28/206, were used. Both crops were planted simultaneously. Soil thermometers were positioned randomly in the middle of two adjacent sorghum plants in same row in treatments (1), (3) and (4) to monitor temperatures. Soil temperatures were recorded each day at 14.00 h G.M.T. starting from the 6th up to the 12th week after crop emergence.

Striga shoots were counted in the five middle rows in each plot at grain maturity of sorghum. Both panicle yield of sorghum and pod yield of groundnuts were determined.

Results and discussion

Changes in mean weekly temperatures with time at soil depths of 10 and 15 cm are presented in Figure 1. The starting point for recording temperatures was established as the stage when the groundnut intercrop had spread vegetatively enough to close canopy and influence soil temperatures. There was not much change in soil temperature at the depth of 20 cm hence such data were ommitted in the presentation.

Close to 30 °C soil temperatures were recorded under intra-row intercropping at 10 cm in the 6th and 7th weeks. Soil temperatures at depth of 10 cm during this period were at least 2 °C lower and closer to the minimum threshold in intra-row intercropping than in sole sorghum.

Differences in soil temperatures were more pronounced at 15 cm depth with sole sorghum having the highest temperature followed by inter-row intercropping and then intra-row intercropping, in decreasing order of temperatures. Except in the 8th week, soil temperatures of intra-row intercropping were below the germination optimum of 35 °C and were at least 4 °C lower than those recorded in sole sorghum from the 9th week onwards.

Results of *Striga* shoot counts in 1985 showed a possible

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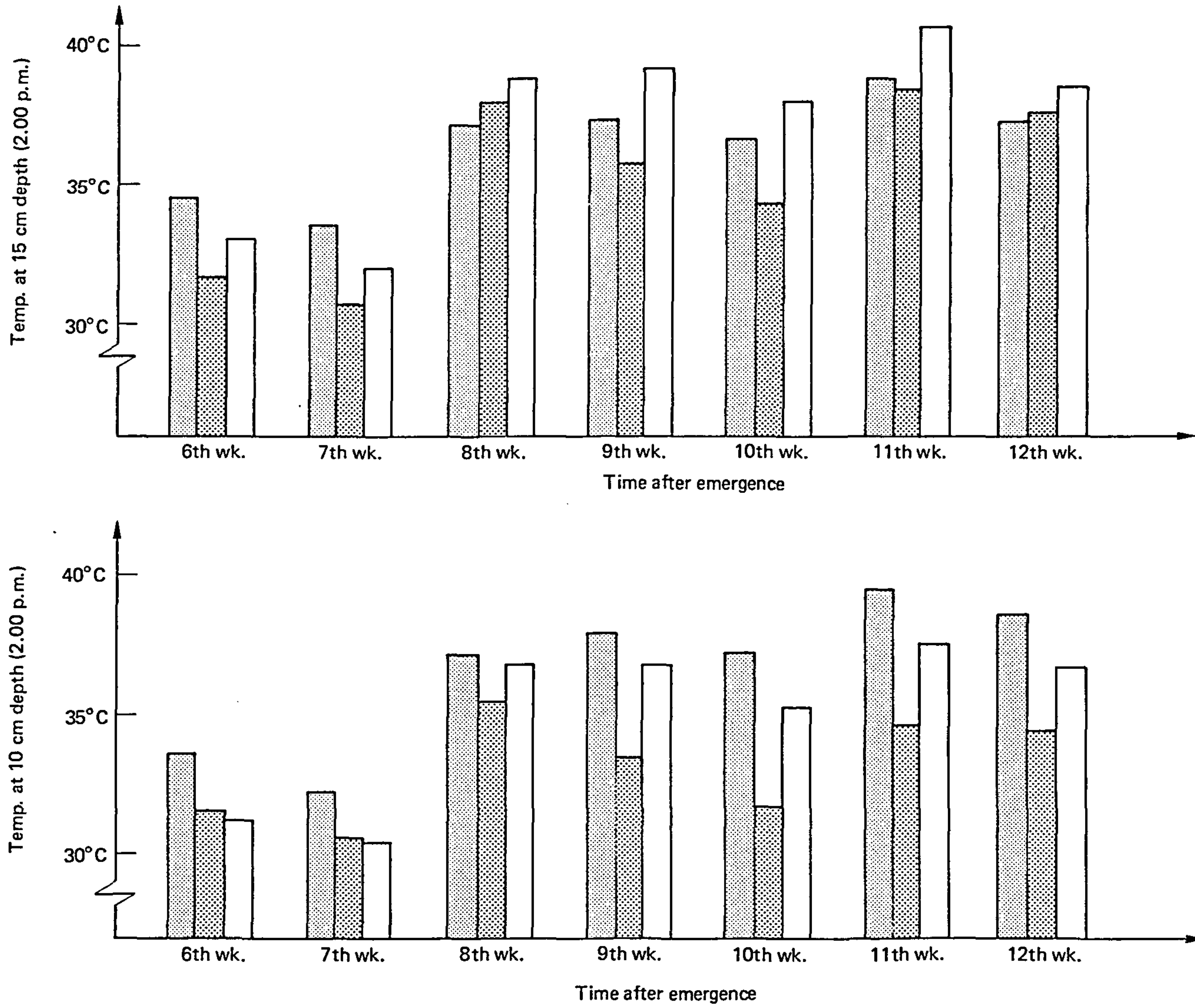

Figure 1. Mean soil temperatures under sole — intra-row and inter-row intercropping at 10 cm and 15 cm soil depths. ▒ sole sorghum; ░ intra-row inter cropping; ☐ inter-row intercropping.

correlation between soil temperatures and reduced *Striga* density (Table 1). *Striga* counts was significantly higher in sole sorghum than in intra-row intercropping, with counts in inter-row intercropping in between the two treatments in both years. It was possible that the relative low temperatures in intra-row intercropping during the 6th and 7th weeks, albeit still within the optimum range for germination, may have reduced germination and therefore emergence of *Striga*. This period was seen to coincide with the peak period of germination of *Striga* since excavation of 8 week-old millet plants nearby had revealed formation of numerous tiny primary haustoria on the roots at the time.

There was also the possibility that the trap-cropping effect of groundnuts could have contributed to the decrease in density of *Striga* in intra-row intercropping. In order to resolve this experimentally, it might be necessary to include in future work an additional treatment of using straw mulch in sole sorghum so as to reduce soil temperatures in the absence of any trap-crop. This will permit comparison between the effects of reduced temperature *per se* and reduced temperature plus trap-cropping influence on *Striga* density.

In spite of the demonstrated favourable effect on *Striga* density, there could be technical constraints to adopting intra-row intercropping in the animal draft based cropping systems of the Gambia. For one thing, it will be difficult to mechanically seed and harvest two different crops within the same row. Secondly, different packages of fertilizer and pest control recommendations may be required for such crop mixtures.

A future line of work will be to investigate the effect of inter-row intercropping (alternating cereal and legume on rows) of cereals with more spreading and shadier legume species such as cowpeas and bambarra groundnuts on suppression of *Striga*.

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Table 1. Striga shoot count and yield of sorghum and groundnuts in intercropping trials at Sapu, 1985–86

	Sole sorghum	Sole groundnuts	Sorghum inter-row intercropped	Sorghum intra-row intercropped
1985				
Panicle yield (kg/ha)	3231	—	3028	1775
Pod yield groundnuts (kg/ha)	—	2310	935	1794
Striga shoot count per 75 m²	88	0	45	26
	(9·4)†	(0·7)	(6·7)	(5·1)
L.S.D. (5%)			(3·8)	
1986				
Grain yield (kg.ha)	1087	—	456	650
Pod yield groundnuts (kg/ha)	—	1750	550	575
Striga shoot count per 75 m²	208	0	180	80
	(14·4)	(0·7)	(13·4)	(9·0)
L.S.D.			(4·8)	

( ) = Transformed data ($\sqrt{x + 0{\cdot}5}$).

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