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THE EFFECTS OF INTERCROPPING COWPEA, GROUND NUT, GINGILI AND SWEET MELON ON TERMITE DAMAGE ON SUGARCANE IN SRI LANKA

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Abstract

Six species of termites attack sugarcane in Sri Lanka and their infestation is severe in rain-fed cultivations. Management of termites of sugarcane by cultural and biological methods have been received greater attention to avoid the harmful effects of pesticides and their residues on the environment. Intercropping has been used to control the termites in sugarcane in different countries, but no scientific information on the effects of intercropping on termites in sugarcane in Sri Lanka is available. An experiment was conducted from September 2010 to September 2012 in the research farm of the Sugarcane Research Institute, Sri Lanka to find out the effects of intercropping cowpea, ground nut, gingili and sweet melon with sugarcane on germination, termite damage to buds of the planted setts and young plants and on cane yields. Four intercrops were sown in the sugarcane plots soon after planting sugarcane. The control was a sugarcane mono crop. Data on number of germinated buds, number of termite-infested buds, total number of plants and number of termite-infested plants, number of millable stalks and the weight of harvested cane in each plot were recorded in both plant and ratoon crops. The effects of the treatments were compared by ANOVA using SAS software. The results showed that, intercropping in sugarcane fields with cowpea, ground nut, gingili and sweet melon had no significant effect on germination of buds, termite damage on sugarcane during early growth stages and on cane yield. Though statistically not significant, cultivation of ground nut showed some effect on reducing termite damage in sugarcane.

Keywords: Intercropping, Sri Lanka, Sugarcane, Termites

INTRODUCTION

Termites are considered as one of the major soil-borne pests, particularly when sugarcane is grown under rain-fed conditions. The majority of the existing sugarcane plantations and almost all proposed areas for future expansion of sugarcane cultivation in Sri Lanka under rain-fed. Moreover, Reddish Brown Earths (RBE) which is the major soil group found in the existing and proposed commercial sugarcane-growing areas in the island and is having sandy clay-loam texture is prone to termite infestation. The use of chemicals as seed treatment before planting and as soil drenches after establishment are laborious, expensive, inefficient and in particular could be hazard apart fromthe adverse effects on environment by contaminating residues with soil and water sources. Therefore, management of termite damagesin sugarcane without harming the environment by green means is important to minimise yield losses. Environment-friendly cultural and/or biological methods to control the termites in sugarcane in Sri Lanka have become necessary for sustainable sugarcane production.

Intercropping affects incidence of sugarcane pests in different ways (Srikanth*et al.*, 2000), and it has been suggested as a method of preventing the termites from accessing the sugarcane setts and seedlings (Ahmed *et al.*, 2008). There are some plant species which can attract or repel the termites, and these plant species can be used as intercrops to save the major crop from termites. A number of different food crops are intercropped with sugarcane in Sri Lanka with the recommendations of the Sugarcane Research Institute (SRI), Sri Lanka. However, there is no scientific information on their effects on different types of pests including termites. Studies on the effects of different intercrops on the damage of termites in rain-fed cultivations are useful to develop an integrated management programme for the termites of sugarcane in Sri Lanka. Therefore, a field experiment was conducted to find out the effects of intercropping four recommended food crops on termite damage in sugarcane in Sri Lanka. The specific objectives of the project were to find out the effects of intercropping on germination, termite damage to buds in the planted seed setts and to young plants and the yield of sugarcane.

MATERIALS AND METHODS

A field experiment was conducted from September 2010 to September 2012 in the research farm of the SRI, UdaWalawe, Sri Lankaunder rain-fed.The soil in the experimental area is predominantly well–drained Reddish Brown Earths (RBE) (Alfisol to Ustalf) with a sandy clay-loam texture, pH 5.5 – 7.0, low organic matter content (1 – 2%) and moderate to low N, K and Cation Exchange Capacity (CEC). The area is characterised by a bimodal pattern of rainfall distribution, with about 1,300 mm average annual precipitation. About, two-thirds of the annual rainfall is received from September to February (*Maha* season). There is a small peak of rainfall from March to May (*Yala* season) but it is erratic. The ambient air and

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soil temperatures are high and range from 28^0 C to 32^0 C.

A fallow field with hightermite activity was selected for the field trial. Four recommended field crops, namely, cowpea, ground nut, gingili, and sweet melon were selected as intercrops and five treatments including four intercropped plots and monocrop sugarcane were laid out in a Randomised Complete Block Design (RCBD) with three replications. A treatment plot consisted of 10–metre-long six cane rows. The sugarcane variety SLI 121 which is soft and has higher susceptibility to termite attack was planted on 29th September 2010 with the densities of five setts each with three live buds per one meter length at1.37m inter-row spacing. One intercrop crop row in-between two adjoining cane rows was planted on the following day and the recommended management practices for raising inter-crops were followed (Witharama, 2007). In the ratoon crop, the trash was removed from each plot and the original randomisation and the same intercrops were sown in the same treatment plots as in plant crop on the following day after ratooning.

Data collection

Germination of buds

The emerged shoots were counted in each plot at 35 days after planting (DAPs) and the percentage of buds germinated was calculated based on the number of live buds (900) present on the planted setts in each plot.

Damage of termites to buds of seed setts

Each treatment plot was observed regularly to identify vacant spaces without germinated settlings along the cane rows and five such vacant spaces exceeding more than one metre along the cane rows in each plot were randomly selected. The selected vacant places were excavated and the seed setts were exposed to count the number of termite-infested buds at 35DAPs. The percentages of buds damaged were calculated based on the total number of buds on the observed seed setts.

Damage of termites to young sugarcane plants

The total number of plants and the number of termite-infested plants in each plot were counted fortnightly from 20 to 95 day after planting/ratooning. The percentages of young plants damaged were calculated.

Cane yield

The number of millable stalks and the weight (kg) of the harvested cane at 12 months age in each plot were recorded at the time of harvesting in both plant and ratoon I crop to compare each treatment.

Analysis

Percentage values of bud germination, bud damage and young plant damage due to termites were transformed to square root valuesto carry out ANOVA using SAS (for windows 9.0) software to analyse the effects of the treatments and means were separated using LSD at 5% level of probability.

Results and Discussion

The effect of intercrops on germination and on termite damage to buds inthe planted seed setts

The germination percentage in each plot of the plant crop, ranged from 41% to 48 %, and there was no significant difference among treatments (Table 1). The termite damage to buds on the planted seed setts was not considerable, and the observed differences among different treatment plots were not significant at 5% probability.

Table 1. Percentage germination (Means±SE) of the plant crop intercropped with cowpea, ground nut, gingili and sweet melon and in mono-cropped sugarcaneat 35 DAPs at UdaWalawe, Sri Lanka

Treatment	Germination (%) (Mean±SE)
Cowpea	41.0 (± 2.1)
Ground nut	47.9 (±2.5)
Gingili	45.9 (±4.8)
Sweet melon	45.1 (±2.7)
Sugarcane monocrop	45.5 (±4.3)

Note: Means are not significantly different at 5% probability level.

In contrast, a field experiment conducted with garlic, linseed, sarson and methi as intercrops to evaluate the effect of intercropping on termites in India showed that the percent bud damage was significantly low and the germination was significantly high at 80 days after sowing garlic in sugarcane (Ahmed *et al*; 2008). According to Misra (2003), the alleochemicals released from the roots and other parts of the plants may be acting as toxicants against insects and fungi. The magnitude of the toxic effects largely depends on the type of chemical released to the soil layer. Therefore, laboratory studies are needed to identify whether cowpea, ground nut, gingili, and sweet melon have ability to release alleochemicals which affect termites in sugarcane.

The effect of intercrops on termite damage in young sugarcane plants

In plant crop, termite damage intensities in young plants in all inter-cropped and mono-cropped plots were recorded low values and ranged from 0.4% to 5%. However, comparatively high damage intensities were recorded in all gingili inter-cropped plots than the plots intercropped with other crops. Significantly high damage intensities (P=0.05) were recorded at 20, 35 and 80 DAP in gingili inter-cropped plots (Table 2).

In ratoon crop, termite damage intensities in young plants in all treatments were also low and ranged from 0.05% to 2.5%. The termite damage to sugarcane was 100% more

in sweet melon inter-cropped plots and 200% less in groundnut inter-cropped plots than monocrop sugarcane at 20 DARs and 80 DARs respectively (Table 2).

Table 2. Percentage damage intensities (mean) of termites in young sugarcane plants in plant and ratoon I crop intercropped with cowpea, ground nut, gingili and sweet melon and in mono-cropped sugarcane from 20 to 95 DAP/DAR at Uda Walawe, Sri Lanka

	Plant crop Days After Planting (DAP)					
	20	35	50	65	80	95
Cowpea	1.8ab	0.8b	1.6ab	1.1a	1.2b	2.2a
Ground Nut	0.8b	0.5b	1.5ab	0.4a	0.8b	1.4a
Gingili	2.6a	5.2a	2.2a	1.3a	2.9a	3.2a
Sweet Melon	1.2b	0.6b	0.9b	0.4a	0.6b	5.3a
Sugarcanemonocrop	1.1b	1.1b	1.0ab	1.1a	0.9b	1.4a
	Ratoon I crop Days After Ratooning (DAR)					
	20	35	50	65	80	95
Cowpea	0.4a	0.2a	0.1a	0.3a	0.2ab	0.2ab
Ground Nut	0.8ab	0.1a	0.4a	0.3a	0.1 b	0.1b
Gingili	1.7a	0.1a	0.5a	0.5a	0.5 a	0.2ab
Sweet Melon	2.4a	0.3a	0.4a	0.4a	0.1 b	0.7a
Sugarcane monocrop	1.2a	1.0a	0.2a	1.3a	0.3ab	0.6ab

Note: Means with the same letter in each recording day within each crop category are not significantly different at 5% probability level.

Indigenous crops are more resistant to termites than exotic crops. For example,in Africa, sorghum and millets are more resistant to termites than maize (Ahmed *et al.*, 2004). Ground nut produced a higher yield without any pest or disease incidence than other intercrops. Evaluation of groundnut as an intercrop with sugarcane at large scale is required to confirm its reaction to termites.

Effect of intercropping on cane yield

The results showed that the cane yields in the intercropped plant crop and ratoon I crop were not significantly different from that of the sugarcane monocrop. Even though high damage intensities were recorded in gingili-intercropped plots during the tillering stages, it has not affected the final cane yield. Even if tillers are damaged due to termites in early stages, it will not affect the final yield as sugarcane produces more tillers during the tillering stages.

CONCLUSION

Intercropping sugarcane fields with cowpea, ground nut, gingili and sweet melon has not have a significant effect on germination or damage intensity of termites during early growth stages of sugarcane in Sri Lanka. However, since ground nut-intercropped fields showed comparatively low incidence of termites in sugarcane, further studies are required for its verification.

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