ISSN 1729–6668

EAST AFRICAN JOURNAL OF LIFE SCIENCES

Volume 5 — Part 2 November 2004

Contents

Sacred groves (*Kibaga*) of Mfangano Island, Lake Victoria, Kenya.
C.K.P.O. Ogol, P.O. Ogola & B. Khayota. 49

Estimation of maize fodder/grain yield before flowering in the Kenya highlands.
E.M. Njoka, G.R. Muraguri & C.M. Ndirangu. 59

Effects of soil erosion and land use on soil quality in the semi-arid Negev Desert of Israel.
T.E. Akuja, E. Zaady, D. Ward and Y. Gutterman. 67

Farm management practices and their effects on yield, disease incidence and pest density of banana and groundnut in western Kenya: planting density, intercropping and banana weevil *Cosmopolites sordidus* Germar (Gleoptera: Curculionidae) trapping.
L. Ngode, E.W. Kairu, J.M. Mueke & K.V. Seshu Reddy. 75

Growth Performance and Serum Metabolites of young pigs fed maize offal as Energy source.
A.O.K. Adesehinwa. 87

An International Journal of Pure and Applied Science

East African Journal of Life Sciences 5(2): 75–85 (2004)

Farm management practices and their effects on yield, disease incidence and pest density of banana and groundnut in western Kenya: planting density, intercropping and banana weevil *Cosmopolites sordidus* Germar (Gleoptera: Curculionidae) trapping

L. Ngode[1], E.W. Kairu[2], J.M. Mueke[2]* and K.V. Seshu Reddy[1]
[1]International Centre of Insect Physiology and Ecology (ICIPE), P.O. Box 30772, Nairobi, Kenya.
[2]Department of Zoology, Kenyatta University, P.O. Box 43844 Nairobi 00100, Kenya.
*Corresponding author.

Studies on the effects of pseudostem trapping, plant density and intercropping on the banana weevil *Cosmopolites sordidus* Germar. populations and crop yields were conducted in western Kenya from 1994 to 1997. The objective of the investigation was to explore the efficacy of non-pesticidal options for the management of banana weevil. Field experiments were conducted using clean planting material, pseudostem traps for weevil management and intercropping banana with groundnuts, *Arachis hypogaea* L. in two different banana densities. Results indicate that at low weevil population density, pseudostem traps significantly reduced the number of adult weevils. It suppressed weevil population increase and reduced the level of damage caused to the crop. Though intercropping banana with groundnuts did not prevent weevils from colonizing the banana, it influenced their distribution during the early growth stages of the banana. Banana crops planted at 3×3 m and 5×5 m spacing did not affect the growth of groundnuts during the first year. However, beyond this period, the banana canopy significantly reduced the growth of the groundnuts, which were intercropped within the 3×5 m banana spacing. Nevertheless, spacing significantly influenced the banana yield per unit area. Thus under the 3×3 m banana spacing, yields were more comparable with the 5×5 m banana spacing. Competition for growth factors was first experienced in the banana at 3×3 m under the groundnut intercrop after three growing seasons. The number of flower thrips, aphids, and groundnut rosette virus were relatively reduced in the banana intercrop compared to those in the groundnut monocrop.

Key words: banana weevil; trapping; pseudostem; intercropping; banana; groundnut; yield.

INTRODUCTION

East Africa produces about 15.5% of the total world bananas (FAO, 1993) and over 20 million people in the region subsist on banana as their principal dietary carbohydrate. Consumption ranges between 220 and 460 kg per person per year (INIBAP, 1986). Banana is also used for thatching, brewing, handcrafts and as fodder for cattle (Acland, 1971). The potential yield of banana in east Africa is over 35 tons per hectare compared to 3–4 tons/ha realized (Mbwana, 1992). This low yield is due to a combination of yield loss factors including weevils, nematodes, diseases, and poor agronomic practices.

The banana weevil *Cosmopolites sordidus* Germar causes great losses in yield, especially in poorly managed farms (Sikora *et al.*, 1989). Plants produce small bunches and are liable to snapping or dead-heart due to larval feeding. The perennial nature of banana means that the losses increase with ratoon crops (Mitchel, 1980) and the banana weevil's four distinct developmental stages (egg, larva, pupa and adult) are found associated with the crop throughout the year. Most farming practices in East Africa are also characterized by traditional methods of production with haphazard spacing both in pure and intercropped stands. Mulching and weeding are inadequate with unpruned stools giving rise to competition. Use of manure, fertilization and pesticides are minimal resulting in low yields (Acland, 1971).

Chemicals for control have been used in pseudostem traps, planting holes, and dipping suckers before planting (Yaringao & Meer, 1975). However, despite widespread use in areas where *C. sordidus* is a problem, their use has not always been proven to be effective because yield may not improve (Mitchel, 1980). Furthermore, the continued use of cyclodiene insecticides on banana fields may lead to deterioration of crop hygiene and subsequent development of resistance in weevils and resurgence of the banana borer (Edge, 1974; Mitchel, 1978). Growers are advised to be more discriminating when using insecticide and treat only areas where baits indict adult borers present at levels that would cause damage. Sery (1988) stressed the need for control strategies that substitute extensive pesticide use with prophylaxis, cultural control methods, genetic selection and improvement of existing cultivars.

Deep planting (60 cm or more) discourages egg-laying by weevils, and prevents high matting and premature snapping (Seshu Reddy *et al.*, 1995). Mulching banana fields with household refuse (e.g. banana trash, grass, stable manure and coffee husks) maintains soil fertility. Intercropping offers an opportunity for more effective utilization space and control of weeds, pest reduction, labour distribution and yield (Omolo & Ollimo, 1986). In western Kenya, where more than 80% of the banana is grown in association with other food and cash crops, pest control needs to be understood within the complexity of these cropping systems.

Using pseudostem traps, Yaringao and Meer (1975) observed 50% reduction in weevil numbers within four months. Mitchel (1980) estimated that 5 to 15% of weevils are attracted to the traps. There are no published data that demonstrates a relationship of adult borers to yield (Gowen, 1995). This has been controversial and calls for further study to understand its contribution to weevil management. In this study, the effectiveness of split-pseudostem trapping and groundnut intercropping on banana weevil were investigated.

MATERIALS AND METHODS

A field experiment was conducted at Oyugis in Rachuonyo District, western Kenya (latitude 34°15'E and longitude 0°?'S, 160 m above sea level) to investigate effects of spacing, weevil trapping and groundnut intercropping on banana weevil populations. The area receives 1600 mm to 1800 mm of rainfall annually, distributed between two seasons, long rains from March to July, and short rains from September to December. Mean annual temperatures are 20.5–21.7°C. Soils are well drained, deep to very deep reddish brown friable clay with humic topsoil (nitosols). The experiment was conducted in a field that had been under bush fallow for ten years and isolated from other banana farms.

Experimental treatments were assigned for factorial combinations of two-plant spacing (3×3 m, 5×5 m) with or without intercropping and with or without trapping. The control was groundnut monocrop at 45 cm × 15 cm spacing. Each treatment and control was replicated 3 times to give a total of 27 experimental units (20×20 m) arranged in a completely randomized block design. Ploughing and harrowing of the field were performed using a tractor. Holes were dug in the marked plot at a spacing of 3×3 m (9 mats in the same area) or 5×5 m (4 plants in the same area) depending on the treatment combinations. Planting holes (60 cm deep × 60 cm diameter) were prepared and topsoil was mixed with 200 gm of di-ammonium phosphate fertilizer and 10 kg of organic manure.

Healthy banana suckers (one metre tall) were selected from relatively clean farmers' fields. Suckers with damage symptoms were discarded. The selected healthy, pared and hot water treated suckers were planted in the prepared holes. Bananas were planted first then groundnut was intercropped between banana rows at an inter-row and intra-row spacing of 45 and 15 cm respectively. Two crops of groundnut were planted within each year, during the long and short rain seasons. Regular weeding was done on all the plots. Detrashing, desuckering, propping and debelling were undertaken according to local practices. Pseudostems of harvested bananas were used for traps but excess ones were cut to small pieces to be used as mulch. Groundnut crop debris was spread as mulch within plots.

Weevil trapping and population monitoring

In plots where trapping was done, weevils were collected weekly from the traps and destroyed. The traps were changed fortnightly. In non-trapping plots, weevils were collected using pseudostem traps at regular intervals. The weevils were counted then released back to the same plots.

The following parameters were monitored

a. Banana weevil

In addition to the weekly monitoring of weevil populations, the damage caused by the weevils was determined at crop harvest and expressed as percent coefficient of infestation (PCI)

b. Banana crop

Bunch weight was determined. Light changes with time in the canopy were measured using a quantum photometer.

c. Groundnut pests and diseases

Groundnut flower thrips, *Megalurothrips sjostedti* Trybom, were collected from ten flowers selected randomly. Sampled flowers were placed in alcohol and thrips counts were made in the laboratory. Infestation of groundnut plants by the groundnut aphid *Aphis craccivora* Koch. was rated on a scale of 1–5 with 1 representing clean and 5 representing a totally infested plant. The groundnut rosette disease was expressed as percentage based on the affected plants in a 5×5 metre-quadrat. Groundnut yield was assessed on 5×5 experimental yield plot and yields converted to kg/ha.

The information generated was analyzed using SAS package for ANOVA and means were separated by Turkey's Student zed Range (HSD) Test

RESULTS

Results shown in Table 1 indicate that there were significant differences in weevil numbers for different treatments during the long rainy season of 1994. Plots where trapping was done had fewer weevils compared to the ones where trapping was not done. Intercropping banana with groundnuts significantly reduced the weevil populations during the long rainy season of 1994 in the 3×3 m and 5×5 m spacings. In later seasons however, no significant reductions were observed. There was a gradual weevil population increase with time in all the plots but the numbers were greater in plots where trapping was not undertaken.

Table 1. Population density of the banana weevils under different treatments.

Treatment	LR 1994	SR 1994	LR 1995	SR 1996
3×3 m G'nut No trap	39.3 ±14.ab	46.0±13.1a	60.0±7.5a	88.7±13.1a
3×3 m G'nut trap	18.7±0.9b	29.3±5.1a	54.3±13.3a	47.6±18.5a
3×3 m Mono No trap	78.0±19.1a	62.0±14.0a	75.0±16.0a	102.7±7.5a
3×3 m Mono Trap	17.0±7.5b	25.0±4.5a	38.3±9.5a	66.0±3.5a
5×5 G'nut No trap	50.0±16.7ab	29.3±13.8a	76.7±23.3a	85.3±23.5a
5×5 G'nut Trap	19.3±5.6b	21.7±3.8a	26.6±8.1a	50.7±10.7a
5×5 Mono No trap	34.7±2.6ab	50.7±17.9a	77.3±5.8a	82.7±8.6a
5×5 Mono Trap	24.3±13.9b	23.7±7.1a	42.0±7.0a	66.3±10.5a
CV	50.2	54.5	40.4	41.3

LR — long rain season
SR — short rain season
Means in the same column with the same letters are significantly different as determined by Turkey's Studentized Range (HSD) Test at p=0.05

Trapping did not influence the damage caused by the weevil. PCI ranged from 2.2 to 2.6 and 0 to 6.0 in the first and second ratoon crops, respectively. An increase in PCI was recorded in the second ratoon (Table 2).

Table 2. Percent coefficient of infestation (PCI) on plant and ratoon crops.

Treatment	plant crop	first ratoon	second ratoon
3×3 m G'nut No trap	0.0	2.5±0.1a	3.3±3.0a
3×3 m G'nut trap	0.0	2.6±0.2a	2.6±2.0a
3×3 m Mono No trap	0.0	2.4±0.1a	6.6±3.0a
3×3 m Mono Trap	0.0	2.3±0.2a	1.7±1.6a
5×5 G'nut No trap	0.0	2.3±0.1a	4.3±2.3a
5×5 G'nut Trap	0.0	2.2±0.1a	0.0±0.0a
5×5 Mono No trap	0.0	2.7±0.1a	6.0±3.0a
5×5 Mono Trap	0.0	2.4±0.2a	0.0±0.0a
CV	9.9	142.9	67.6

Means with the same letter are not significantly different as determined by Turkey's Studentized Range (HSD) Test at p=0.05

There were no significant differences in bunch weight in the plant and first ratoon crops (Table 3). The bunch weights ranged from 12.6 kg to 18.8 kg. However, significant differences were recorded in the yield of the second ratoon. Bunch weight for the monocropped plots was significantly more than for intercropped plots in both 3×3 and 5×5 m spacing. Banana yield (tons/ha) was significantly different in the 5×5 m spacing compared to 3×3 m spacing (Table 4). The 3×3 m spacing more than doubled the banana yield compared to 5×5 m spacing.

Table 3. The effect of banana spacing, groundnut intercropping and trapping on the banana yield (Kg/plant)

Treatment	plant crop	first ratoon	second ratoon
3×3 m G'nut No trap	12.6±0.7a	15.6±1.9a	12.2±0.8b
3×3 m G'nut trap	13.1±1.5a	15.1±1.1a	12.5±1.5b
3×3 m Mono No trap	12.6±0.7a	16.5±0.6a	13.8±0.4ab
3×3 m Mono Trap	12.8±0.3a	16.7±1.5a	14.1±0.8ab
5×5 G'nut No trap	13.5±1.3a	17.4±0.1a	15.0±0.5ab
5×5 G'nut Trap	13.0±0.1a	18.8±0.9a	14.1±0.1ab
5×5 Mono No trap	12.8±1.8a	17.7±1.4a	17.5±1.4a
5×5 Mono Trap	13.9±0.8a	16.0±1.0a	16.7±1.9a
CV	12.4	20.1	13.4

Means in the same column with the same letter are not significantly different as determined by Turkey's Studentized Range (HSD) Test at p-0.05

Table 4. The effect of treatment on banana yield (tons/ha).

Treatment	plant crop	first ratoon	second ratoon
3×3 m G'nut No trap	13.7±0.8a	16.9±2.0a	14.7±0.9a
3×3 m G'nut trap	14.3±1.3a	16.5±1.2a	13.7±1.9a
3×3 m Mono No trap	13.7±0.7a	18.0±0.7a	15.1±0.5a
3×3 m Mono Trap	13.9±0.3a	21.2±4.1a	15.4±0.8a
5×5 G'nut No trap	5.4±0.5b	7.0±0.1b	6.0±0.2b
5×5 G'nut Trap	5.2±0.1b	7.5±0.3b	5.6±0.1b
5×5 Mono No trap	5.1±0.7b	7.1±0.5b	7.0±0.5b
5×5 Mono Trap	5.6±0.3b	6.4±0.4b	6.7±0.7b
CV	10.9	20.6	13.0

Means in the same column with the same letter are not significantly different as determined by Turkey's Studentized Range (HSD) Test at p-0.05

The number of groundnut thrips was not affected by the banana crop spacing during the first long and short rainy seasons. However, during the second long and short rainy seasons, the 5×5 m spacing had significantly more thrips. There were no significant differences in thrips abundance between the 5×5 m spacing and the groundnut monocrop treatment (Table 5).

Table 5. Effect of banana spacing on mean number of flower thrips.

Treatment	LR1	SR1	LR2	SR2
3×3 m G'nut No trap	29.3±7.1a	5.7±4.1a	3.0±1.0a	15.6±4.3
3×3 m G'nut trap	31.3±6.7a	6.7±1.2a	7.3±3.4a	9.6±3.4a
5×5 G'nut No trap	41.5±5.6a	4.0±1.7a	66.3±24.2b	71.3±11.7b
5×5 G'nut Trap	27.7±11.2a	8.0±4.7a	61.1±8.3b	57.6±20.4b
G'nut monocrop	34.0±4.1a	5.6±3.1a	62.0±14.0b	68.0±6.8b
CV	41.0	85.0	54.7	46.7

LR — long rain season
SR — short rain season
Means in the same column with the same letter are not significantly different as determined by Turkey's Studentized Range (HSD) Test at p-0.05

Incidence of groundnut rosette disease varied significantly among treatments. Greater incidence occurred in the groundnut monocrop followed successively by the groundnut intercropped with banana at 5×5 m, and groundnut intercropped within the banana at 3×3 m spacing (Table 6). Except in the groundnut monocrop, incidence of the disease was higher in the first long and short rainy seasons than during the second rainy seasons.

Table 6. The effect of spacing on the incidence of groundnut rosette virus (%).

Treatment	LR1	SR1	LR2	SR2
3×3 m G'nut No trap	7.4±1.6c	7.6±3.7a	1.7±0.7a	0.6±0.1a
3×3 m G'nut trap	9.4±1,7ab	3.8±1.1a	1.1±0.4a	0.4±0.2a
5×5 G'nut No trap	9.7±2.2ab	9.2±2.0a	5.6±0.8b	5.4±0.8a
5×5 G'nut Trap	4.6±1.2c	7.5±2.0a	3.8±0.4b	3.9±0,1a
G'nut monocrop	11.9±1.9a	8.3±2.0a	7.3±0.9c	16.3±4.2b
CV	16.1	61.1	28.1	59.1

LR — long rain season
SR — short rain season
Means in the same column with the same letter are not significantly different as determined by Turkey's Studentized Range (HSD) Test at p-0.05

The banana density did not affect incidence of groundnut aphids in the first and second seasons of year one. In the third season (long rains of the second year), there were significant differences with the groundnut monocrop having the greatest number of aphids compared to the banana intercrop. The incidence of aphids was greater during the short rains than during the long rains (Figure 1).

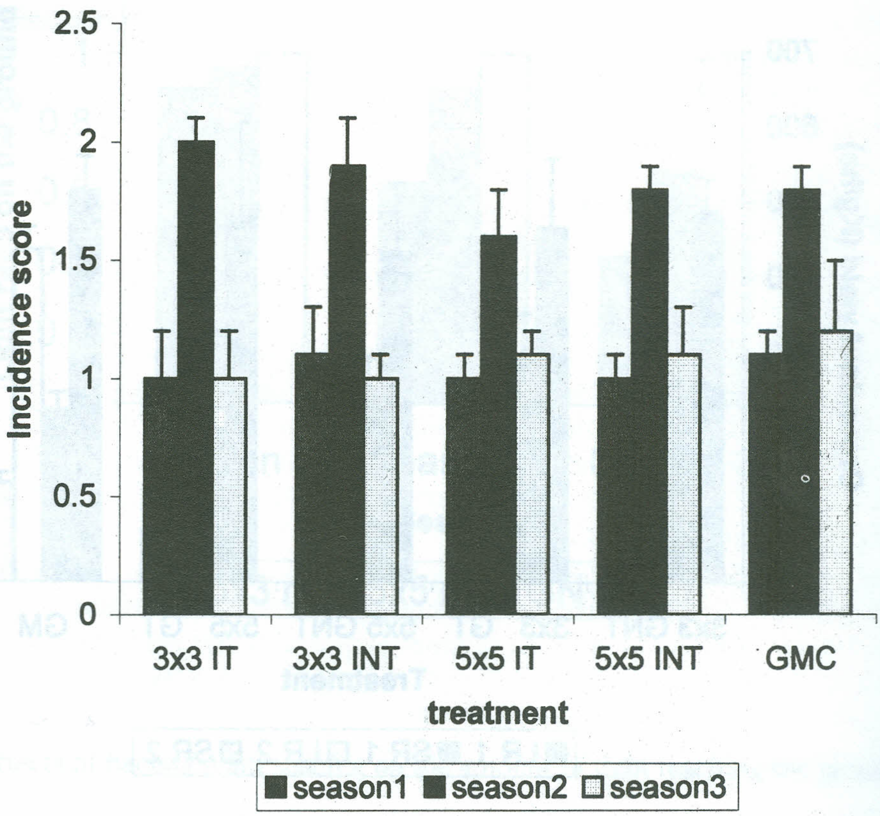

Figure 1. Effect of banana intercrop on incidence score of groundnut aphids.

IT — Intercrop trapping
INT — Intercrop no trapping
GMC — Groundnut monocrop
Season 1 & 3 long rains
Season 2 short rains

Groundnut yield was not affected by the banana intercrop during the first two seasons (long and short rains). However, yields were reduced significantly during the third and fourth seasons. Yields in the 3×3 m spacing treatment were lowest followed by 5×5 m, and the monocropped groundnut yielded highest. The yield was influenced by the season, thus doubled during the long compared to the short rainy seasons (Figure 2).

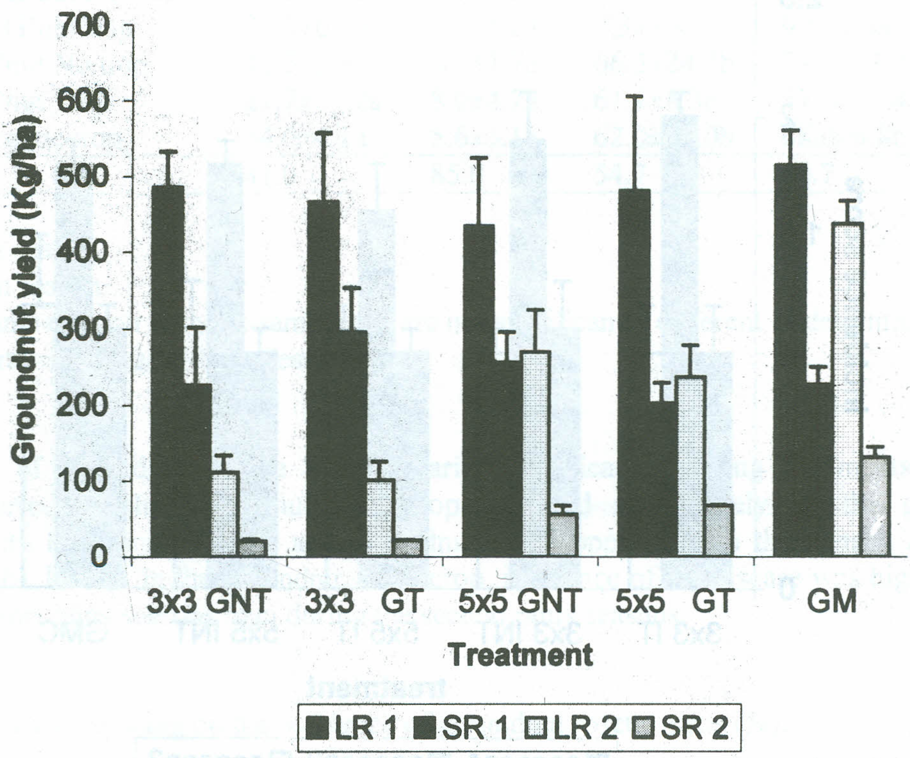

Figure 2. Effects of trapping and intercropping on groundnut yield.

SR — short rains
LR — long rains
3×3, 5×5 banana spacing (m)
GNT — banana intercropped with groundnut and no trapping
GT — banana intercropped with groundnut and trapping done
Groundnut monocrop

There was a progressive decrease in light reaching the groundnut crop in the two banana spacing treatments. During the first season, ratios were similar in the different plant densities. By the third season under the 3×3 m banana spacing, the ratio had dropped to 0.42 while it was 0.67 in the 5×5 m banana spacing (Figure 3).

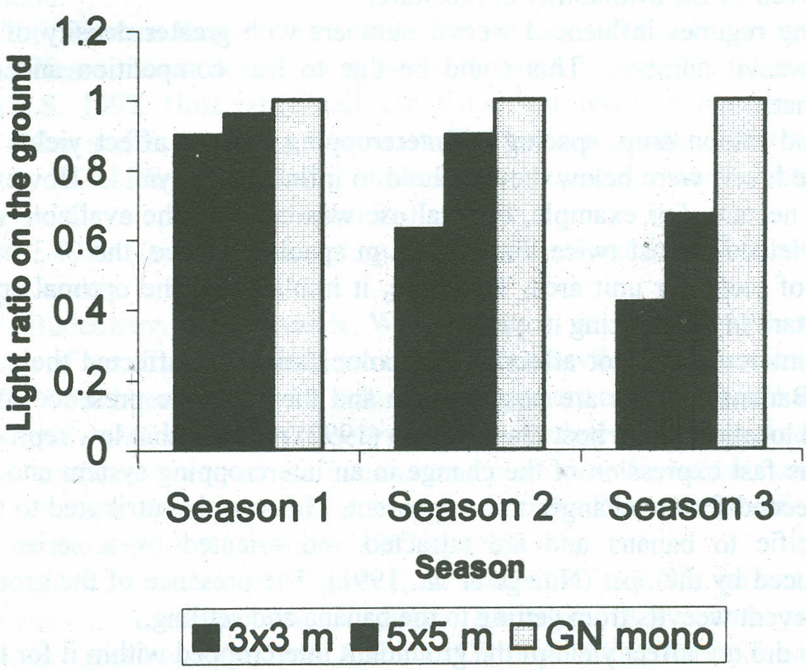

Figure 3. Effects of banana plant spacing on the amount of light reaching the groundnuts crop.

DISCUSSION

Increase in weevil numbers in plots with traps was lower compared to the plots without traps. Thus, the few weevils arriving on the field from the surrounding areas will tend to increase in numbers where they are not removed. Contribution of traps to the reduction of the weevil population was particularly pronounced during the early growth stages of the banana crop. Pseudostem traps were able to eliminate the weevils while their numbers were few and therefore prevent population explosions. Thus, the observed differences in population densities were due to the traps removing weevils that were colonizing the field. As colonization and reproduction continued, the traps were unable to remove all the weevils and their populations increased over time even in areas where trapping was performed continually. This can be attributed to low trap efficiency (about 30%) and so the un-trapped weevils are still able to reproduce. Damage to the banana crop did not differ between plots where weevils were trapped and those in which trapping was not done up to the second ratoon crop. This suggests that the planting material was clean and weevil population increase were slow. The results are similar to those obtained by Yaringao and Meer (1978) who reported a 50% weevil reduction by trapping over a four month period. Thus trapping could be a valuable management of weevils when their densities are still low. However, this practice depends on the availability of pseudostems and labour, which limits its use as a component of IPM. Since traps are more effective at low weevil population density, trapping should be initiated early in the growing period and intensive trapping during the wet season when trap catches are improved by the availability of moisture.

Different planting regimes influenced weevil numbers with greater density of the banana stools having more weevil numbers. This could be due to less competition and ease of the weevils locating the mats.

Up to the second ratoon crop, spacing or intercropping did not affect yields per banana plant. Perhaps damage levels were below the threshold to influence the yields. However, spacing influenced yields per hectare. For example, optimal use was made of the available space in the 3×3 m spacing and yielded almost twice that of 5×5 m spacing. Hence, the 3×3 m spacing is economical in terms of yield per unit area. Therefore, it implies that the optimal spacing for a given variety is important in maximizing its yield.

The groundnut intercrop did not affect weevil colonization but affected their distribution early in the season. Banana weevils are host-specific and therefore the presence of groundnut may not have affected location of the host plant. Uronu (1992) reported that low reproductive rate of the weevil mask the fast expression of the change in an intercropping system and so a longer time period may be needed for the changes to be apparent. This may be attributed to the fact that the weevils are specific to banana and are attracted and oriented by a series of volatile semiochemicals produced by the host (Ndiege *et al.*, 1991). The presence of the groundnut crop could not therefore prevent weevils from getting to the banana and settling.

The banana crop did not affect yield of the groundnut intercropped within it for the first two consecutive seasons in both 3×3 m and 5×5 m banana spacing. There was still less shading as the banana canopy was incompletely formed and this allowed enough light to reach the groundnut. Intercropping banana with groundnut is therefore feasible during the first two seasons in the 3×3 m spacing. However, beyond this time period the banana drastically reduces the yield of the groundnut.

Intercropping groundnut with banana resulted in lower incidence of both aphids and flower thrips (groundnut pests). The banana canopy created a microclimate possibly not favourable to the pests, hence the low incidence. This however, may not be an advantage since groundnuts yields were reduced by the canopy. Thus a combination of compatible crops in time and space is necessary.

AKNOWLEDGEMENTS

We are grateful to the federal Ministry of Economic Cooperation (BMZ), Federal Republic of Germany for the provision of research funds.

REFERENCES

Acland, J.D. 1971. *East African Crops*. Longman, .

Edge, V.E. 1974. Cyclodiene-BHC resistance in *Cosmopolites sordidus* Ger. (Coleoptera: Curculionidae) in New South Wales, Australia. *Bulletin of Entomological Research* 641:1–7.

FAO. 1993. *Food and Agricultural Organization yearbook*. FAO,

Gowen, S.R. 1995. Pests. In S. Gowen (ed.), *Bananas and Plantains*: 382–402. Chapman and Hall, London.

INIBAP, (1996). Banana Research in East Africa. In: C.S. Gold & B. Gemmil (ed.), Proposal for a Regional Research and development Network INBAP: 384–387. IITA, Cotonou, Benin.

Mbwana, A.S.S. 1992. Host range and survival of the lesion nematode *Pratylenchus goodeyi* Sher and Allen and its control in banana. Ph.D. Thesis, Kenyatta University, Kenya.

Mitchell, G.A. 1978. *The estimation of banana borer population and resistance levels*. WINBAN Research and Development Technical Bulletin 2.

Mitchell, G.A. 1980. *Banana Entomology In The Windward Islands*. Centre For Overseas Pest Research, London.

Ndiege, I.O., Budenberg, W.J., Lwande, W. & Hasanali, A. 1991. Volatile components of banana pseudostem of a cultivar susceptible to the banana weevil. *Phytochemistry* 30: 3929–3930.

Omollo, E.O. 1986. Intercropping for cultural management of pests. *ICIPE annual report 1986*.

Sery, G.D. 1988. *Orientation of research for formulating new methods for the control of nematodes and borer weevils on banana and plantains. Nematodes and the borer weevil in bananas. Present status of research and outlook*. Proceedings of a workshop held in Bujumbura, Burundi, 7–9 December 1987 by INIBAP.

Seshu Reddy, K.V., Prasad J.S., Ngode L. & Sikora R.A. 1995. Influence of trapping on the banana weevil, *Cosmopolites sordidus* (Germar 1824) and root-lesion nematode, *Plratylenchus goodeyi* (Sher and Allen 1953) population densities and subsequent banana yield. *Acta Ecologica* 16: 593–598.

Sikora, R.A., Bakofuzara, N.D., Mbwana, A.S.S., Oloo, G.W., Uronu, B. & Seshu Reddy, K.V. 1989. Interrelationships between banana weevils, root lesion nematodes and agronomic practices and their importance for banana decline in the united republic of Tanzania. *FAO Plant Protection Bulletin* 37: 151–157.

Uronu, B.E.M.A. 1992. The effect of plant resistance and cultural practices on population densities of banana weevil (*Cosmopolites sordidus* Germar) and on banana yield. Ph.D. Thesis, Kenyatta University, Kenya.

Yaringao, C.V.M. & Van der Meer, F. 1975. Control of the banana weevil, *Cosmopolites sordidus* by means of varius traos and granulated pestcides. *Revista Peruana de Entomologia Agricola* 18: 112–116.

EAST AFRICAN JOURNAL OF LIFE SCIENCES
An International Journal of Pure and Applied Science

East African Journal of Life Sciences is published by the School of Pure and Applied Sciences, of Kenyatta University. The journal is produced by an editorial committee, with the advice of an international panel of referees. Each volume consists of two issues, to be published when sufficient processed material is at hand, without a pre-determined publication date. For guidelines on the submission of manuscripts, see inside back cover. Volumes 1–4 were entitled *East African Journal of Science*, and included papers in physical sciences and mathematics. With the start of volume 5 the former journal has been divided into two independent and somewhat more specialised journals.

Address for correspondence: The Chief Editor, Department of Biological Sciences, Kenyatta University, P.O. Box 43844, Nairobi 00100, Kenya. *E-mail*: ellyen@yahoo.com