UTILIZATION OF SYNTHETIC AND BOTANICAL INSECTICIDES TO MANAGE THRIPS (THYSAN.: THRIP.) ON SNAP BEANS (FABACEAE) IN KENYA

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ABSTRACT

Nderitu J, Mwangi F, Nyamasyo G, Kasina M (2010) Utilization of synthetic and botanical insecticides to manage thrips (thysan.: thrip.) on snap beans (fabaceae) in Kenya. *Int. J. Sustain. Crop Prod.* 5(1), 1-4.

This field experiment was performed in Mwea–Tebere, Central Kenya, to evaluate and compare effectiveness of synthetic insecticides (Thiacloprid and chloropyrifos) and botanical insecticides (azadirachtin 0.15% A.I. and azadirachtin 0.06% A.I.) to suppress populations of *Frankliniella occidentalis* Pergande and *Megalurothrips sjostedti* Trybom on snap beans (*Phaseolus vulgaris* L). The treatments were laid in complete randomized block design with four replicates for two relay plantings in 2006. Sampling was done by collecting flowers and pods from ten randomly selected plants per plot for thrips identification and counting. The results indicate that there was significant difference ($P<0.05$) among the four treatments. The lowest number of adult thrips and their larvae was recorded in plots treated with azadirachtin 0.15% A.I. and chloropyrifos. Snap beans treated with thiacloprid and azadirachtin 0.06 % A.I. had higher number of adult thrips in both plantings. Thiacloprid was only effective in control of *M. sjostedti* compared with the botanical pesticides. *Orius* spp, a natural enemy of thrips, was more abundant on neem based products compared with the synthetic pesticides. In terms of yields, snap bean plots treated with chloropyrifos produced more marketable pods compared with plots treated with botanical pesticides in both plantings. It is argued that farmers can use chloropyrifos early in the season to reduce thrips population but at fruiting it is recommended they use Azadirachtin 0.15%. This will lower the cost of production incurred by farmers, allow increase of thrips natural enemies and reduce resistance development by the pest to the synthetic pesticides.

***Key words**: azadirachtin, chloropyrifos, Frankliniella occidentalis, Megalurothrips sjostedti, thiacloprid*

INTRODUCTION

Snap bean (*Phaseolus vulgaris* L.) is the second major export crop in Kenya and accounts for up to 55% by volume of all vegetable export crops (Anon 2006) mainly to Europe. The crop is produced by small holder growers in farm size ranging from 0.25 to 1 ha. Relay cropping is the most common practice, resulting to all-year production, targeted at maintaining the export-market demand. Production is hindered by insect pests and diseases (Michalik *et al*. 2006) and inadvertently the residue limits that are influenced by pesticide usage. Among arthropod pests, thrips *Frankliniella occidentalis* (Pergande) and *Megalurothrips sjostedti* (Trybom) are key pests. They feed on all development stages, young leaves, flower buds and young pods. Damage on leaves result to stagnant growth, on blossoms they cause abortion of premature flowers and in pods they cause coiling and malformation, making it unfit for market. Most farmers rely on foliar pesticides to control thrips (Nderitu *et al.* 2008). However, the cryptic habit of thrips makes the pesticides ineffective due to inability to reach them. This results to farmers using frequent sprays, which then contribute to resistance development by thrips. Insecticide resistance is a threat to thrips management and methods are being devised to manage such. One way is by integrating different methods for thrips management instead of applying same pesticide or pesticide group (Nabirye *et al*. 2003). Some plant extracts have been reported to reduce thrips population on legumes. Thoeming *et al*. (2006) found that when bean seeds were dressed before planting with neem extracts (Azadirachtin and 3–Trigloazdirachtol), the population of *F. occidentalis* was effectively reduced in flowers. Likewise, Oparaeke *et al*. (2006) reported cowpea protection from *M. sjostedti* when sprays of Nigerian spices (*Piper guineese*, *Afromomum melagueta*, *Xylopia aethiopica* and *Zinger officinarum*) were applied once weekly for 4 weeks. Asawalam (2006) also showed that a combination of crude extracts of *Azadirachtin indica* and *Ocimum grassimum* significantly reduced *M. sjostedti* on cowpeas. This study was conducted to evaluate the effectiveness of selected synthetic and botanical pesticides in managing snap bean flower thrips in Kenya with an aim of identifying pesticides that can be used in thrips resistance management.

MATERIALS AND METHODS

Experiments were laid out at Mwea-Tebere, Central Kenya in 2006 using Snap beans var. Samantha. Seeds were treated with Imidacloprid before sowing to protect the crop from early soil pests, which are common in the study area. Plots measured 3 x 4m and were separated by a 2m gap. Diammonium phosphate fertilizer was applied just before seed placement using recommended rates. The crop was top dressed at 2 and 4 weeks after germination with calcium ammonium nitrate. Treatments (azadirachtin 0.15% A.I., azadirachtin 0.06% A.I., chloropyrifos and thiacloprid) were arranged in a randomized complete block design and replicated 4 times. Each treatment was applied with a lever-operated knapsack sprayer using recommended rates: thiacloprid 20 ml/20 l water, chloropyrifos 20 ml /20 l water, azadirachtin 0.06% A.I. 40 ml/20 l water and azadirachtin 0.15% A.I. 20 ml/20 l

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water. The insecticides were applied after 50% crop flowering at 2 weeks interval. Sampling of thrips was done by picking a flower and pod from 10 randomly selected plants from the inner six rows of a plot. The flower samples were preserved in universal bottle containing 60% ethyl-alcohol while pods were puts in polythene bags for the assessment of thrips pod damage in the laboratory. Counting of thrips was done under a dissecting microscope and they were separated into *F. occidentalis* adults, *M. sjostedti* adults and larvae. Pod from each plots were physically assessed for thrips damage and percentage scale score was used 1=0-24% no or slight damage, 2=25-49% damage or moderate damage, 4=50-74% damage or high damage, 5=75-100% damage or severe damage. The pod damage score was arcsine transformed to fit requirements for using analysis of variance (ANOVA) test. Means were separated by standard error of means (SED) when the treatments effect showed significant F- test.

RESULTS

The results indicate that there was significant difference (P<0.05) in the number of observed pests due to the effects of pesticide treatments (Table 1). Snap bean plots treated with azadiarachtin 0.15 % had significantly (P<0.05) lower number of adult *F. occidentalis* in both plantings. However, the plots recorded higher number of adult *M. sjostedti*, which were lowest in thiacloprid-treated plots in both plantings. By comparison, the synthetic pesticides recorded significantly lower number of thrips larvae compared with the neem-based products.

Table 1. Mean number of adult *F. occidentalis* and *M. sjostedti* thrips, their Larvae and *Orius* spp in Snap bean crops in two planting period

Treatment	Planting 1				Panting 2			
	F. occidentalis	*M. sjostedti*	Larvae	*Orius* spp	*F. occidentalis*	*M. sjostedti*	Larvae	*Orius* spp
Azadirachtin 0.06%	102	12.2	58.2	2.25	92.5	16	81	0.75
Azadirachtin 0.15%	49.8	15.2	46.2	2.25	72.8	23.5	85.5	1.5
Thiacloprid	92.2	2.8	51.2	1.5	109.2	4.8	73.2	1.75
Chloropyrifos	72	2.8	34.2	1.25	83.5	7	52.8	0.75
LSD (5%)	25.36	6.67	13.64	2.41	21.28	7.8	20.33	1.85
F	7.92	8.92	5.22	0.44	5	11.6	4.83	0.74
P value	<0.05	<0.05	<0.05	>0.05	<0.05	<0.05	0.05	>0.05

Generally infestation of snap beans by thrips was not significantly different in the two plantings (Figure 1). In addition, the infestation trends were similarly for each species in the two plantings but the magnitude was significantly different between the species.

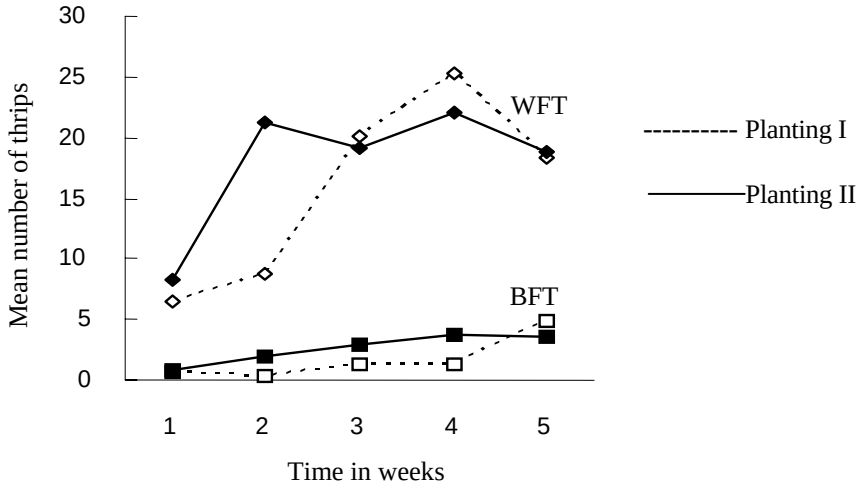

Figure 1. Mean number of adult *F. occidentalis* (WFT) and *M. sjostedti* (BFT) thrips during planting I and II of Snap beans crop treated with four pesticides

The snap bean pod damage during the first planting was significantly different in the first planting but there was no significant difference in pods damage during the second planting (Figure 2). However, there was no significant difference of pods sampled from azadirachtin 0.06% and chloropyrifos treated plots. Plots treated with neem based

pesticides recorded higher number of severely damaged pods compared with those treated with synthetic pesticides. In the second planting, pods from all treatment had no significant difference in terms of their damage by thrips (Figure 3). However, plots treated with neem based products had lower number of marketable pods compared with plots treated with the synthetic pesticides.

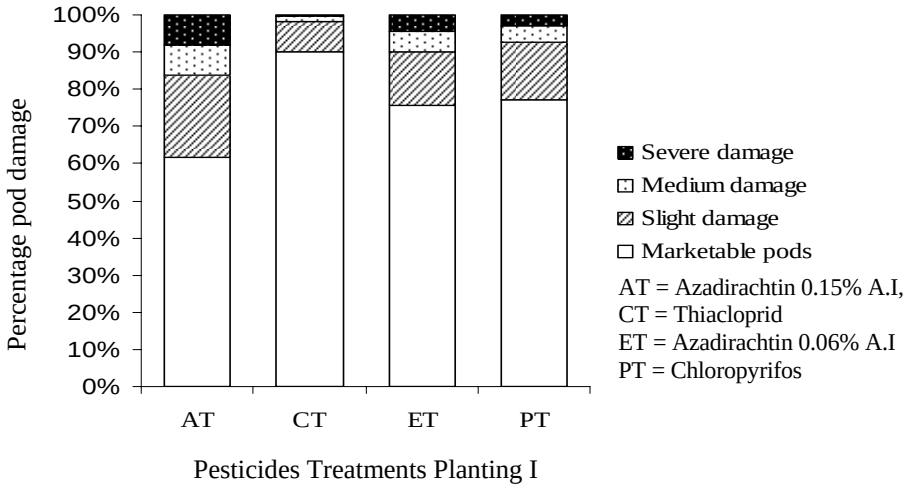

Figure 2: Mean percentages of Snap bean pods damage categories in different pesticides treatments on Snap bean crop in planting 1 in Mwea-Tebere

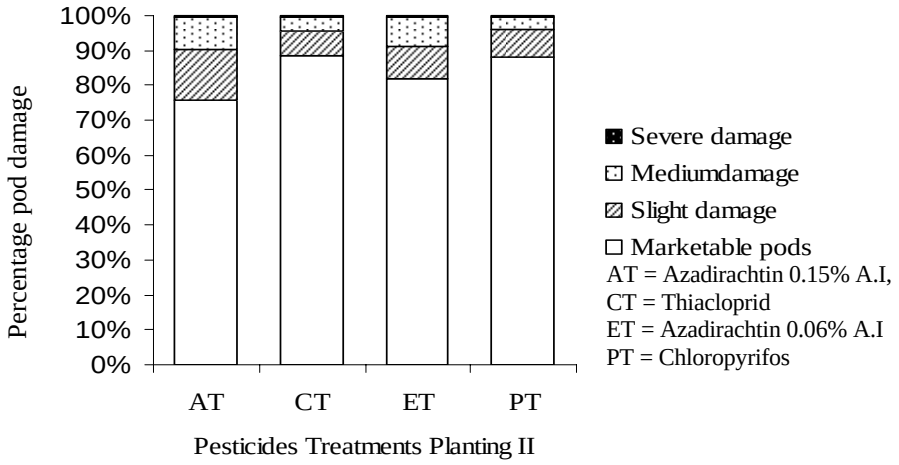

Figure 3: Mean percentages of Snap bean pods damage categories in different pesticides treatments on Snap bean crop in planting 2 in Mwea-Tebere

DISCUSSION

Findings from this study have shown that synthetic pesticides are better than botanical pesticides in thrips control. However, this does not hold for all pesticides. For instance, azadirachtin 0.15% was better in terms of reducing the number of thrips infesting Snap beans compared with thiacloprid, a synthetic pesticide. In addition, the findings show that *F. occidentalis* is much difficult to control compared with *M. sjostedti*. Azadirachtin 0.15% was effective against *F. occidentalis* compared with the effects of thiacloprid against the same pest. This is the most serious pest in Snap beans in Kenya currently. Since thiacloprid was effective against *M. sjostedti*, this pesticide and azadirachtin 0.15% can be used in combination to manage the thrips on Snap beans. Chloropyrfos would only be needed if the *F. occidentalis* population is above the threshold level, which is about 3 adult thrips per flower (Nderitu *et al.* 2008). Such combination of botanical and synthetic based pesticides in snap beans production is beneficial not only to the grower but also environment. Synthetic pesticides are known to be harmful to natural enemies and non target organisms as shown in this present study where *Orius* spp was more abundant in plots sprayed with neem based

pesticides compared with synthetic pesticides. Also synthetic pesticides are expensive and require careful application to avoid endangering the health of applicant as well as crop attendants. Considering that harvesting of Snap beans is usually a continuous activity and coincides with flowering of the crop, it implies that thrips are common when still the crop is being harvested. This requires selection of effective but ecologically friendly pesticides for use (Dhandapani *et al.* 2003). The issue of pesticide residue also impacts on the use of synthetic pesticides during this period and only pesticides with low pre harvest intervals, e.g., 1 day, are advocated to use by farmers. Formulations with azadirachtin 0.15% would therefore, be more attractive to check thrips populations at harvesting and the synthetic pesticides could be used early in the season to lower thrips population to levels manageable using the botanical pesticides. The number of thrips on the crop after application of neem based products should not be a sole measure of the product effectiveness. This is because neem is known to have wide range of effects on the pest such as deterring feeding and oviposition, repellent effects, insect growth regulation, sterilant, mating disruptor as well as toxicity (Singh and Doharey, 2001). Hence some properties may not lead to elimination of the pest and pest presence may not lead to feeding/damage. Snap beans are mainly grown for export market and mere presence of thrips on the pods may lead to rejection of the commodity. However this is not a serious threat to the crop grower since pods are usually cleaned before packaging hence there is no likelihood of presence of the cadaver in the pods destined for the market. The study shows that incorporating neem based product in thrips management could reduce high usage of synthetic pesticides. This could delay pesticide resistance development by thrips, reduce cost of production, create favorable ecology to natural enemies and impact on the health of the growers.

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