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Full Length Research Paper

Preliminary studies on incidence of insect pest on okra, *Abelmoschus esculentus* (L.) Moench in central Burkina Faso

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A field experiment was carried out in 2006 and 2007 in central Burkina Faso to determine extent of damage and yield losses caused by insect pests occurring on okra. We set up a trial with plot of unprotected and protected okra testing increasing doses of deltamethrin. The most important insect pests included 2 species of flea beetles *Podagrica* sp. These insects caused heavy defoliation of up to 80% of the leaf surface. Spraying of deltamethrin at the doses of 6.25 to 25 g a.i./ha was effective for controlling the insect population but no evidence of significant fruit yield losses was observed.

Key words: *Podagrica* sp., okra, deltamethrin, Burkina Faso.

INTRODUCTION

Okra, *Abelmoschus esculentus* (L.) Moench is a vegetable widely grown in West-Africa. In Burkina Faso, okra is grown for its immature edible pods which are consumed as a vegetable. Okra is available almost throughout the year and cultivated even in poor soil and dry area (Anonymous, 1994). Young tender fruits are usually cut into small pieces for use in sauce to be served with starchy foods such as millet, sorghum and rice. The plant is rich in minerals, carbohydrate fibre, protein, fat, and phenols (Karakoltsidis and Constantinides, 1975; Al-Wandawi, 1983; Camciuc et al., 1998; Huang et al., 2007; Arapitsas, 2008).

In west-Africa, the plant is attacked by two flea beetle species, *Podagrica uniforma* (Jac.) and *P. Sjostedti* (Coleoptera: Chrysomelidae) which are responsible of heavy defoliation (Odebiyi, 1980). Important yield losses are reported in Nigeria and Ghana (Obeng-Ofori and Sackey, 2003; Ahmed et al., 2007). These insects also transmit the okra mosaic virus which causes significant yield losses (Vanlommel et al., 1996).

So far in Burkina Faso okra remained a neglected crop for which few attention has been given by researchers despite it's great potential. Thus, there is a lack of information on the extent of damage and yield losses caused by insect pests occurring on okra. Traditionally farmers dusted wood ash on leaves to protect their okra crop; vegetable growers nearby big cities used chemical pesticides for okra protection. Recently new interest for okra production improvement came in the agenda of researchers (Sawadogo et al., 2009). This study is in line of such new interest and aimed to investigate the extent of okra damages and yield losses caused by insect pests. A field experiment was carried out in 2006 and 2007 in central Burkina Faso with unprotected and protected plots of okra with increasing doses of a conventional insecticide to score insect damage and yield losses.

MATERIAL AND METHODS

Insecticides

Deltamethrin (Decis EC, 25 g a.i. / litre) was obtained from Bayer Crop Sciences (Monheim am Rhein) Germany.

Experimental site

The trials were conducted on the research station of the Institut de l'Environemment et de Recherche Agricole (INERA) at Kamboinse (Latitude, 12º 27'N, Longitude 1º 33'W, Altitude 330 m) from Sep-

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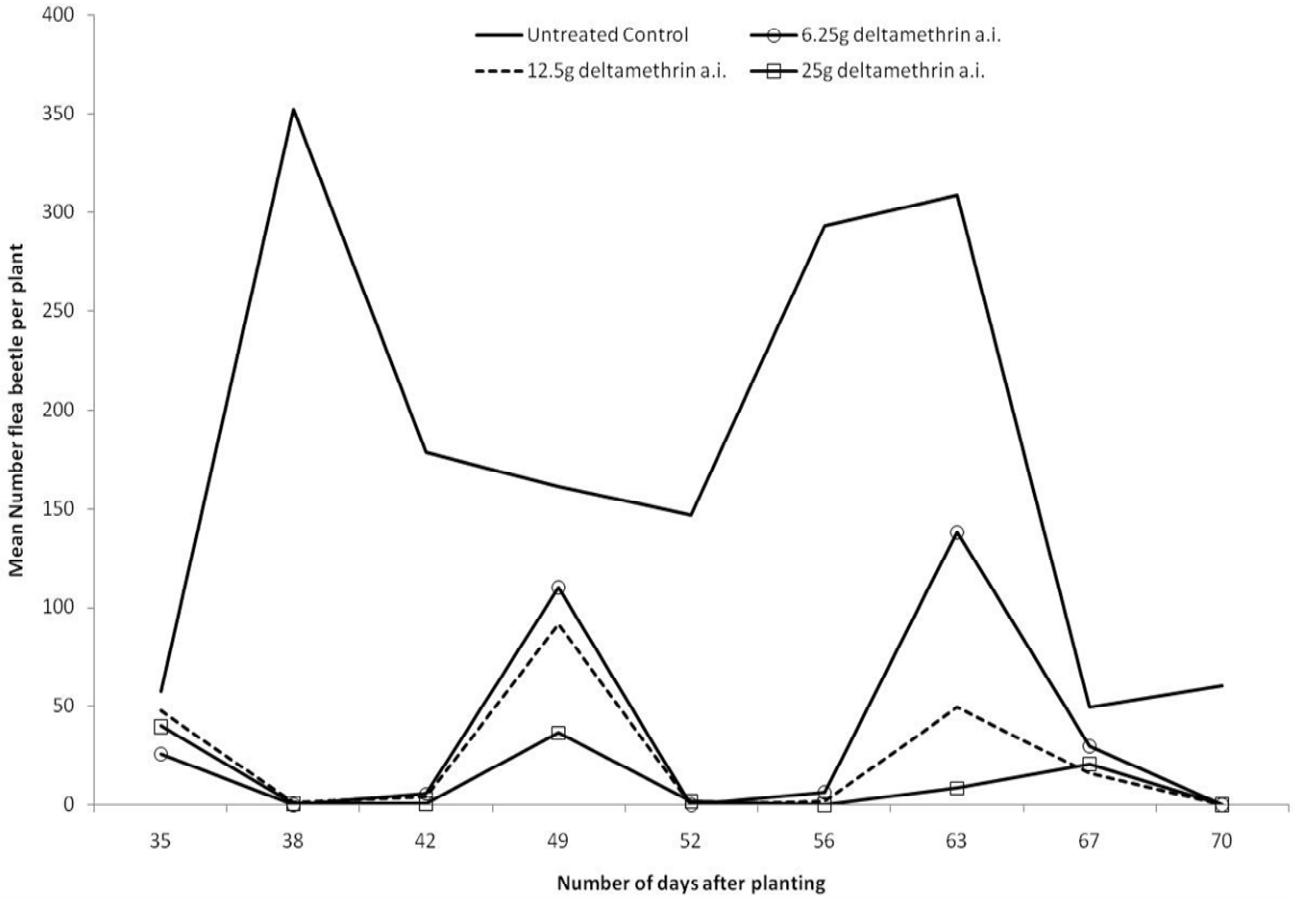

Figure 1. Temporal variation of mean number of flea beetle per plant of okra treated with increasing doses of deltamethrin in 2006.

September to mid-November during two consecutive years from 2006 to 2007. Organic fertilizer (20t/ha) and mineral fertilizer (NPK at 45 kg a.i/ha) were applied before planting. Supplemental N (35 kg a.i. /ha) in a form of urea was applied two weeks after planting. Manual weeding and irrigation was carried out when necessary.

Experimental design

A Randomized complete Block Design with 4 treatments and 4 replications was setup. The treatments consisted of 3 doses of deltamethrin (6.25, 12.5 and 25 g active ingredient per ha) and an untreated control. The first spray was performed after the first signs of infestations about 4 weeks after planting, followed by a spray every 2 weeks using a CP Knapsack sprayer. While spreading a tarpaulin was used to prevent insecticide extending or sifting to nearby plots. Plot sizes were 24 m^2 and each plot consisted of 6 lines of 5 m. A variety from INERA okra collection (BF-40) was planted with intra-row spacing of 0.50 m and inter-row spacing of 0.80 m according to the national planting requirements. Plots were separated by 2 m wide border margin and blocks by 3 m.

Data sampling

On a biweekly basis we counted the number of insects present on 20 randomly chosen plants per plot. Counting was done early in the morning between 7 and 8 am when the flea beetles were less active and the number of each species was recorded separately. Specimens were collected for identification of species. We also estimated on 10 randomly selected plants the damages on okra leaves by scoring the percentage of defoliation. Before lignification, the fresh fruits were harvested from all the plants in the plot at weekly intervals over one month period and were sorted out into marketable and unmarketable fruit. Fruit yield was calculated based on mean yield of marketable fruit per hectare.

Data analysis

SAS software (version 8, 2001) was used for data analysis. ANOVA were performed for each of the parameters and separation of the means was done using the Student Newman Keuls test at 5% significance level.

RESULTS AND DISCUSSION

Two flea beetle species, *Podagrica* sp. (Coleoptera: Chrysomelidae) were observed as feeding on okra leaves. Infestations started from 35 to 45 days after planting depending on the year (Figures 1 and 2). In 2006, flea beetles number increased rapidly to reach an average of

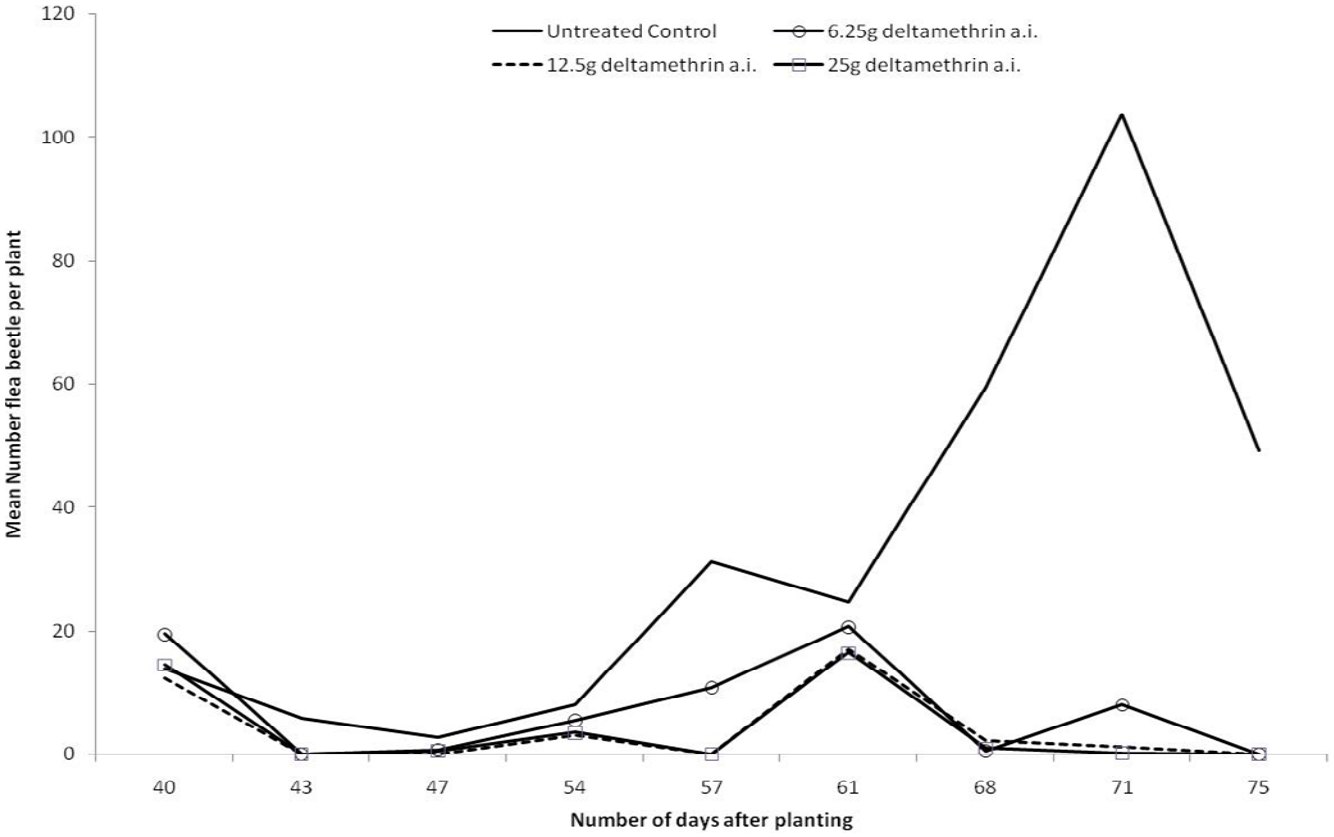

Figure 2. Temporal variation of mean number of flea beetle per plant of okra treated with increasing doses of deltamethrin in 2007.

350 beetles per plant 38 days after planting. The insect infestation was lower in 2007 with a maximum of 100 beetles per plant. *Podagrica* flea beetle is reported in most of West Africa countries as the major insect pests of okra with similar numbers of insects per plant (Ogbalu and Ekweozor, 2002; Obeng-Ofori and Sackey, 2003; Ukoima and Okah, 2006). In addition to flea beetles we recorded few number of leaf rollers *Notarcha derogata* F. and leafhoppers *Empoasca* spp on leaves; blister beetle, *Mylabris* spp on flowers; cotton stainer bug, *Dysdercus* spp on fruits and colonies of cotton aphid, *Aphis gossypii* Glov. on different organs. The same insects were also recorded on okra in Ghana (Obeng-Ofori and Sackey, 2003).

Treated plant showed significantly lower flea beetle population than untreated in both years regardless of deltamethrin doses ($P < 0.05$). The insecticide treatments induced an average reduction of 82% of the insect population on treated plots. Similar high reduction of flea beetles with different insecticides molecules has been reported (Emosairue and Uguru, 1999; Ahmed et al., 2007; Mohamed-Ahmed, 2000). Efficiency of deltamethrin against *Podagrica* species is also reported in Nigeria (Anaso and Lale, 2002; Anaso, 2003)

Continuous feeding of beetles on okra leave resulted in a significant higher defoliation of the foliar surface on untreated control plants compare to treated plots (Table 1). Similar leaf damages are reported by Obeng-Ofori and Sackey (2003). Flea beetles bore holes into the leaves and as a consequence, reduce the photosynthetic ability of the leaves. Therefore they may reduce okra fruit yield. Despite heavy infestations no significant yield loss was recorded in untreated control plots compared to the treated (Table 2). These observations were made despite yield loss reported by Emosairue and Ukaegbu (1994) in farmer's field. There are conflicting reports on the impact of flea beetles on okra yield loss. Several studies mentioned that insecticide spraying enhance yield increase in okra (Agbaje and Daramola, 2000; Anaso, 2003; Ahmed et al., 2007; Thul et al., 2009; Adhikary, 1984; Agunloye, 1986; Obeng-Ofori and Sackey, 2003) while other reports showed no systematic evidence of yield enhancement due to control of flea beetle on okra (Emosairue and Ukeh, 1997; Odebiyi et al., 1981).

However in most of the studies reporting yield losses other major insect species like leaf rollers and aphids were also occurring on okra at the same time. Some of these insects are known to impact significantly okra yield (Mohamed-Ahmed, 2000; Nderitu et al., 2008). Mohamed-Ahmed (2000) only observed yield improvement while controlling flea beetle on okra when aphids' population was high. Insecticide spraying can control

Table 1. Effects of increasing doses of deltamethrin treatments on okra leave damage (% visual estimation means).

	Leaf damage (%)	
Treatments	**2006**	**2007**
Untreated control	70 a	50 a
6.25 g deltamethrin/ha	20 b	15 b
12.5 g deltamethrin/ha	18 b	13 b
25 g deltamethrin/ha	15 b	10 b
	P < 0.05	

The data in the table are mean of 4 replications

Table 2. Effects of increasing doses of deltamethrin treatments on okra fresh fruit yield (tons /ha ± SE).

	Fresh fruit Yield	
Treatments	**2006**	**2007**
Untreated control	1,02 ± 0.32	1.45 ± 0.51
6.25 g deltamethrin/ha	1,56 ± 0.84	1.30 ± 0.24
12.5 g deltamethrin/ha	1,57 ± 0.19	1.77 ± 0.58
25 g deltamethrin/ha	1,56 ± 0.84	1.52 ± 0.76
	P > 0.05	

The data in the table are mean of 4 replications

several insect pests and can lead to a better yielding of okra. In our case other insect pests were of no significant importance. As flea beetle also transmitted the okra mosaic virus which caused yield losses, controlling these insects can result in yield gain (Vanlommel et al., 1996). Unfortunately in this study we do not scored the virus incidence.

In conclusion our study revealed no evidence of yield losses due to flea beetle feeding on okra leaves despite high level of defoliation in central Burkina Faso. Therefore it is not necessary to spray insecticides when growing okra in that area of the country. However before advising farmers about our important findings, further investigations need to be done to determine the up-limit insect capacity carrying per plant that do not need protection.

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