

Evaluation of pesticide/variety combinations for thrips (Thysanoptera: Thripidae) management on French Beans (*P. vulgaris* L.) in Kenya

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Abstract: A field study was undertaken to evaluate pesticide/variety combinations for thrips infestation and damage in Kabete Field Station, University of Nairobi, Kenya. Four French bean varieties (Amy, Monel, Samantha and Impala) and four insecticides (Lambda-cyhalothrin (Karate 1.75 EC), Petroleum spray oil (DC Tron 500 ML), Spinosad (Tracer 480 SC) and Fipronil (Regent 50 SC)) were used for the study. The study revealed that both the varieties and insecticides influenced thrips infestation independently. Tracer 480 SC and Regent 50 SC gave the lowest thrips numbers in all the varieties. The mean number of *F. occidentalis* in Karate 1.75 EC sprayed plots was higher and significantly different from plots sprayed with Tracer 480 SC and Regent 50 SC. The mean number of *M. sjostedti* was not significantly different for all the plots sprayed with Tracer 480 SC, Regent 50 SC and Karate 1.75 EC. DC Tron 500 ML had no significant effect on thrips infestation.

Key words: *Frankliniella occidentalis*, *Megalurothrips sjostedti*, French bean

Introduction

French beans (*Phaseolus vulgaris* L.) continue to be the most important export vegetable in Kenya and it accounts for over 60% of all exported vegetables. French bean ranks second after cut flowers in terms of volume and value among export crops. The main share of production in terms of volume is by small scale farmers who rely mainly on chemical insecticides for pest control. Farmers have been reported to apply up to 15 sprays per season (Nderitu *et al.*, 1997) mainly due to thrips infestations, and has residue problem on French beans (Lohr, 1996). Successful use of insecticides for thrips control require attention to the issues of pesticide choice, coverage, phytotoxicity, residues and resistance. The introduction of maximum residue limits by importing countries has posed a challenge in the export industry given the high number of smallholder growers involved. A further limitation to the effective suppression of thrips with chemical pesticides is the development of resistance (Robb *et al.*, 1995), which is more complicated by farmer's preferences of cheaper insecticides that are not effective. This study was undertaken to determine effective variety/pesticide combinations for thrips management on French beans. This was done for the purpose of making a contribution to the development of an integrated thrips management on French beans in Kenya.

Materials and Methods

The study was carried out at Kabete Campus Field Station farm, University of Nairobi in Kenya. Land was ploughed and harrowed to fine tilth using a disc harrow while demarcation into blocks and digging of furrows was done manually. The crop was grown under overhead sprinkler irrigation due to the dry spell period. Four commercial varieties were selected from an earlier experiment based on the susceptibility to thrips; the most susceptible

(Monel), the least susceptible (Impala) and two moderately susceptible (Amy and Samantha). Commercial certified seeds treated with Imidacloprid (Gaucho 350FS) to prevent bean fly (*Ophiomyia* spp) and other soil borne pest were used. Each variety had a control plot that was not sprayed. Four insecticides were selected from the local market based on registration for use on French beans in Kenya, earlier efficacy trials and what farmers were currently using. These were Karate 1.75 EC (Lambda-cyhalothrin), Tracer 480 SC (Spinosad), Regent 50 SC (Fipronil) and DC Tron 500 ML (Petroleum spray oil). The experiment was laid in split plots within Randomized Complete Block Design (RCBD). The variety formed the main plots while the pesticides formed the subplots. Five plots measuring 3m by 4m per plot and a 2m path to separate them within each main plot were established and the crop planted in furrows at 30cm inter-row and 15cm intra-row spacing. Two plantings were done in June 2002 at an interval of two weeks. Diammonium Phosphate (DAP) fertilizer was applied at a rate of 494kg/ha in the furrows and mixed well with the soil before placing the seeds during sowing. At the first trifoliate leaf stage, top dressing was done at rate of 494 Kg/ha using Calcium Ammonium Nitrate (CAN) and a second application done just before flowering. The crop was hand weeded two weeks after emergence followed by a second weeding three weeks later. Pesticide application at the recommended rates was done at the onset of flowering using a hand operated knapsack sprayer. A clear polythene sheet was used between the plots during spraying to avoid the effect of drift. Sampling for thrips infestation was done just before spraying, after one day, three days, seven days and fourteen days. Ten open flowers were randomly picked from each of the plots at every sampling. The samples were put in 70% alcohol in separate bottles in the field and taken to the laboratory for thrips counting. The bottles were shaken and flowers dissected for thrips counting.

Counting of both adult thrips and larvae was done under a dissecting microscope using a tally counter. Each of the species was recorded separately for each of the variety/pesticide combinations. The data collected was subjected to Analysis of Variance (ANOVA) using GENSTAT statistical package. Significance was analyzed by F-test and means separated by use of standard error of difference of means.

Samantha had the least mean number of *F. occidentalis* in unsprayed plots while Monel had the highest numbers (Fig. 1). Plots sprayed with DC-Tron 500 ML had the highest *F. occidentalis* among the sprayed plots. All the plots sprayed with Tracer 480 SC and Regent 50 SC had the lowest numbers of *F. occidentalis* except Impala that recorded lower *F. occidentalis* numbers when sprayed with Karate. The mean *F. occidentalis* numbers in all the plots sprayed with Karate were significantly higher than plots sprayed with Tracer 480 SC and Regent 50 SC but lower than plots sprayed with DC Tron 500 ML and unsprayed plots.

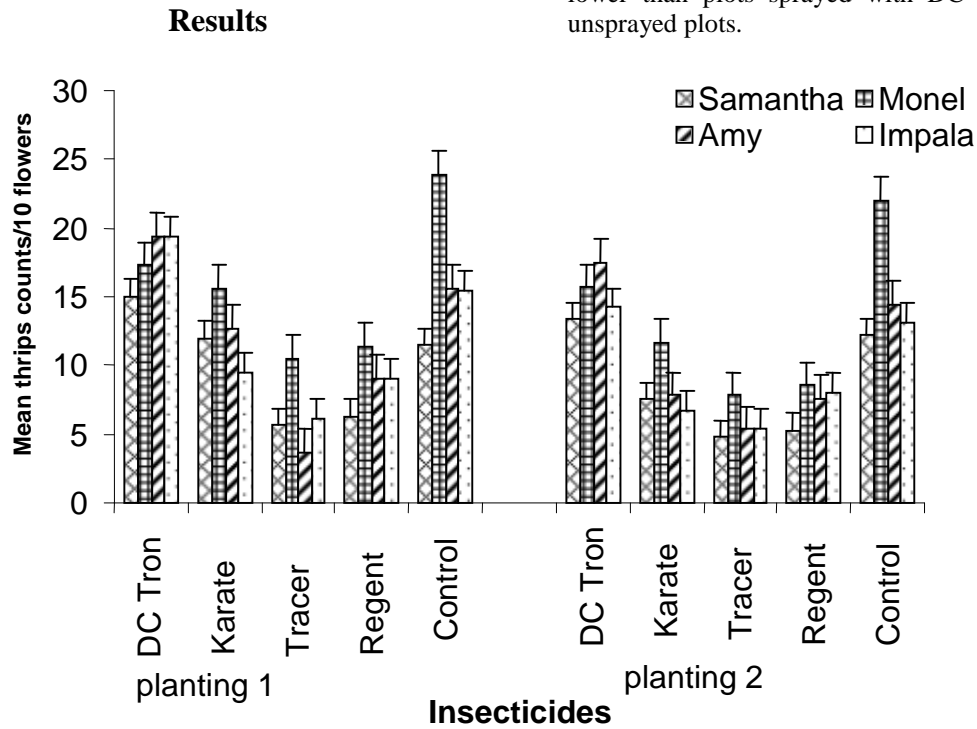


Fig. 1: Mean number of *F. occidentalis* in variety and pesticide combinations at Kabete Field Station

Monel had the highest number of *M. sjostedti* in the unsprayed plots while Samantha had the lowest (Fig. 2). All plots recorded least number of *M. sjostedti* when sprayed with Regent 50 SC, Tracer 480 SC and Karate 1.75 EC compared to the other treatments. Samantha had the lowest numbers of *M. sjostedti* in all the treatments. The mean number of *M. sjostedti* was however not significantly different for all the plots sprayed with Regent 50 SC, Tracer 480 SC and Karate.1.75 EC.

The number of larvae was higher in the unsprayed Monel plots while Samantha had the least (Fig. 3). Sprays of Tracer 480 SC, Regent 50 SC and Karate 1.75 EC had the least larvae number in all the varieties. Plots sprayed with DC-Tron 500 ML recorded the highest larvae numbers in all the varieties and were not significantly different from the unsprayed plots.



Fig. 2. Mean number of *M. sjostedti* in variety and pesticide combinations at Kabete Field Station

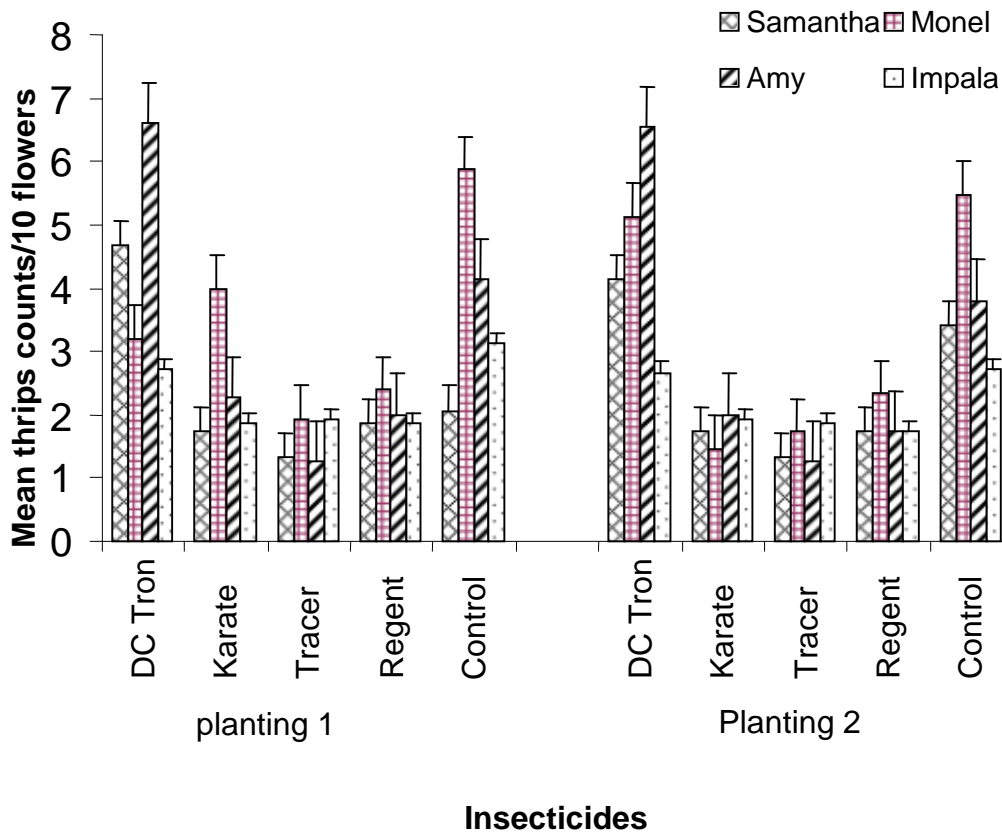


Fig. 3. Mean number of larvae in variety-pesticide combinations at Kabete Field station

Generally, Monel had the highest number of total thrips in the unsprayed plots while Samantha had the lowest (Fig. 4). Plots sprayed with Tracer 480 SC and Regent 50 SC had the lowest number of thrips than those sprayed with

the other insecticides. Impala had the lowest thrips numbers than other varieties only when sprayed with Karate 1.75 EC.

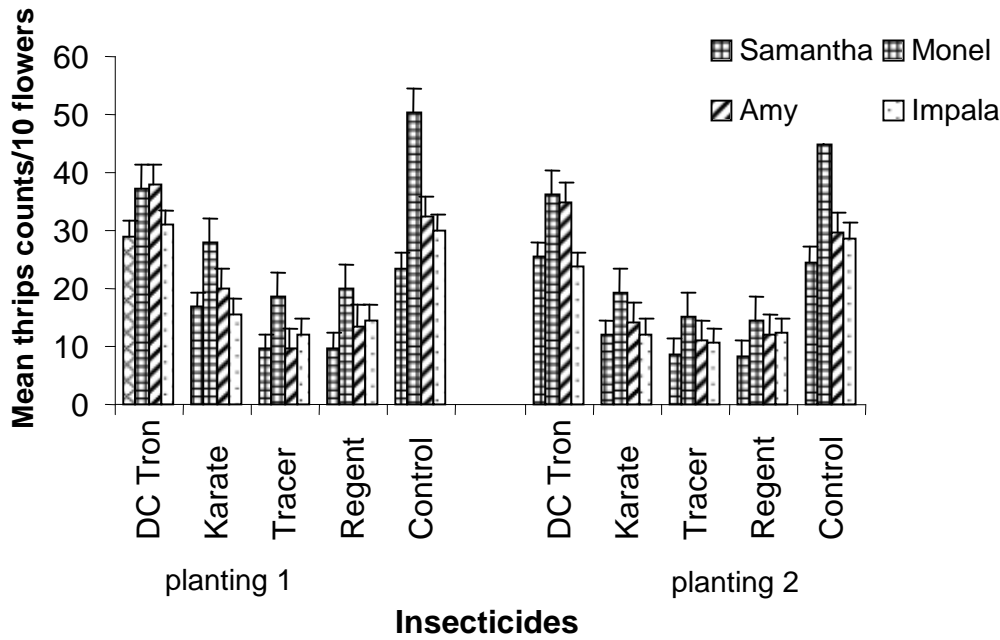


Fig. 4. Mean number of total thrips in variety-pesticide combinations at Kabete Field Station

The number of *F. occidentalis* in the plots sprayed with Tracer 480 SC and Regent 50 SC gave the lowest thrips numbers (Fig 5). The thrip numbers was significantly lower one day after spraying and remained low fourteen days after spraying. The number of *F. occidentalis* in the plots sprayed with Karate 1.75 EC was low three days

after spraying but increased significantly thereafter. The number of *F. occidentalis* in the unsprayed plots and those sprayed with DC Tron 500 ML were not significantly different a day after spraying and had an upward trend throughout the sampling period.

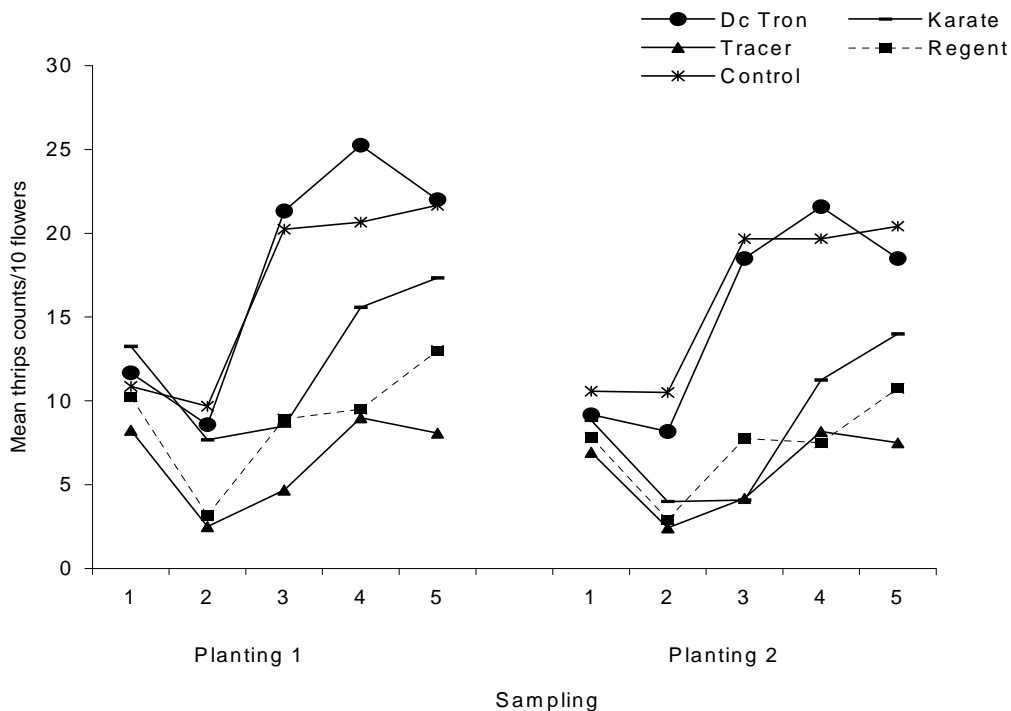


Fig. 5. Mean number of *F. occidentalis* in variety-pesticide combinations over the sampling period at Kabete Field Station

Karate 1.75 EC, Tracer 480 SC and Regent 50 SC sprayed plots had the least mean number of *M. sjostedti* (Fig 6) during the sampling period. *Megalurothrips.sjostedti* numbers in Tracer 480 SC and Regent 50 SC sprayed plots remained low fourteen days after spraying while in

the karate 1.75 EC sprayed plots, the number remained low seven days after spraying but rose significantly thereafter. The number of *M. sjostedti* in the unsprayed and DC Tron 500 ML sprayed plots increased throughout the sampling period.

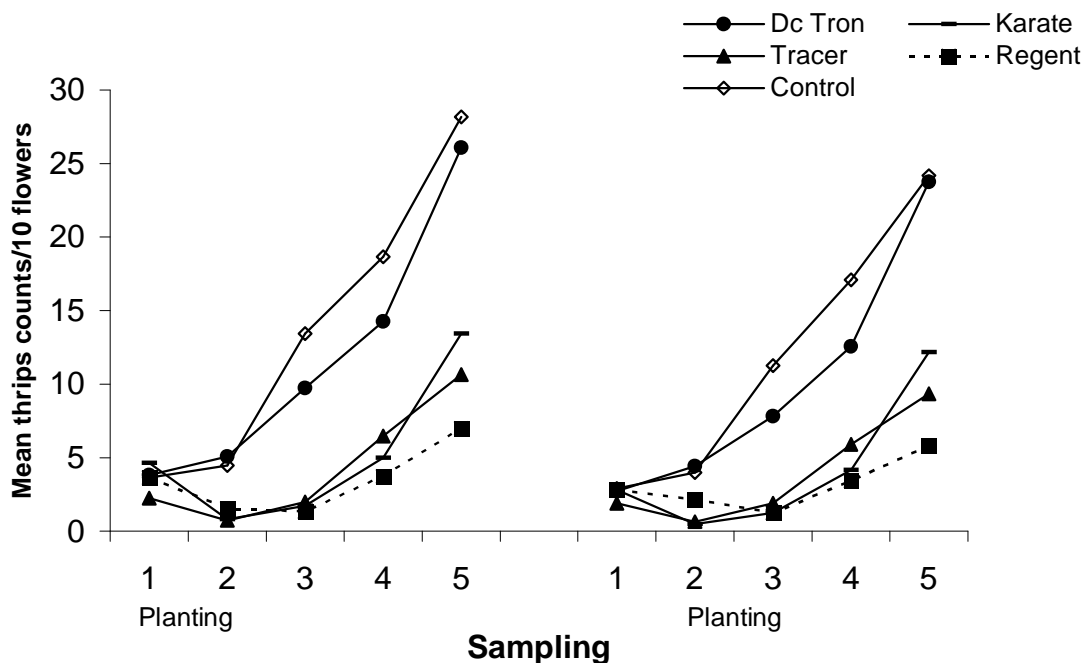


Fig. 6. Mean number of *M. sjostedti* in variety-pesticide combinations over the sampling period at Kabete Field Station

Tracer 480 SC, Karate 1.75 EC and Regent 50 SC sprayed plots had the lowest mean larvae numbers (Fig 7). The number of larvae in Tracer 480 SC and Regent 50 SC sprayed plots remained low fourteen days after spraying

while the karate 1.75 EC sprayed plots showed incremental levels after seven days. Tracer 480 SC and Regent 50 SC sprayed plots had the lowest total thrips number, which remained low fourteen days

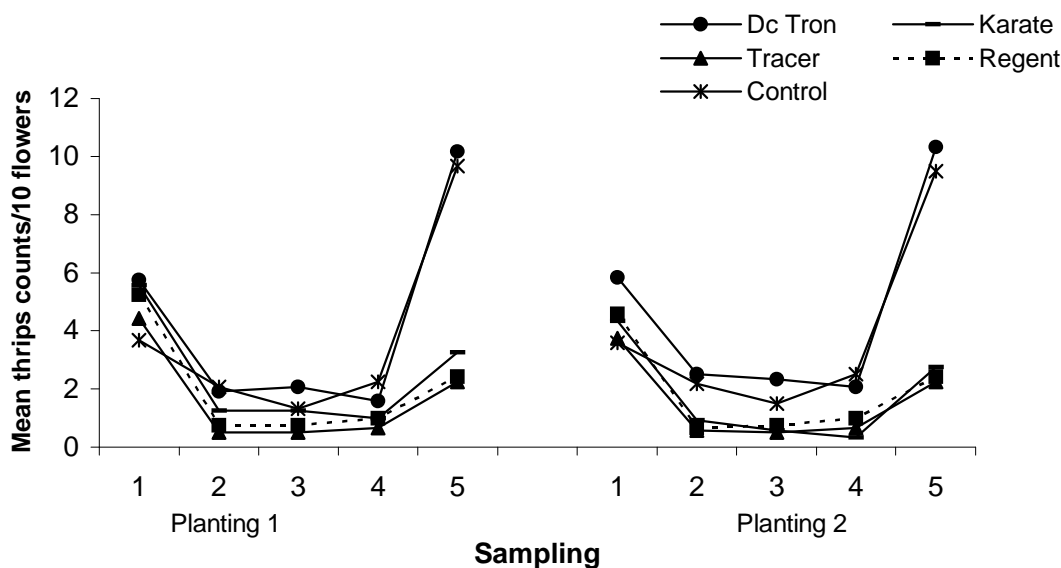


Fig. 7. Mean number of larvae in variety-pesticide combinations over the sampling period at Kabete Field Station

after spraying (Fig 8). The total number of thrips in the Karate 1.75 EC sprayed plots remained low three days after spraying then increased significantly thereafter.

Mean number of the total thrips in the unsprayed and DC Tron 500 ML sprayed plots increased throughout the sampling period.

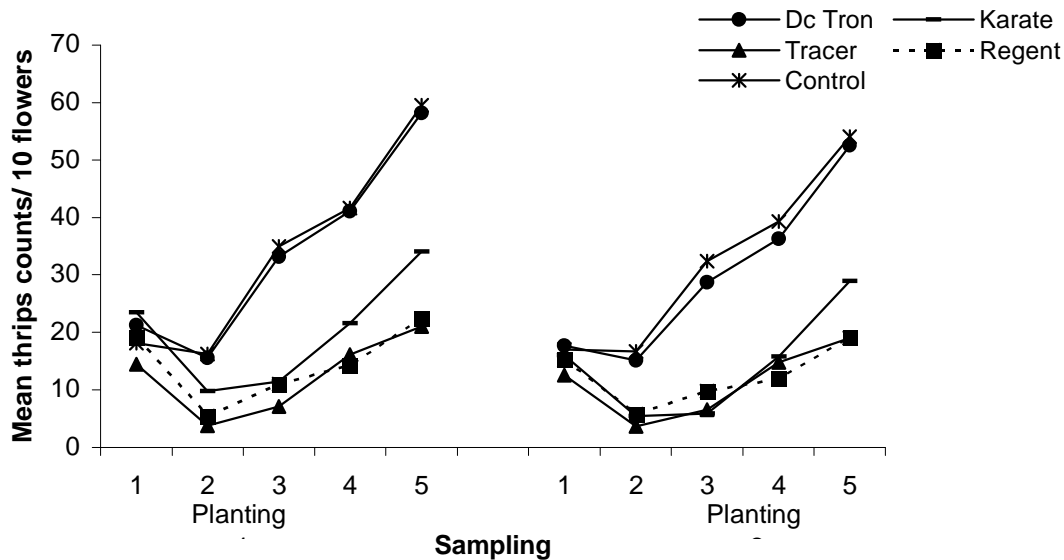


Fig. 8. Mean number of total thrips in variety-pesticide combinations over the sampling period at Kabete Field Station

Discussion

The mean number of *M. sjostedti* and *F. occidentalis* was significantly lower ($P= 0.05$) in the Regent 50 SC and Tracer 480 SC treated plots than in the other treatments across all varieties. Thus both Tracer 480 SC and Regent 50 SC reduced thrips population effectively irrespective of the variety involved. The effectiveness of Regent 50 SC in the control of thrips especially *F. occidentalis*, was also reported by Gauzo *et al.*, (2000). Lohr (1996) also reported the effectiveness of Regent 50 SC in the control of *F. occidentalis* in French beans in Kenya. This product could be recommended for use in French bean given that it is broad spectrum and may thus be used to control other insect pests. The product was still effective fourteen days after application and hence could be applied early in the crop growth to avoid residue problems. Tracer 480 SC, a biological pesticide, could be most appropriate for use late in the season given that it has a short pre-harvest interval and poses no danger to the environment and has no residue problems. Karate 1.75 EC had a limited control of *F. occidentalis* but effectively controlled *M. sjostedti* in all the varieties. Amatob (1994) found Karate 1.75 EC to be effective against *M. sjostedti* in cowpeas in Nigeria. Similar findings were also reported by Kibata and Anyango,(1996) while working on French beans in Kenya. Karate 1.75 EC, a pyrethroid, may however be incompatible with IPM programs due to the non-selective nature and the risk of pest resurgence and redistribution characteristic to pyrethroids (Kibata and Anyango, 1996). DC Tron 500 ML was found to be ineffective against thrips and could thus not be recommended for use in their control or IPM thrips program.

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