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Full Length Research Paper

Control of Tomato Fruitworm *(Helicoverpaarmigera* H.) on Tomato using Cypermethrin, Dimethoate and Neem Extracts in Samaru, Zaria, Nigeria

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The effects of cypermethrin, dimethoate and neem extracts were investigated during the dry and wet periods of 2012 cropping seasons in Samaru, Zaria. The design used was Randomized Complete Research Design. Five treatments were used; Cypermethrin, dimethoate, neem seed extract, neem leaf extract and a control where no insecticidal spray was carried out. The treatments wee replicated four times. Parameters recorded were, number of holed tomato fruits, number of damaged tomato fruits, weight of tomato fruits and size of tomato fruits. The result of the experiment indicated that plots sprayed with dimethoate had the least number of holed and damaged fruit, followed by cypermethrin and neem seed extract in both the dry and wet seasons. There was no significance difference (P<0.05) between cypermthrin and neem seed extract. Therefore, further studies should be carried out to determine the efficacy of different concentrations of neem seed extract on the insect pest. Probably higher concentrations can effectively protect tomato fruit against the worm, and this can be part of the management strategy for the insect pest since neem products are environmentally friendly.

Keywords: cypermethrin, dimethoate, fruitworm, neem extract, tomato

INTRODUCTION

Tomato (*Lycopersiconesculentum* Mill.) is the most commercially grown vegetable in Africa, and parts of Northern Nigeria (Schippers, 2000). Nigeria is the fourteenth largest producer of the crop in 2012 (FAO, 2014). However, tomato production in the Nigeria is constrained by a complex of pests that includes the tomato fruit worm (*Helicoverpaarmigera* Hubner), white flies (*Bemisiatabaci* Genn), nematodes and beetles (Lange and Bronson, 1981; Umeh et al., 2002). Of which, *H. armigera*is a major insect pest of tomato. As larval boring and feeding activities primarily injure tomato fruits, and then predispose infested fruits to the entry of fungal pathogens (Erinle, 1989; Martin et al., 2000, 2005; Ratnadass et al., 2011). Synthetic insecticides including Carbaryl, Karate, Cypermethrin, Dimethoate and Monocrotophos have been documented to effectively protect tomato fruits. The use of synthetic insecticides were found to be effective but they are toxic, scarce, and costly at the time of need and can

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cause environmental pollution and leave residues in food products (Cameron and Walter, 2002). Alternative natural pesticides which are readily available, environment friendly than synthetic pesticides are therefore required to replace the synthetic pesticides which are harmful and toxic to producers and consumers (Ivbijaro, 1990; Fuglie, 1998).

This research work was carried out so as to determine the efficacy of cypermethrin, dimethoate and neem extracts on tomato fruit worm (*Helicoverpaarmigera* Hubner) that infests tomato plant in Samaru, Zaria, Nigeria.

MATERIALS AND METHODS

The experiment was conducted at college of Agriculture, Ahmadu Bello University, Zaria Nigeria, Experimental field, during dry and wet seasons of the year, 2014. The field is located in Northern Guinea Savanna. The Experimental Design used was Randomized complete Block Design. Five treatments were used; Cypermethrin, Dimethaote, neem seed extract and neem leaves extract and control. Each treatment was replicated four times.

A week before transplanting, the experimental site was cleared of weeds, ploughed, harrowed and plots were made at 5.0m x 4.0m size with an inter plot space of 1.0m and border space of 2.0m round the experimental field. The tomato seedlings were transplanted into the field in the evening after all the plots were watered and allowed to drain to field capacity. One week after transplanting, gaps were filled, the plots were weeded and NPK15.15.15 fertilizer was applied at 37g/stand. Watering was carried out regularly for the dry season tomatoes. Sprays the tomato were done three time at weekly interval, using knapsack sprayer.

Treatment sprays were then sustained at fortnightly intervals until fruit harvesting was completed. Data collection at harvest time was made from five randomly selected plants per plot. The numbers of bored holes per fruit, damaged and undamaged fruits per plant, fruit weight (g) per plant using the Metter balance (2000 model), fruit size (the measure of fruit diameter at the broadest portion) (mm) per plant and total fruit yield (the weight of total undamaged and damaged tomato fruits) (t/ha) were recorded.

Data analysis

Data recorded on various parameters under study were subjected to analysis of variance (ANOVA). Mean separation were then performed using the New Duncan Multiple Range Test (DMRT) at 5% level of significance.

Preparation of neem seed extracts (NSE) and neem leaf extract (NLE)

Mature neem seeds and leaves were collected from the bush of Samaru. The seeds and leaves were dried under the shade. The seeds were then pounded using mortar and pestle to separate the kernel from the shell. The inner kernels were further pounded to obtain the powder .The leaves were also pounded in the similar way. Five hundred grams of the powder was then weighed and soaked in 5 litres of water. The mixtures were vigorously shaken and allowed to stand overnight. In the morning the mixtures were filtered using double layer of muslin cloth. The filtrates (neem seed extract and neem leaf exract) were then collected in small plastic jars and stored under cool condition before spray.

RESULTS

The result of the study in Table 1, has sown that lowest fruit damage was recorded in the plot that was sprayed with dimethoate (2.2) followed by cypermethrin (3.3). There was no significant difference ($P< 0.05$) between cypermethrin and neem seed extract. The control, where there was no insecticide spray, has the highest number of holes on the fruits (7.0). The result has also shown that number of damaged fruit is lowest in the plot sprayed with dimethoate. Therefore it has the highest number of undamaged fruits, This was followed by the plots sprayed with cypermethrin, neem seed extracts and neem leaf extract, During the wet season, the result (Table 2) obtained followed similar pattern with the result in table one. Lowest number of hole per fruit was obtained in the plot sprayed with dimethoate (2.8), followed by cypermethrin and neem seed extract (3.7 and 4.7 respectively).Highest number of holes pr fruit was recorded in the plot without spray of any of the chemicals. Lowest number of damaged fruits was recorded in the plot sprayed with dimethoate (2.7), and consequently highest number (52.2) of undamaged fruits was recorded in the same plot.

The plot sprayed with dimethote has the highest fruit weight (36.1g) as shown in Table 3. This is followed by cypermethrin and neem seed extract (29.3g and 29.5g). There was no significant difference ($P<0.05$) between the two. Similarly fruit size was found to be highest in the plot sprayed with dimethoate. The control lowest weight and size was recorded (20.3 g and 21.3 mm respectively)

Fruit weight and size during the wet season followed similar pattern with that of the dry season (Table 4). The result has shown that the plot sprayed with dimethoate has highest fruit weight and frit size (35.0g and 57.0mm), followed by cypermethrin and neem seed extract. Neem leaf extract has the lowest fruit weight and frt size (23.5 g ad 27.0 mm). However, the control has the lowest fruit weight and fruit size among the treatment used (15.3 g and 19.3 mm). In both dry and wet season, there were no significance differences ($P<0.05$) in fruit sizes between the plots sprayed with cypermethrin and neem seed extract.

Table 1. Effect of Cypermethrin, Dimethoate and Neem extracts on tomato fruitworm damage during the dry season

Treatment	No of holes per fruit	No of damaged fruits	No. of undamaged fruits
Cypermethrin	3.3 b	5.2 c	30.3b
Dimethoate	2.2 c	2.0d	48.2a
NSE	3.7b	5.6 c	31.2b
NLE	4.0b	15.7b	30,3b
Control	7.0a	28.0a	20.1c
CV	14.7	16.7	20.0
SE±	1.2	3.4	4.9

Means in the column accompanied by the same letter (s) are not significantly difference at (P< 0.05%) using New Duncan Multiple Range Test (DMRT).

Table 2. Effect of Cypermethrin, Dimethoate and Neem extracts on tomato fruitworm damage during the wet season

Treatment	No of holes per fruit	No of damaged fruits	No. of undamaged fruits
Cypermethrin	3.7 b	5.9 c	39.3b
Dimethoate	2.8c	2.7d	52.2a
NSE	4.7b	6.6 c	39.2b
NLE	5.1b	19.7b	27,3c
Control	9.0a	30.0a	25.1d
CV	17.7	19.7	25.0
SE±	1.8	4.8	5.4

Means in the column accompanied by the same letter (s) are not significantly difference at (P< 0.05%) using New Duncan Multiple Range Test (DMRT).

Table 3. Effect of Cypermethrin, Dimethoate and Neem extracts on mean tomato fruitworm weight during the dry season

Treatment	fruit weight(g)	fruit size (mm)
Cypermethrin	29.3b	41.6b
Dimethoate	36.1 a	48.0a
NSE	29.5b	39,2b
NLE	25.5 c	30.0c
Control	20,3 d	21.3d
CV	10.7	12.7
SE±	0.2	1.4

Means in the column accompanied by the same letter (s) are not significantly difference at (P< 0.05%) using New Duncan Multiple Range Test (DMRT).

Table 4. Effect of Cypermethrin, Dimethoate and Neem extracts on mean tomato fruit size during the wet season

Treatment	fruit weight(g)	fruit size (mm)
Cypermethrin	28.3 b	33.6b
Dimethoate	35.0a	37.0a
NSE	24.5c	31,2b
NLE	23.5c	27.0c
Control	15,3d	19.3d
CV	8.7	10.7
SE±	0.2	1.2

Means in the column accompanied by the same letter (s) are not significantly difference at (P< 0.05%) using New Duncan Multiple Range Test (DMRT).

DISCUSSION

The result of this study showed the efficacy of the synthetic and botanical insecticides on tomato fruit worm (*Helicoverpaarmegera* H). Both number of holes per plant and number of damaged fruits were reduced by the insecticides. However, the synthetic insecticides were more effective than the botanical in terms of reducing the number of holed fruits and damaged fruits. This finding was in conformity with what Dike (1998) had discovered. He found out that synthetic insecticides were more effective than botanicals. Cypermthrin tested. This is possibly due to: 1) greater photostability of Cypermethrin, a pyrethroid insecticide, on the tomato plants after spraying in the field, and 2) stronger and rapid debilitating effect on the biting and sucking activities of *H. armigera* larvae that bore into and feed on tomato fruits. Greater knockdown effect of pyrethroid insecticides compared to natural insecticides

was, for instance, reported to be responsible for better control of insect pests on tomato (Singh and Narang, 1990). However in this study, dimethoate was more effective than the cypermthrin. This probably due its systemic property, which will enable the insecticide to be carried into the transport system of the tomato plant, and therefore can chronically control the worm. The neem extract, especially the neem seed extract was found to be as effective as cypermthrin in reducing the number of holed fruits and damaged fruit. Neem has an antifeeding and repulsive properties (Tanzabil, P.B., 1987; Rahman, A and Talukder, 2006).This might be the reason for protecting the fruits against the worm. Probably, if the concentration is increased, there properties, including systemic capability will be enhanced. Therefore it may catch up with the effectiveness of dimethoate in controlling the worm as several workers (Silas et al, 2011; Degri and Mailafiya, 2013) had shown that botanicals can be used to control *H, armegera* on tomato.

In conclusion, the findings from this study had shown that cypermethrin, dimethoate and neem seed extract are effective against tomato fruit worm (*H. armegera*). However dimethoate was the most effective among them, perhaps due to its systemic property. But due to the environmental side effects of systemic insecticides, neem seed extract can be used in the management of the insect pest. Further research should be carried out using different concentrations of the botanical. This, will probably enhance its systemic property and thereby, effectively, controlling the insect pest.

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