EVALUATION OF BAMETHRIN 2.5EC EFFICACY FOR PESTS CONTROL IN FLUE CURED TOBACCO

Abstract

As one of the most important economic crop, tobacco is often endangered by pest disaster, which can lower the quality and output of tobacco. A two year trial was conducted to test the efficacy of Bamethrin 2.5 EC (Deltamethrin) in flue cured tobacco (K.326) and recommend the appropriate dosage in tobacco production. The trial was on station at Tobacco Research Institute of Tanzania (TORITA) in Tabora region. A randomized complete block design (RCBD) was employed with three replications and five treatments. The five treatments were: 0.08liter/ha Bamethrin 2.5EC, 0.12 lts/ha Bamethrin 2.5EC, 0.16 liter/ha Bamethrin 2.5EC, 0.20 lts /haBamethrin 2.5EC and control 2 ml/20 lts/ha Amecron. NPK (10: 18: 24) basal fertilizer was applied followed by top dressing CAN (27% N) at the amount of 10 and 2.5 bags of NPK and CAN per hectare, respectively. Green and cured tobacco yields showed a significant difference between all treatments where in the first season 2011/12 Amecron had higher fresh and cured yield than other treatments followed by treatment number three (0.16ltha^{-1}) while the lowest yield was obtained from treatment number one (0.08l/ha). In the second season (2012/13) Treatment number three 0.16lts/ha out yielded the control the lowest yield obtained from treatment number two 0.12 lts/ha. Few insect pests were observed in 2011/12 season compared to 2012/13 season where in the first season few aphids and budworms were observed and whitefly observed in treatment number three many number of aphids and budworms were observed from the control. From these findings, 0.08lha^{-1} of Bamethrin EC is more efficient dose for controlling aphids, whitefly and budworm thus highly recommended in flue cured tobacco production.

Key words: Insecticide, insect control, Bamethrin, tobacco, Pyrethroid, Amecron

Introduction

Tobacco (*Nicotiana tobaccum*) is the most popular genus grown in the world. It was originated from South America (FAOSTAT, 2009). It was introduced in Tanzania during the early 1930s. Currently, in Tanzania the crop is one of the major agricultural export crops being the first largest exchange earner (Bank of Tanzania, 2012) followed by coffee, cashew and tea. The importance of the tobacco crop, apart from being a national foreign exchange earner, is greatly emphasized in providing employment opportunities to many Tanzanians in the tobacco farms, processing industries, and tobacco trading companies. In Tanzania tobacco is cultivated by small holder farmers at a scale of 1-3 acres as their main source of income to alleviate poverty (Tanzania Tobacco Board, 2010). It is grown commercially in the districts of Tabora, Urambo, Sikonge, Manyoni, Mpanda, Iringa, Chunya, Songea, Namtumbo, Tarime, Serengeti and Rolya (Musimu *et al*., 2011).

Just like many other crops, commercial tobacco production requires a number of measures to be implemented in order to protect the growing plant so as to secure the desired quality and profitable yield. One of these measures is the use of agrochemicals aimed at controlling insect pests that can adversely affect tobacco growth (Paul et al., 2008). Pest control measures start with the nursery in order to get strong and healthy seedlings that are a basic requirement for higher yields.

Paul *et al*. (2008) reported that, several species of insects which pose serious threats to tobacco in the field, greenhouse, and the curing barns. The author stated that, insects damage the roots, leaves and buds they also reduce leaf quality and transmit several important tobacco diseases.

The pests reported was leaf feeding insects (aphids, fleas and beetles) and soil insects (cutworms, wire worms and nematodes).

Tobacco pests have the potential to cause serious reduction in tobacco yield and value. Uncontrolled infestation of the tobacco pests can reduce yield and value of flue cured tobacco by 10 to 25 percent (William et al 2001). The application of the right types and dosage of insect-pest, soil type, crop and those which are not harmful to the environment gives better results in crop production (Hassan and Bakshi, 2005). On top of that chemicals which are just introduced in the area without proper testing and investigation receives low rate of acceptance and subsequent rejection (Omolehin et al., 2007).

Deltamethrin is a synthetic pyrethroid pesticide that kills insects through dermal contact and digestion. It is applied for a range of commercial crops and recreational uses and it controls a variety of pests. Deltamethrin is considered the most powerful and therefore the most toxic of the pyrethroids (Shrivastrava *et al.*, 2011). Also deltamethrin reported to increase the amount of chlorophyll (Fidalgo *et al*., 1993). Furthermore, deltamethrin promote plant growth and inhibit enzyme degradation of indole-3-acetic acid in Pisium sativa (Fidalgo *et al*., 1993 in Lee, 1977).

Pesticide recommendation to farmers needs a number of measures to be undertaken, such as testing on their performance in the field. The aim of this research was to evaluate the performance of BAMETHRIN 2.5EC as insect control in tobacco production.

The objective of the research was to assess the efficacy of deltamethrin 25g/l insect control in flue cured tobacco and to obtain important information for its registration for use in the country for tobacco production.

Materials and Methods

The trial was conducted on station at TORITA farm (Tumbi-Tabora) 2011/12 and 2012/13. A completely randomized block design with five treatments and three replications was used to evaluate the introduced Bamethrin 2.5 EC. Different rates of Bamethrin 2.5EC against the commonly used pesticide (Amecron 2ml) were tested.

The treatments were: 0.08liter/ha Bamethrin 2.5EC,0.12liter/ha Bamethrin 2.5EC,0.16liter/ha Bamethrin 2.5EC,0.20liter/ha Bamethrin 2.5EC, 20ml/20lts Amecron (control).

The plot sizes were 6x 5m with plant spacing of 1 m ridge to ridge and 0.6 m plant to plant. Each plot contained five rows of 6m.

Plant management

The recommended fertilizer regime was employed in this trial. NPK (10:18:24) basal fertilizer was applied followed by top dressing of CAN (27% N) at the amount of 500kgs and 125kgs of NPK and CAN per hectare respectively.

Data collection

Data collected included field fresh tobacco leaf yield, cured tobacco leaf yield, pests count and tobacco grade index to reflect monetary value.

Pests count

Insect damage assessment was done by counting the number of pests available per plot in ten plants per treatment before pesticide application and after pesticide application for four consecutive weeks. The collected data were analyzed by COSTAT statistical package.

RESULTS AND DISCUSSION

Effects of Bamethrin 2.5 EC on tobacco pests

Results after treatment application appear in Table 1. There was no significance difference among different tested rates of Bamethrin 2.5 EC against the control Amecron at ($p<0.05$) for the first season (2011/12). Numbers of aphids were not found in all treatments in the first season (2011/12) possibly due to the weather condition which might have not been favorable to them (Anex1). In this season few numbers of budworms (2) and whitefly (1) were found in small number on tobacco leaves especially in plots which were treated with 0.08ltha^{-1}. In the season 2012/13 there was a significance difference among different tested rates of Bamethrin 2.5 EC at ($p<0.05$). In this season more aphids were observed before pesticides application and after pesticides application. More aphids (278) were observed in plots treated with Amecron (control) while few aphids (164) were observed in plot treated with 0.12lt Bamethrin/10lt of water). Whitefly and budworms were found in small number on tobacco leaves for this season (2012/13).

Effects of Bamethrin on green and cured leaf yield

Table number 2 shows the results of green and dry weight yield. There was a significance differences between all treatments at ($p<0.05$). Results shows that the first season (2011/12) higher yields were obtained from the control (Amecron) with 1.303tha^{-1} followed by plot treated with 0.16 bamethrin 2.5EC which gave 1.257tha^{-1}. The lowest yield was obtained from the plot treated with the rate of 0.08 Bamethrin 2.5 EC with 0.951tha^{-1}

Likewise, in the second season (2012 /13) the highest dry leaf yield was from plot treated with 0.20lts of Bamethrin which gave 3.908tha^{-1} followed by plots treated with the rate of 0.16l/ha Bamethrin which gave 3.77tha-1. The lowest yield obtained from the plot treated with the rate 0.12l/ha Bamethrin which gave 3.08tha^{-1}.

Grade index

There was a significance differences between the all treated treatments on grade index. The highest grade index (1.38) was obtained from the plot treated with 0.08lt Bamethrin 2.5EC for the first season (2011/12) followed by the plot treated with 0.12lt of Bamethrin 2.5 EC with grade index 1.202. The lowest grade index was obtained from plot treated with 0.20lt of Bamethrin with 0.75 grade index.

Likewise, for the second season the rate of 0.08lts of Bamethrin had a higher grade index compared to other rates of Bamethrin 2.5 EC followed by the rate of 0.12lts of Bamethrin 2.5 EC. The lowest grade index was obtained from plots treated with 0.16lts of Bamethrin.

Economic analysis discovered that by applying Bamethrin 2.5 EC product, a farmer would have gained 8775.3 **US$/**/ha instead of 5207.92 **US$/** /ha by applying the current used insecticide (Table 3).

DISCUSSION

Effects of bamethrin on tobacco pests

Bamethrin at the level of 0.08lt/10lt H_2O had the low number of insects comparing to the control Amecron. This indicated that application of Bamethrin 2.5 EC at the rate of 0.08lt/10lt H_2O reduced the insect's number which implied that plants were not affected by pests and resulted into high yield and quality of tobacco. The results observed agree with those of Teran *et al.* (2005) who recorded the differential decrease number of budworm by applying deltamethrin on budworms to control tobacco budworms in cotton production in Southern, Tamaulipas, Mexico.

Effects of Bamethrin on green and cured leaf yield

The yield differences in two seasons were caused by rainfall shortages (Appendix 1). The water requirement for maximum yield in tobacco production ranges from 400 to 600mm (FAO 2009). From these results we can conclude through the use of proper chemical and rates to control pests yield can be increased.

Grade index

Tobacco curing contributes much to grades offered although other factors like damage levels are considered during tobacco classification. Since there was no leaf damage, grades depend on other factors such as leaf color, plant position, proper curing and the classifier. More carefully curing is needed since the low rate gave the higher grade. Fidalgo et al (1993) reported that deltamethrin increase chlorophyll pigments in solanaceae family this may be led to difficult in curing of tobacco treated with high rate of bamethrin 2.5EC which resulted to low grade index. From the data collected it shows that high rate of bamethrin gave low grade and low rate gave high grade index (Table 2)

CONCLUSIONS AND RECOMMENDATIONS

The two season experiment on tobacco insecticide showed that Bamethrin at the rate of 0.08lt is better than the current used insecticides (Amecron at a rate of 2mls/20ltsha^{-1}. Bamethrin at the rate of 0.08lt/ha^{-1} had few insects number and a farmer can obtain 3.298t/ha of cured tobacco leaves which is equivalent to 3,389.2 **US$** to pay for production costs and other incentives. Bamethrin at the rate of 0.08lt/ha is highly recommended to tobacco growing areas. These products are expected to reduce production costs and thus increase net benefit and income to tobacco farmers. Training department, researchers, tobacco chemical companies and policy makers could utilize these findings to improve tobacco production.

Table 1. Bametrin effects on pest count

	Season 2011/2012		season 2012/2013			
Bamethrin lt/10lt H_2O	**Budworms counts**	**White fly counts**	**Grasshopper**	**Aphid**	**Budworms counts**	**White fly counts**
0.08	2	1	1ab	204.3	0	4.33b
0.12	4	1	1.66a	164.66	0.66	5b
0.16	4	0	1ab	225.66	0	5b
0.20	4	1	0.66b	241.6	0	6.3b
2mlAmecron/20lts H_2O	4	1	3a	278	0	11a
Mean	3.4	0.73	1.46	222.8	0.13	6.6
L.S.D	6.24 ns	1.61 ns	2.18	319.8	0.486	4
CV%	97.54	116.77	79.22	76.21	193.6	31.87

Table 2. Effects of Bamethrin 2.5 EC on tobacco yield

	Season 2011/2012			Season 2012/2013		
Treatments Bamethrin l/10lt H_2O	**Green weight tha^{-1}**	**Dry weight tha^{-1}**	**Grade index**	**Green weight tha^{-1}**	**Dry weight tha^{1})**	**Grade index**
0.08	12.752 a	0.951 a	0.38	23.665a	3.298a	2.66a
0.12	14.040 a	1.001 a	1.202	17.831a	3.083a	1.80ab
0.16	13.681 a	1.237a	1.83	21.203a	3.770a	0.9b
0.20	14.309 a	1.073a	0.75	20.371a	3.908a	1.78ab
2mlAmecron/20lts H_2O	16.061 a	1.303 a	0.82	19.862a	3.471a	1.5b
Mean	14.168	1.117	1	20.586	3.5	1.735
L.S.D	4.150 ns	0.402 ns	1.02 ns	7.463n.s	2.79 ns	1.42
CV (%)	15.56	19.13	54.17	19.25	29.08	29.9

Means followed by different letters are significantly different by Duncan New Multiple range $P<0.0$

Table 3. Economic analysis of Bamethrin 2.5 EC for 2012/2013 growing season

Treatments Bamethrin Lt/10lt H2O	Yield t/ha	Grade index (US$/Kg)	Chemical cost	GFB (US$//ha)*	NB (US$//ha)*¤
0.08	3.298	2.66	1.86	8775.3	8773.44
0.12	3.083	1.80	2.8	5549.68	5546.88
0.16	3.770	0.9	3.73	3393	3389.27
0.20	3.908	1.78	4.66	6956.24	6951.58
20ml Amecron	3.471	1.5	0.6	5207.92	5207.32
Mean	3.506	1.735			
L s d	27.94	1.42			
CV%	29.08	29.9			

* = GFB = Gross field benefit (Dry weight × grade average price).

¤ = Net benefit = GFB- chemical cost only.

Appendix 1: Amount of rainfall for two seasons2011/12-2012/13

MONTH	**2011/12**	**2012/13**
OCTOBER	-	-
NOVEMBER	-	-
DECEMBER	578 mm	553 mm
JANUARY	373 mm	493 mm
FEBRUARY	660 mm	404 mm
MARCH	562 mm	862 mm
APRIL	469 mm	418 mm
MAY	-	-
AVERAGE RAINFALL	528.4 mm	554 mm

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