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EFFICACY OF SOME SELECTED ACARICIDES AGAINST JUTE YELLOW MITE

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ABSTRACT

Efficacy of seven acaricides namely Haysulf DF 80%, Ethiosul 46.5EC, Aimcoflo 80WDG, Thiovit 80WDG, Ambush 1.8EC, Omite 57EC and Sharper 5WDG with concentrations of 0.13%, 0.06%, 0.35%, 0.06%, 0.04%, 0.06% and 0.05%, respectively were evaluated against jute yellow mite *Polyphagotarsonemus latus*. The investigations were done in the Jute Agriculture Experimental Stations at Dhaka and Manikgonj during the jute season 2014. Sharper 5WDG showed the highest mortality rate of mite at 24, 48 and 72 hours after treatment and the mortally was 86.8%, 94.0% and 95.7%, respectively. All the acaricides revealed significantly lower rates of plant infestation compared to control, and the Sharper 5WDG exerted the lowest infestation in both the stations. The acaricide treatments significantly increased height and base diameter of plants, and yield in both the stations compared to control. The increased yield over control at Dhaka and Manikgonj ranged from 24.2% to 35.1% and 25.3% to 45.1%, respectively. The tested acaricides showed significant efficacy against jute yellow mite and the most effective result was obtained with Sharper 5WDG.

Keywords: Acaricide, *Polyphagotarsonemus latus*, infestation, mortality, yield

Introduction

Jute is the main fiber crop of Bangladesh which is cultivated in 758218 hectares of land with a total production of 8894683 Bales in the year 2018 (BBS 2018). Jute is grown in summer season. About 40 species of insects and mites are so far been identified as the pests of jute in Bangladesh (Anonymous 2014). These pests attack jute plants from seedling to harvesting stage. Among them yellow mite *Polyphagotarsonemus latus* Banks is the most common and destructive pests of jute.

Yellow mite is extremely polyphagous and attacks more than 60 plant families worldwide (Rahman and Khan 2006). Both the immature and adult *P. latus* attack young leaves of plant and cause damage by sucking cell sap resulting in wrinkle and curly appearance of the leaves (Nasrin *et al.* 2020). Mite infested jute leaves appear coppery or purplish color, dry up and eventually drop down (Banu *et al.* 1999). Levels of damage severity and resistance varied among the accessions of jute *Corchorus spp*. against mite *P. latus* (Banu *et al.* 1999). Yellow mite also attacks flower buds and seeds of young pods of jute. The infested flower buds cannot bloom properly. The floral parts become crinkled and the color changes into yellow to a blackish. Both yield and quality of fiber are reduced due to the attack of *P. latus* (Rahman *et al*. 2020).

Chemical acaricides are important and effective control method of pest management, especially during emergency, when the pest population exceeds the economic threshold level. In Bangladesh, many synthetic pesticides are available in the local market to control yellow mite but all of them are not available throughout the country and of similar effective. As such it is necessary to select alternate new acaricides for the control of jute yellow mite. Furthermore, farmers can choose pesticides according to the availability and cost. The present investigation was therefore undertaken with seven acaricides to find out their efficacy for controlling jute yellow mite.

Materials and Methods

The experiment was conducted in the Jute Agriculture Experimental Station at Dhaka and Jagir, Manikganj during the jute growing season (April-August) 2014.

Pot experiment: Tossa jute *Corchorus olitorius* variety O-9897 seeds were sown in pots in April 2014 at Jute Agriculture Experimental Station, Dhaka, Bangladesh. The pots were set following randomized complete block design with three replications. There were 5 plants in each pot. After 45 days of sowing when the plants were about 30 cm, laboratory reared yellow mites were inoculated to each plant of the pots. Whenever infestation has built up in all the plants then the acaricides were applied.

Field experiment: Field experiment was conducted in two jute research stations located at Dhaka and Manikganj. The jute plant was cultivated in unit plot size of 2m × 2m with three replications following randomized complete block design. Manures and fertilizers were applied according to the Fertilizer Recommendation Guide (FRG 2012). Irrigation and weeding were done whenever needed. After 60 days of sowing, when natural infestation was found, the acaricides were applied in the jute field.

Experimental treatments and observation of the mortality of mite: Seven acaricides **specially** Haysulf DF 80%, Ethiosul 46.5EC, Aimcoflo 80WDG, Thiovit 80WG, Ambush 1.8EC, Omite 57EC and Sharpper 5WDG were sprayed in the jute fieldd with concentrations of 0.13%, 0.06%, 0.35%, 0.06%, 0.04%, 0.06 and 0.05%, respectively. The control plots were kept untreated. Spread jute leaves were collected from the experimental plots at 24, 48 and 72 hours after treatment (HAT) and the number of mite/cm^2 area of a leaf was counted under a stereomicroscope. For each treatment five leaves were investigated at 24, 48 and 72 hours after treatment (HAT). The mortality rate was calculated in percentage using Henderson and Tilton (1955) formula:

$$Mortality(\%) = \left(1 - \frac{Nc \times nt}{nc \times Nt}\right) \times 100$$

Nc = Number of mite in control before treatment, nt = Number of mite in treatment after treatment, nc = Number of mite in control after treatment, Nt = Number of mite in treatment before treatment

Observation of plant infestation level and agronomic traits: Plant infestation data were recorded at the mature fruiting stage of the plants. Total plants and number of infested plants of each plot were counted at 5, 7 and 10 days after treatment, and the infestation rate was calculated into percentage. Numerical observation was done to measure plant agronomic traits specifically plant height and base diameter. Ten plants from each plot were randomly selected and their height (length from top to base) and diameter were measured using a mm-scale tape measure. With a view to evaluate the effect of different acaricides on the jute yield, crop was harvested from each plot. The obtained fiber yield was weighted and converted into t/ha, and percent increase of yield over control was calculated.

Data analysis: One-way analysis of variance (ANOVA) followed by Tukey HSD posthoc test was used for analyzing data and the analyses were performed using IBM SPSS 20.0.

Results and Discussion

The percent mortality of *P. latus* at 24, 48 and 72 hours after treatment ranged from 82.6% to 86.8%, 87.5% to 94.0% and 93.0% to 95.7%, respectively and the results differed significantly (Table 1). Sharper 5 WDG and Ehiosul 46.5 EC revealed the highest and lowest mortality rates of mite at 24, 48 and 72 hours after treatment. All the acaricides showed more than 90% mortality after 72 hours after treatment. The results are in accordance with the findings of Banu *et al*. (2007) who tested the efficacy of six acaricides on jute yellow mite and reported more than 90% mortality. Piao *et al*. (1999) found the highestlevel

Table 1. Efficacy of different doses of seven acaricides on the mortality of *Polyphagotarsonemus latus*

Acaricide	Dose (%)	Mortality rate (%) of yellow mite at different hours after treatment (HAT)		
		24HAT	48HAT	72HAT
Ethiosul 46.5 EC	0.13	82.6±1.2 ac	87.5±2.3 af	93.0±1.9 af
Haysulf DF 80 %	0.06	83.8±1.7 ac	92.8±1.6 ae	93.7±1.7 af
Aimcoflo 80 WDG	0.35	83.5±1.5 ac	90.2±2.0 af	93.5±1.6 af
Thiovit 80 WDG	0.06	85.6±1.5 ab	92.6±2.3 ae	94.1±1.7 af
Ambush 1.8 EC	0.04	83.4±1.7 ac	93.7±1.6 c	93.7±1.3 af
Omite 57 EC	0.06	82.8±1.8 ac	89.0±1.7 af	92.3±2.8 af
Sharper 5 WDG	0.05	86.8±2.0 a	94.0±1.5 ac	95.7±0.8 ab

Data expressed as mean±SE. Means within a column followed by same letter(s) are not significantly different by Tukey HSD posthoc at $p \leq 0.05$.

of mortality of *P. latus* when applied Ambush 1.8EC with concentration of 0.5 ml/L water.

Plant infestation rate at Dhaka is presented in table 2. Results showed that infestation rates at 5, 7 and 10 days after treatment varied from 6.4% to 47.5%, 6.0% to 47.4 and 0.8% to 47.4% respectively. All the treatments revealed that the significantly lower level of infestation compared to control. The present study showed that the infestation levels at 5, 7 and 10 days after treatment among the acaricides were statistically similar. The results differ from that of Rahman *et al*. 2016 who reported lower level of infestation after 7 and 10 days of treatment.

Table 3 showed the infestation level of different treatments at Manikgonj station. Results showed that the infestation level varied from 6.6% to 48.2% at 5 days after treatment; 3.7% to 48.2% at 7 days after treatment, and 2.3% to 48.2% at 10 days after treatment, respectively and the results differed significantly. All the treatments revealed significantly lower level of infestation compared to control.

The effect of the acaricides on plant height, base diameter and fibre yield differed significantly (Table 4). All the tested acaricides resulted significantly the higher plant height, base diameter and yield compared to control. Among the acaricides Sharper 5WDG treated plants showed the highest plant height (382.8cm), base diameter (17.5mm) and yield (3.5t/ha). Percentage of yield over control of the acaricide treatments varied from 24.2% to 35.1% and the result was obtained from Shaper 5WDG. The result of this study are in agreement with Talukder (2000) who reported that the acaricide Ambush significantly reduced mite population and exerted the higher plant height, base diameter and yield of jute.

Effect of different treatments on plant height, base diameter and yield of jute at Manikgonj ranged from 235.5cm to 384.1cm, 12.0mm to 17.7mm and 1.1 t/ha to 3.5t/ha, respectively and the results differed significantly (Table 5). All the acaricides revealed significantly the higher plant height, base diameter and yield than that of control. Sharper 5WDG exerted the higher plant height, base diameter and yield among the tested acaricides. Yield over control of the acaricides varied from 25.3% to 45.1% and the result was obtained from Shaper 5WDG. Banu *et al.* (2007) tested some acaricides against jute yellow mite and found that the treated plants had significantly higher yield over control.

The present findings revealed that the tested acaricides exerted significantly higher level of the mortality and lower level of infestation of jute yellow mite. The

Table 2. Effect of different acaricides on jute yellow mite infestation at Dhaka under field condition

Acaricide	Dose (%)	Plant infestation rate (%mean ± SE) at different day after treatment (DAT)		
		5 DAT	7 DAT	10 DAT
Ethiosul 46.5 EC	0.13	9.6±0.1 b	8.0±0.4 b	6.3±0.2 b
Haysulf DF 80 %	0.06	8.3±0.5 b	6.5±0.4 b	3.3±0.2 b
Aimcoflo 80 WDG	0.35	8.6±0.4 b	6.7±0.1 b	4.0±0.4 b
Thiovit 80 WDG	0.06	8.5±0.3 b	7.1±1.1 b	4.1±0.2 b
Ambush 1.8 EC	0.04	8.1±0.5 b	6.9±1.9 b	0.8±0.3 b
Omite 57 EC	0.06	8.5±0.2 b	7.6±0.3 b	4.7±0.1 b
Sharper 5 WDG	0.05	6.4±0.1 b	6.0±0.6 b	1.9±0.2 b
Control	-	47.5±2.9 a	47.4±2.9 a	47.4±2.9 a

Data expressed as mean±SE. Means within a column followed by same letter(s) are not significantly different by Tukey HSD posthoc at p ≤0.05.

Table 3. Effect of different acaricides on jute yellow mite infestation at Manikgonj under field condition

Acaricide	Dose (%)	% Infested plant (mean ± SE)		
		5 DAT	7 DAT	10 DAT
Ethiosul 46.5 EC	0.13	9.7±1.9 b	7.2±0.8 b	5.4±0.8 b
Haysulf DF 80 %	0.06	8.0±0.5 b	5.8±0.7 b	3.0±0.8 b
Aimcoflo 80 WDG	0.35	8.7±0.8 b	6.6±0.9 b	3.8±0.9 b
Thiovit 80 WDG	0.06	8.6±0.5 b	6.8±1.1 b	4.0±1.1 b
Ambush 1.8 EC	0.04	7.1±0.8 b	4.9±0.6 b	2.3±0.5 b
Omite 57 EC	0.06	8.0±0.7 b	6.4±1.0 b	5.0±0.8 b
Sharper 5 WDG	0.05	6.6±0.9 b	3.7±0.7 b	2.3±0.6 b
Control	-	48.2±1.0 a	48.2±1.0a	48.2±1.0 a

Data expressed as mean±SE. Means within a column followed by same letter(s) are not significantly different by Tukey HSD posthoc at p ≤0.05.

Table 4. Effect of different acaricides on plant height, base diameter and yield of jute as influenced by mite control under field condition at Dhaka

Acaricide	Dose (%)	Plant characteristics and yield			Yield increase over control (%)
		Plant height (cm)	Base diameter (mm)	Yield (t/ha)	
Ethiosul46.5 EC	0.13	318.9±5.4 d	15.0±0.4 c	3.0±0.1 b	24.2
Haysulf DF 80 %	0.06	359.0±6.9 ac	16.7±0.5 ac	3.1±0.1 b	28.4
Aimcoflo 80 WDG	0.35	346.3±7.3 bd	16.1±0.4 ac	3.1±0.1 b	26.9
Thiovit 80 WDG	0.06	339.4±7.9 cd	15.9±0.4 ac	3.1±0.1 b	26.6
Ambush 1.8 EC	0.04	371.3±8.1 ab	17.2±0.4 ab	3.2±0.1 ab	30.6
Omite 57 EC	0.06	323.3±5.3 d	15.4±0.4 bc	3.0±0.1 b	25.4
Sharper 5 WDG	0.05	382.8±6.9 a	17.5±0.5 a	3.5±0.1 a	35.1
Control	-	258.8±5.6 e	12.7±0.3 d	2.2±0.0 c	----

Data expressed as mean±SE. Means within a column followed by same letter(s) are not significantly different by Tukey HSD posthoc at p ≤0.05.

Table 5. Effect of different acaricides on plant height, base diameter and yield of jute as influenced by mite control at Manikgonj under field condition

Acaricide	Dose (%)	Plant characteristics and yield			Yield increase over control (%)
		Plant height (cm)	Base diameter (mm)	Yield (t/ha)	
Ethiosul46.5 EC	0.13	305.0±9.3 e	15.8±0.3 c	3.0±0.1 c	25.3
Haysulf DF 80 %	0.06	358.1±6.1ac	16.8±0.4 ac	3.2±0.1 bc	32.6
Aimcoflo 80 WDG	0.35	340.4±6.6 bd	16.3±0.3 bc	3.1±0.1bc	30.0
Thiovit 80 WDG	0.06	331.4±4.0 ce	16.2±0.3 bc	1.1±0.1bc	29.5
Ambush 1.8 EC	0.04	371.0±6.8 ab	17.3±0.3 ab	3.3±0.1 ab	36.8
Omite 57 EC	0.06	317.8±6.8 de	16.0±0.3 bc	3.1±0.1 bc	27.3
Sharper 5 WDG	0.05	384.1±6.4 a	17.7±0.4 a	3.5±0.1 a	45.1
Control	-	235.5±6.3 f	12.0±0.2 d	2.4±0.1 d	—

Data expressed as mean±SE. Means within a column followed by same letter(s) are not significantly different by Tukey HSD posthoc at p ≤0.05.

acaricides treated plants depicted higher plant height, base diameter and yield of jute. Sharper 5WDG was the most effective among the tested acaricides. All the acaricides showed more than 90% reduction of *P. latus* in two different geographical locations. Thus, the tested acaricides can be recommended for farmers use to control yellow mite of jute.

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