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EFFECTIVENESS OF SOME CHEMICALS AND BOTANICALS AGAINST JASSID (*Amrasca biguttula biguttula* Ishida) OF BRINJAL AND THEIR IMPACT ON SPIDERS AND LADY BIRD BEETLES

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ABSTRACT

To evaluate the effect of some chemicals and botanicals on jassid, *Amrasca biguttula biguttula* Ishida in brinjal and their impact on spiders and lady bird beetles, a field experiment was conducted at the experimental farm of Sher-e-Bangla Agricultural University, Dhaka during February to August 2007. The experiment comprised nine treatments viz. imidachloprid 200 SL, cypermethrin 10EC, carbosulfan 20EC, thiamethoxam 25WG, neem seed kernel, neem oil combined with trix, trix, mahua leaf extract and an untreated control. It was laid out in a randomized completely block design with 3 replications. The lowest population of adult (2.36 plant^{-1} at vegetative stage and 9.80 plant^{-1} during fruiting stage) and nymph (0.73 plant^{-1} at vegetative stage and 1.67 plant^{-1} during fruiting stage) was observed in carbosulfan treated plots, which gave the maximum protection of brinjal against jassid attack by reducing pest population. Among the botanicals tested, neem oil in combination with trix, and neem seed kernel showed satisfactory control of jassid on brinjal. Trix and mahua leaf extract reduced the infestation of jassid in comparison with control but their effectiveness was not satisfactory. Carbosulfan, imidachloprid and cypermethrin reduced more than 80% population of spiders and lady bird beetles.

Key words: Carbosulfan, imidachloprid, thiamethoxam, cypermethrin, botanical

INTRODUCTION

Cotton jassid (*Amrasca biguttula biguttula* Isida) is the second major pest of brinjal (Alam *et al.*, 2003; Latif, 2007). Both nymphs and adults suck the sap from lower surface of the leaves. They also inject saliva into the tissues, which causes toxemia and injury of the leaves. The infested leaves curl upwards along the margin and ultimately the whole leaf gradually dries up and drops off from the plant. The plant becomes stunted and the quality of fruit is also affected (Nair, 1986). They also transmit viral disease like mosaic. The younger plants were found susceptible to jassid attack than the older plants (Ali, 1990).

The management of jassid (*Amrasca biguttula biguttula* Ishida) through various non-chemical methods namely cultural, mechanical, biological and host plant resistant etc. was limited throughout the world. Moreover, management practices in Bangladesh and other countries are still limited to frequent spray of toxic chemical pesticides (Alam, 2005; Anon., 2005; Misra and Senapati, 2003; Singh and Choudhary, 2001; Bhargava *et al.*, 2001). The insecticides used mostly belong to organophosphates, carbamates, and synthetic pyrethroid groups. The farmers of Bangladesh usually apply six to eight schedule based insecticide sprays against this pest throughout the season. But this kind of insect pest control strategy relying solely on chemical protection had got many limitations, and undesirable side effects. This in the long run led to many insecticides related complications such as direct toxicity to beneficial insects, fishes and other non target organisms, human health hazards, resurgence of pests, out break of secondary pest and environmental pollution (Latif, 2007; FAO, 2003; Pedigo, 2002). To overcome the hazards of chemical pesticides, some botanicals such as

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neem seed kernel extracts, neem oil, and soap water are now used in many developed and developing countries for combating this pest infestation with the aim of increasing crop yield (Hossain *et al.*, 2003; Mote and Bhavikatti, 2003; Singh and Kumar, 2003; Rao and Rajendran, 2002). But in Bangladesh, information on the efficacy of neem and other botanicals, soap water are scanty. Moreover, the information regarding the effect of these chemical and botanical pesticides on predaceous insects is not well documented. Therefore, an attempt has been taken to investigate the effectiveness of some chemicals and botanicals on jassid in brinjal and their impact on predaceous spider and lady bird beetles in the brinjal field.

MATERIALS AND METHODS

The experiment was carried out at the experimental field of the Sher-e-Bangla Agricultural University (SAU), Dhaka, Bangladesh during February to August, 2007. The experiment was laid out in a completely randomized block design (RCBD) with three replications. There were nine treatments in this experiment viz. T_1 = admire (Imidachloprid) 200SL @ 1.2 ml L^{-1} of water, T_2 = marshal (Carbosulfan) 20EC @ 2.0 ml L^{-1} of water, T_3 = ripcord (Cypermethrin) 10EC @ 1.0 ml L^{-1} of water, T_4 = actara (Thiamethoxam) 25WG @ 0.3 g L^{-1} of water, T_5 = neem seed kernel @ 25 g L^{-1} of water, T_6 = neem oil + Trix @ (3.0 ml + 1.0 ml) L^{-1} of water, T_7 = trix @ 5 ml L^{-1} of water, T_8 = mahua leaf @ 5.0 g L^{-1} of water and T_9 = untreated control. The whole field was divided into three blocks of equal size having 1 m space between the blocks and 1 m between the plots. The unit plot size was 3 m × 2 m accommodating eight pits/plot. The distance between rows was 1 m and that of the plants was 60 cm. Brinjal variety, "Shingnath" was grown following the recommended practices as described by Rashid (1999). The full dose of cow dung and triple super phosphate (TSP) was applied as basal dose during land preparation. One third of the muriate of potash (MP) and urea was applied in the pits one week before transplanting and rest of the MP and urea were applied as top dressing after 21, 35 and 50 days of transplantation. Irrigation and mulching were done as and when required. The chemicals and botanicals were applied with the help of Knapsack sprayer. The first application of insecticides was initiated after 20 days of transplantation and subsequent applications in each treatment were made at seven days interval. Precautions were taken to avoid drift to the adjacent plots. The population dynamics of the jassid was studied on treated and untreated plots of brinjal throughout the cropping season starting from 30 days after transplantation. Adults and nymphs of jassid were counted from a random sample of five plants taken from each plot. Five leaves were chosen randomly on each plant, two from the bottom (older leaves), one from the middle and two from the top (younger leaves). The lower surface of the leaf was thoroughly examined for the presence of insects. Counts were made before 08.00 hr to avoid the excessive mobility of the adult insects after this time, but nevertheless, the migration of the fast moving and mobile adults from one plot to the other could not be totally avoided. The data were pooled over the cropping season and the population density was expressed as number of individuals per five leaves of the plant. The population of spiders and lady bird beetles were also counted by randomly selected five branches from 5 plants of each plot at weekly interval.

Data were analyzed by using MSTAT-C software for analysis of variance after square root transformation. ANOVA was made by F variance test and the pair comparisons were performed by Duncans, Multiple Range Test (DMRT).

RESULTS AND DISCUSSION

Effect of different treatments on jassid

The effect of different chemicals and botanicals on population of jassid in brinjal was assessed at vegetative and fruiting stages of brinjal. At vegetative stage of brinjal, the lowest number of adult (2.36 plant^{-1}) was observed in carbosulfan treated plots, which was significantly lower than all other treatments (Table 1). During the fruiting stage of the crop, the lowest number of adult (9.80 plant^{-1}) was also found in the same treatments and no significant difference was observed between imidachloprid and cypermethrin regarding this parameter. On the other hand, significantly higher number of adult jassid was observed in untreated control at both vegetative and fruiting stages (7.27 plant^{-1} and 24.07 plant^{-1}, respectively) of the crop. Application of neem oil in combination with trix and neem seed kernel had the similar level of jassid population (13.40/plant and 12.67plant^{-1}, respectively) during the fruiting stage but significantly lower than thiamethoxam treatments.

The data (Table 1) also revealed that spraying of carbosulfan showed the highest effectiveness by reducing maximum adult population of jassid at vegetative as well as fruiting stages of brinjal. Application of imidachloprid and cypermethrin reduced more than 50-55% of jassid population as compared to control. Spraying of neem oil in combination with trix and neem seed kernel reduced higher percentage of adult jassid than thiomethoxam. Although spraying of mahua leaf extract reduced a substantial amount of adult jassid compared to control, but its performance was poor in relation to other treatments.

Table 1. Number of adult jassids at two different stages of brinjal

Treatments	Vegetative stage		Fruiting stage	
	Number of adult	Percent reduction over control	Number of adult	Percent reduction over control
Imidachloprid	2.60 g	64.24	10.64 f	55.80
Carbosulfan	2.36 h	67.54	9.80 g	59.29
Cypermethrin	3.13 f	56.95	11.93 f	50.44
Thiamethoxam	4.00 d	44.98	14.87 d	38.22
Neem seed kernel	3.80 d	47.73	13.40 e	44.33
Neem oil + Trix	3.36 e	53.78	12.67 e	47.36
Trix	5.60 b	22.97	17.27 b	28.25
Mahua leaf	4.87 c	33.01	15.93 c	33.82
Untreated control	7.27 a		24.07 a	
$LSD_{(0.05)}$	0.41		1.13	
CV (%)	6.78		7.05	

In a column, means having similar letter(s) are statistically identical at 5% level of significance

Similarly, the lowest population of jassid nymph was found in carbosulfan at vegetative as well as fruiting stages of brinjal (0.73 plant^{-1} and 2.20 plant^{-1}, respectively), which was statistically identical with imidachloprid treatment (Table 2). Spraying of neem oil in combination with trix and neem seed kernel had the similar level of nymph population at both the stages of crop growth. The Table 2 further showed that the population of nymph was the highest in control plots, which was significantly higher than all other treatments. However, no significant difference was observed regarding population of nymph in thiamethoxam, neem seed kernel and neem oil in combination with trix

treated plots at vegetative stage of the crop but it was significantly higher in thiomethoxam than neem seed kernel during fruiting stage of brinjal.

In terms of reduction of nymph population over control, carbosulfan performed the best effectiveness by reducing more than 80% population in both stages of brinjal. Although imidachloprid reduced 83.53% population of nymph at vegetative stage, however, it reduced 79.42% nymph population compared to control during fruiting stage of brinjal (Table 2). Neem oil combined with trix and neem seed kernel spraying showed better performance than thiamethoxam in reducing the nymph population of jassid in brinjal.

Table 2. Number of jassid nymphs at two different stages of brinjal

Treatments	Vegetative stage		Fruiting stage	
	Number of nymph	Percent reduction over control	Number of nymph	Percent reduction over control
Imidachloprid	1.00 e	83.53	2.20 d	79.42
Carbosulfan	0.73 e	87.97	1.67 d	84.38
Cypermethrin	1.33 e	78.09	2.73 d	74.46
Thiamethoxam	2.87 d	52.72	5.27 b	50.70
Neem seed kernel	2.47 d	59.31	4.76 c	55.47
Neem oil + Trix	2.00 d	67.05	4.04 c	62.21
Trix	4.07 b	32.95	6.64 b	37.89
Mahua leaf	3.40 c	43.99	5.96 b	44.25
Untreated control	6.07 a	--	10.69 a	--
$LSD_{(0.05)}$	6.09		1.35	
CV (%)	5.96		8.33	

In a column, means having similar letter(s) are statistically identical at 5% level of significance

The above results indicate that carbosulfan was the most effective insecticide against the nymph and adult jassid in brinjal; imidachloprid was also showed the similar performance but none of the insecticides was able to exceed the standard level of 80% reduction in case of adult in both stages of the crop. Although, carbosulfan was able to exceed the standard level (80%) in reduction of nymph population over control in both stages of crop, however, imidachloprid failed to exceed the standard level of reduction (80%) of nymph/plant during fruiting stage. Neem oil combined with trix, neem seed kernel, and thiamethoxam were moderately effective against jassid in brinjal and trix showed the least effectiveness in reducing jassid population. Mahua leaf extract had considerable effect on reduction of jassid population in brinjal but its effectiveness was unsatisfactory.

The results of this study agree with the findings of Misra and Senapati (2003) who reported that imidachloprid gave the significant control of jassid. The higher efficacy of carbosulfan against jassid population on brinjal could not compare with that of the others due to lack of available information. The moderate effect of neem seed kernel against jassid population in the present investigation confirms the findings reported by Mote and Bhavikatti (2003) and Obeng-Ofori and Sackey (2003), who observed that aqueous neem seed extract was moderately effective against jassid. Moreover, the effectiveness of trix obtained in the present study agrees with the findings of Hossain *et al.* (2003) who reported that soap powder application reduced the jassid population on cotton. These findings partially contradict to the findings of Kaur (2002) who observed higher efficacy of cypermethrin against population of cotton jassid. These results also contradict with those of Singh and Kumar (2003) who reported the highest efficacy of neem seed kernel in controlling okra jassid. However, the difference of the results is logical because effectiveness of any insecticides may vary with crop canopy, spraying methods and ecological variations.

Effect of different treatments on spiders and lady bird beetles in the brinjal field

The effect of different chemicals and botanicals on the population of spider and lady bird beetle in brinjal field has been presented in Table 3. The data revealed that carbosulfan treated plots had the lowest number of spider (0.08 plant^{-1}), which was significantly different from all other treatments. In contrast, the highest number of spider (1.49 plant^{-1}) was observed in control plots, which was significantly higher than all other treatments. The other treatments had significantly lower number of spiders than control. In terms of reduction of spider population, all chemicals and botanicals reduced the spider population in the brinjal field. Carbosulfan reduced 94.63% spider population in brinjal field followed by imidachloprid, cypermethrin and neem oil combined with trix, which respectively reduced 87.92%, 76.51% and 71.14% spider population. Neem seed kernel and thiamethoxam had moderate effect while mahua leaf and neem oil + trix had less effect in reducing spider population.

Table 3. Effect of different treatments on the population of spider and lady bird beetles in the brinjal field

Treatments	Number of spider plant^{-1}	Percent decrease over control	Number of lady bird beetle plant^{-1}	Percent decrease over control
Imidachloprid	0.18 f	87.92	0.21 g	91.89
Carbosulfan	0.08 g	94.63	0.14 g	94.59
Cypermethrin	0.35 e	76.51	0.31 f	88.03
Thiamethoxam	0.65 c	56.38	0.58 d	77.61
Neem seed kernel	0.54 d	63.76	0.50 e	80.69
Neem oil + Trix	0.43 e	71.14	0.42 e	83.78
Trix	0.85 b	42.95	0.79 b	69.50
Mahua leaf	0.78 b	47.65	0.70 c	72.97
Untreated control	1.49 a	--	2.59 a	--
$LSD_{(0.05)}$	0.08		0.08	
CV (%)	7.78		6.57	

In a column, means having similar letter(s) are statistically identical at 5% level of significance.

The data (Table 3) also showed that the number of lady bird beetle was the lowest (0.14 plant^{-1}) in carbosulfan treated plot followed by 0.21plant^{-1} in imidachloprid having no significant difference between them. In contrast, the highest number of lady bird beetle (2.59plant^{-1}) was observed in control, which was significantly higher than all other treatments. The other chemicals and treatments had significantly lower number of lady bird beetle than control. In terms of reduction of lady bird beetle population all chemicals and botanicals reduced the population of lady bird beetle in brinjal field. Carbosulfan, imidachloprid, cypermethrin, neem oil combined with trix and neem seed kernel reduced more than 80% lady bird beetle population over control. However, carbosulfan and imidachloprid had the strong negative impact on lady bird beetle. Other treatments had moderate effect on these two predators.

The results thus obtained in the study indicate that carbosulfan, imidachloprid, cypermethrin and neem oil combined with trix had strong negative effect, while thiomethoxam and neem seed kernel had moderate impact on predaceous insect in brinjal field. The findings of the current study suggest that trix and mahua leaf extract had no deleterious effect on spider under field condition when applied at seven days intervals. The negative impact of most of the insecticides against lady bird beetle and spider thus obtained in the present study agrees with the findings reported by many researchers. FAO

(2003) reported that application of insecticides reduced the population of beneficial insect especially spiders and lady bird beetle from the brinjal plant. Maleque *et al.* (1999) and Rahman (2006) reported that the lady bird beetles and spiders were seriously affected in the field when cypermethrin was applied at weekly intervals. Less toxicity of imidachloprid against different species of lady bird beetle and spider was also reported by other researchers (Kannan *et al.*, 2004, Katole and Patil, 2000), which contradicts the findings of the present study. The difference in results may be due to different types of crops and ecological conditions. Considering the effectiveness of different treatments against jassid, conservation of natural enemies, health hazards and environmental safety point of view neem oil in combination with trix may be used for the management of jassid population in brinjal.

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