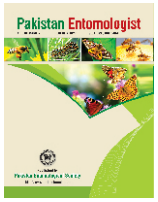
Pakistan Entomologist

Journal homepage: www.pakentomol.com



RELATIVE SUITABILITY OF VARIOUS INSECTICIDE FOR EARLY CROP MANAGEMENT OF COTTON AGAINST SUCKING INSECT PEST COMPLEX ESPECIALLY DUSKY COTTON BUG *OXYCARENUS HYALINIPENNIS* (HEMIPTERA: OXYCARENIDAE)

Ghulam Abbas[1*], Najamul Hassan[1], Ikramul Haq[1], Muhammad Farhan[1] and Haider Karar[2]

[1]Pest Warning and Quality control of Pesticides, Punjab, 21- Agha khan Road, Lahore, Pakistan.
[2]Entomological Research Sub Station, Multan, Pakistan.

ARTICLE INFORMATION

Received: April 10, 2014
Received in revised form: September 5, 2014
Accepted: October 2, 2014

***Corresponding Author**:
Ghulam Abbas
E-mail: drabbas18@gmail.com,

ABSTRACT

Cotton growers are much concerned about early crop health of cotton and use pesticides to control dusky cotton bug (DCB) without knowing its adverse effect at that stage as they think that it is responsible for early shedding of fruiting parts. The present study was carried out to evaluate the performance of ten pesticides including Rignil (fipronil 5 SC),Tara crop science @ 480 ml/acre; Pyriban (chlorpyriphos 40% EC), Helb prsticides & chemicals @ 500ml/acre; Radiant (spintoram 11.7% EC), Arysta Life science @ 60 ml/acre; Karate (lamda cyhalothrin 2.5 EC), Syngenta Pak. Ltd. @300 ml/acre; Concept (pyriproxyfen, 10.5 EC), Kanzo AG @ 200ml/acre; Bono (acetamiprid 20% SL), Helb pesticides & chemicals @ 125ml/acre; Pyramid (nitenpyram 10% AS) Kanzo AG @ 200 ml/acre; Polo (diafenthiuron 5% EC), Syngenta Pvt. Ltd. @ 200ml/acre; Starfen (bifenthrin 10% EC), Tara Crop Science @ 250 ml/acre; and Vibrant (chlorfenapyr 36 SC), Kanzo AG @ 200 ml/acre at early cotton stage when only adult stage of DCB is found in rolled leaves, buds, flowers and sepals of the fruiting parts. The effects of these insecticides on plant health, DCB and remaining insect pest complex were investigated. The results revealed nonsignificant effect of insecticides on percent increase of fruiting parts and plant height. Chlorpyriphos (94.5%), lamda cyhalothrin (87%), spintoram (74.7%) and fipronil (71.7%) proved the most effective and toxic insecticides against DCB and can be used in cotton management program. However, if the beneficial fauna has established then lamda cyhalothrin, spintoram or fipronil can be preferred for avoiding mass destruction of beneficial fauna.

Keywords: Dusky cotton bug, Cotton strainer, *Oxycarenus*, Seed bug

INTRODUCTION

Cotton is an important cash crop of Pakistan which contributes 7 percent to the national economy in the value added in Agriculture sector and it directly contributes 1.7 percent of the GDP of the country (Farooq, 2014). Unfortunately, it is attacked by a complex of major and minor pests (PWQCP, 2013). For last few years, dusky cotton bug or cotton strainers which was already recorded and rendered as a minor pest has become more problematic than before (PWQCP, 2013, Akram *et al.*, 2013, Shah, 2014). It has been reported that specific level identification of *Oxycarenus* spp (Hemiptera: Oxycarenidae) is confusing. Some scientists have reported it as *Oxycarenus laetus* Kirbi (Srinvas and Patil, 2004); whereas, others have reported it as *Oxycarenus hyalinipennis* (Raman and Sanjayan, 1983; Landry, 2010; Sammaiah *et al.*, 2012) while some have avoided to designate it until proper taxonomic research. The best way to report it is *Oxycarenus* spp. (Akram *et al*., 2013, Shah, 2014). It is most probably *Oxycarenus hyalinipennis* (Hemiptera: Oxycarenidae) (with reference to G. Rosser, Plant Pest Diagnostic Centre, CDFA, California, USA, personnel communication). About 11 different pesticides are available in the market and have been evaluated for their efficacy but at

Cite this article as: Abbas, G., N. Hassan, I. Haq, M. Farhan and H. Karar, 2014. Relative suitability of various insecticide for early crop management of cotton against sucking insect pest complex especially dusky cotton bug *Oxycarenus hyalinipennis* (Hemiptera: Oxycarenidae). Pak. Entomol., 36(2):129-133.

the time of boll opening stage when the pest multiplies rapidly and mature as well as immature stages of the pest are available (Akram *et al*., 2013).

The present study was carried out at early cotton stage when only adult stage of pest is found in rolled leaves, buds, flowers and sepals of the cotton plants as well as in the cracks and crevices of the trunks of nearby plants. At this stage, most of the farmers want to get rid of the pest because of the pest phobia created by the private workers (an unpublished survey from 30 farmers made by authors). Although there is no proof, but about 86.7 % farmers think that dusky cotton bug is responsible for early shedding of flower and buds in cotton (an unpublished survey from 30 farmers made by authors). In these circumstances there was a dire need to investigate the suitability of available pesticides for use at early cotton growth stage against dusky cotton bug imposing no or minimum adverse effect on cotton plant growth and naturally present beneficial fauna.

MATERIALS AND METHODS

The study was conducted on a private farm owned by Mr. Rana Abdul Salam situated in Chack Himta, tehsil and district Lodhran. One acre field out of his 4 acres was selected keeping in view the approach and feasibility of sparing it from his own practices till the final collection of data. The selected field was surrounded by 16 medium size *Acacia arabica* (kikar) trees deliberately sown by the farmer as farm forestry and a heap of dry cotton sticks kept for use as fire wood by the farmer. The reason for mentioning these two observations is that both of these factors facilitated the easy carryover of the pest and favored the increased population of dusky cotton bug on the tested crop. The research trial was conducted under Randomized Complete Block Design with 10 treatments and 3 replications. The field was divided into thirty equal small plots leaving nominal non experimental area from the borders, which was taken as control.

Ten pesticides including Rignil (fipronil 5 SC),Tara crop science @ 480 ml/acre; Pyriban (chlorpyriphos 40% EC), Helb prsticides & chemicals @ 500 ml/acre; Radiant (spintoram 11.7% EC), Arysta Life science @ 60 g/acre; Karate (lamda cyhalothrin 2.5 EC), Syngenta Pak. Ltd. @ 300 ml/acre; Concept (pyriproxyfen, 10.5 EC), Kanzo AG @ 200 ml/acre; Bono (acetamiprid 20% SL), Helb prsticides & chemicals @ 125 ml/acre; Pyramid (nitenpyram 10% AS) Kanzo AG @ 200 ml/acre ; Polo (diafenthiuron 5% EC), Syngenta Pvt. Ltd. @ 200 ml/acre; Starfen (bifenthrin 10% EC), Tara Crop Science @ 250 ml/acre; and Vibrant (chlorfenapyr 36 SC), Kanzo AG @ 200 ml/acre were evaluated in RCBD. A control treatment receiving spray of water only was also maintained.

The cotton was sown on April 19, 2013 and pretreatment data was initiated when the cotton plants were 46 days old. At that time, its average height and average fruiting parts /plant were 61± 6.2 centimeters and 21.4 ± 4.6, respectively. Pre-spray data was taken and then plots were treated with the chemicals at the doses mentioned in above paragraph on June 4, 2013 after proper calibration which was carried out to evaluate the quantity of water required as well as actual quantity of pesticide required in the plot on the basis of mentioned doses. The population reduction was recorded 48 hours and 168 hours after treatment.

The data regarding population of sucking insects pests including Jassid, *Amrasca devastans* (Hemiptera: Cicadellidae), whitefly, *Bemisia tabac*i (Hemiptera: Aleyrodidae), thrips, *Thrips tabaci* (Thysanoptera: Thripidae) and dusky cotton bug, *Oxycarenus hyalinipennis*.(Hemiptera :Oxycarenidae) and beneficial fauna like orius bug, *Campyloma* sp. big-eyed bug, pirate bug, assasian bug, *Chrysoperla carnea*, lady bird beetle, *Scymminus* sp., predatory mite, spiders, ants and Hymenopterous parasitoids were recorded. The data on plant health parameters including plant height and fruiting parts were also recorded to note that possible effects of the used pesticides on plant health.

Statistical analysis was performed with statistical software Minitab 15 and relevant graphs were also generated through this software.

RESULTS AND DISCUSSION

There was a significant difference in average of treated and untreated plants ($p < 0.05$) meaning thereby that efficacy of all the pesticides was different from one another (Fig. 2. All the observed dependent parameters demonstrated statistically nonsignificant variation in their response to treatments (insecticides) except the population reduction of dusky cotton bug 168 hours after treatment (HAT) ($p < 0.05$) (Table 1). Graph 1 shows the performance of the pesticides used in the experiment 48 HAT. Chlorpyriphos demonstrated 96.2% reduction in the population of dusky cotton bug (DCB) and proved the highly effective and consistent in its performance followed by lamda cyhalothrin which explained 60.6% reduction in the population of DCB but was found less consistent in its performance than chlorpyriphos. Spintoram resulted in 51.3% reduction in DCB and was found statistically similar to but relatively more consistent than lamda cyhalothrin. Nitenpiram exhibited 50.2% population reduction of DCB with consistent performance in all replications (Fig. 1).

At 168 HAT, chlorpyriphos demonstrated 94.5% population reduction of DCB and proved highly effective followed by lamda cyhalothrin (87%), spintoram (74.7%) and fipronil (71.7%). The order of performance of evaluated insecticides against dusky cotton bug was chlorpyriphos > lamda cyhalothrin > spintoram > fipronil > acetameprid > bifenthrin > nitenpiram > pyriproxifen > diafenthuiron > chlorfenapyre(Fig. 2).

The non significant effect on % population reduction of other sucking pests is because of the fact that population of whitefly, jassid and thrips had not yet established well, in the field, at the time of experiment. A little variation in the population of the insect pests recorded in the field resulted in wide range of variation in numerical data recorded from randomly selected plants during study. It is due to this wide range of variation, that the effect of treatments was not clear enough to be reported as significant statistically, as elaborated in Table 2. For example, the average population of jassid per treatment from minimum to quartile-3 (Q3) was zero. It cannot be calculated in terms of percentage of population reduction (Table 2). Similarly, the average population of thrips and beneficial fauna per treatment from minimum to

quartile-1 (Q1) was zero and hence, percentage of population reduction cannot be calculated (Table 2). Similar is the case for median, for example if population of pest in one observation is 1, and suppose, in the next observation it turns to 0; the reduction turns to 100%, and if the same is 2, the percent population reduction is 100% or -100%, this wide range of calculated variation in data declared that effect of treatments was non significant. Anyhow, the results have revealed the performance trend of various pesticides against non target fauna in this experiment (Table 1). It has been observed that pesticides having better contact and volatile action have better results against dusky cotton bug as compared to systemic ones. It also suggests that sap feeding of the DCB on cotton is not established. The results are in conformity with Akram *et al*. (2013) who have declared that contact poisons of organophosphate group have better effect on the pest. Anyhow, in this experiment new chemistry pesticides like spintoram and fipronil have also proved effective against pest which was not used in their experiment. The trend of pesticides toward beneficial fauna reduction as noted in this experiment in descending order was nitenpiram = bifenthrin > diafenthuiron > chlorpyriphos > acetameprid > fipronil= chlorfenapyre > lamda cyhalothrin > spintoram > pyriproxifen. The trend observed although does not have third party (statistical support) in its validity, but it is nearest to field observations of the authors and opens new avenue for the researches for confirmation.

Non significant effect on percent increase of fruiting parts and plant height suggests that the effect is not measureable in only one week. However, repeated and continuous applications of the treatments for multiple weeks may result in a statistically significant variation in the data regarding fruiting parts and plant height.

The trend of % average plant height increase after 168 hours of the application in descending order was chlorfenapyre > lamda cyhalothrin > chlorpyriphos > acetameprid > bifenthrin > Nitenpiram > pyriproxifen > spintoram > diafenthuiron > fipronil. As stated in above paragraph the trend observed although lacks statistical support (p value 0.922, Table 1) in its validity, but it is provides a basis of verification for other researches for confirmation.

CONCLUSION

For dusky cotton bug management, chlorpyriphos (94.5%), lamda cyhalothrin (87%), spintoram (74.7%) and fipronil (71.7%) explained good results and can be used in cotton management program. However, if the beneficial fauna has established then lamda cyhalothrin, spintoram or fipronil can be preferred for avoiding mass destruction of beneficial fauna.

Table 1

Significance in variation of different dependent parameters, p values and summary of treatments performance as observed in the experiment.

Factors under observation	P value for population change 48 HAT* at 5% CI**)	Summary of results (Top 3 -4 treatments)	P value for population change 168 HAT* at 5% CI**)	Summary of results (Top 3-4 treatments)
Dusky cotton bug *Oxycarenus* spp.	0.093	chlorpyriphos > lamda cyhalothrin > nitenpiram > spintoram	0.001	Chlorpyriphos > lamda cyhalothrin > Nitenpiram > spintoram
White fly *Bemisia tabaci*	0.730	Chlorpyriphos> bifenthrin> spintoram> diafenthiuoron	0.680	Nitenpiram> cyhalothrin Chlorpyriphos> spintoram
Jassid *Amrasca devastans*	Nil	Negligible population No comparison was possible	Nil	Negligible population No comparison was possible
Thrips *Thrips tabaci*	0.875	Bifenthrin> chlorfenapyre > nitenpiram > pyriproxifen	0.141	Bifenthrin> nitenpiram > chlorfenapyre> acetameprid
Benificial fauna	0.357	Pyriproxifen > diafenthiuoron > chlorpyriphos> fipronil	0.545	Diafenthiuoron= nitenpiram > acetameprid > chlorpyriphos
Fruiting parts Increase	0.578	Chlorfenapyre> Cyhalothrin> chlorpyriphos	0.696	Chlorfenapyre> Cyhalothrin> chlorpyriphos
Plant height Increase	0.209	Nitenpiram > Fipronil > chlorfenapyre > chlorpyriphos	0.922	Diafenthiuoron > Cyhalothrin > Bifenthrin = chlorpyriphos

*HAT= Hours After Treatment**CI= Confidence Interval

Table 2

Basic statistics regarding various variables studied in the research trial against dusky cotton bug.

Variable	Mean	SE Mean	Minimum	Q1	median	Q3	Maximum	Skewness
white fly	4.53	0.56	1.0	2.0	4.0	6.0	6.0	1.12
Jassid	0.07	0.07	0	0	0	0	2.0	5.48
Thrips	1.27	0.45	0	0	0.5	2.0	0.5	2.0
B. fauna	0.972	0.16	0	0	1.0	1.25	3.0	0.70
Fruiting	2.06	0.76	14	19	22	25	35	0.72
Height	0.13	0.99	49	56.75	61.0	64.0	71	-0.04

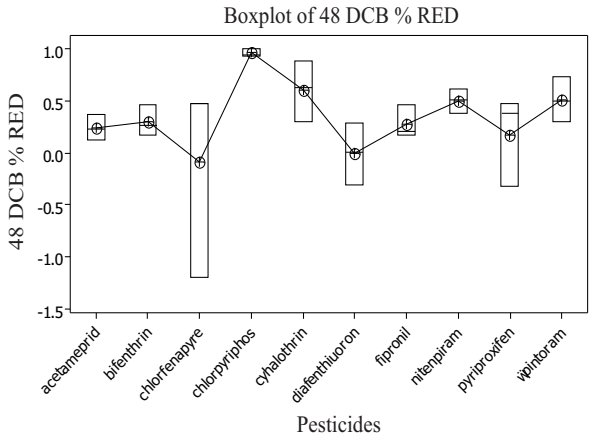


Fig. 1

Minitab software generated graph showing the performance of tested pesticides against percent population reduction of dusky cotton bug *Oxycarenus hyalinipennis* on cotton after 48 hours of the treatment (y-axis= % reduction in population of DCB, 48 hours after treatment)

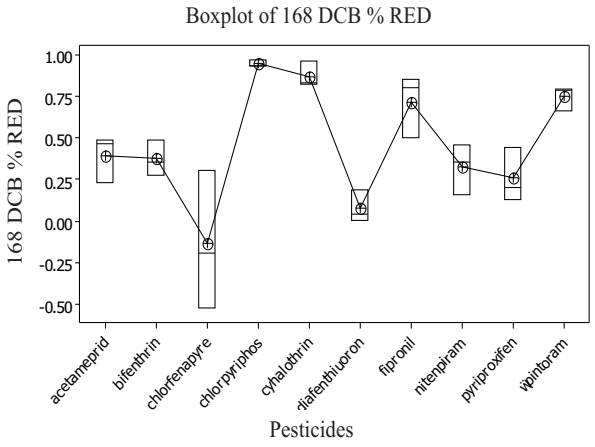


Fig. 2

Minitab software generated graph showing the performance of tested pesticides against percent population reduction of dusky cotton bug *Oxycarenus hyalinipennis* on cotton after 168 hours of the treatment
(y-axis = % reduction in population of DCB, 168 hours after treatment)

ACKNOWLEDGEMENT

Current studies were conducted at a private farm of the farmer under special directions of Malik Muhammad Fiaz, Director General, Pest Warning and Quality Control of Pesticides, Punjab, Lahore to explore a ready remedy of this problem so that farmers and cotton growers do not waste their resources in hit and trials. Authors are also thankful to Muhammad Abbas, pest surveyor and Hassan Sardar, field assistant for their help in taking data from the field. Thanks are also due to Govt. of the Punjab, Pakistan for using the official resources in the conduct of research trial.

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