INTEGRATED CONTROL OF MANGO MEALY BUG *DROSICHA STEBBINGI* GREEN (HEMIPTERA; MARGARODIDAE) INFESTING FORESTRY TREE SPECIES AT THE PAKISTAN FOREST INSTITUTE, PESHAWAR

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Abstract

Drosicha stebbingi appeared in epidemic form during 1995-96 in the research gardens and avenue trees at the Pakistan Forest Institute Campus, Pehawar. An integrated control strategy was developed where cultural, mechanical and chemical methods were incorporated. During November - December 1.5 to 2.0 meter area around each previously infested trees of *Jacranda mymosipholia* and *Paulownia* spp. were hoed and in following February sticky bands were applied on stems at breast height level. For chemical control two experiments were carried out in RCBD. In first experiment five insecticides, i.e. Buldock 25EC, Endon 35EC, Fenvelrate 20EC, Mepra 50EC and Sherpa 5EC were sprayed on stems of Paulownia spp. at the dose rate of 0.2% of given formulations. All the test insecticides reduced the pest population significantly over control with Mepra 50EC most effective affording 2.4, 1.8 and 0.97 individuals of *D.stebbingi* per 225 cm^2 bark area after 24, 48 and 72 hours of treatment, respectively. In the second experiment same five insecticides were sprayed on stems of *Jacranda mymosipholia* at the dose rate of 0.1, 0.2 and 0.5% of active ingredients. All the test insecticides were significantly effective in all test doses, however the differences among the dose rates were statistically nonsignificant. Endon 35EC and Mepra 50EC were most effective @ 0.5% having 3.5, 0.9, 2.1 and 3.6, 2.8, 1.5 individuals of *D.stebbingi* per 225 cm^2 of treated bark area after 24 , 48 and 72 hours, respectively.

The results indicated that integration of banding of tree trunks, destruction of eggs by soil working and application of insecticides was the most effective control strategy. Among the insecticides Mepra 50EC and Endon 35EC @ 0.2%

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are recommended for economical and ecological safe control of manago mealy bug.

Introduction

Giant mango mealy bug, *Drosicha stebbingi*, is a widely distributed and a very common polyphagous insect in the Indo-Pak subcontinent. Principally it is a pest of *Mangifera indica and Shorea robusta*, however also infests numerous other broad leaved tree species like *Acacia nilotica, Achras zapota, Albizia lebbeck, Artocarpus integra, Butea monosperma, Cupressus sempervirens, Dalbergia sissoo, Eucalyptus spp., Ficus glomerata, Juglans regia, Mimusops elengi, Morus alba, Pongamia pinnata, Prosopis spicigera, Syzygium cuminii, Tamarindus indica, Terminalia arjuna, Toona ciliata, Zizyphus mauritiana, Phyllanthus emblica, Cordia dichotoma, Prosopis juliflora and Solanum nigrum* and occassionally conifers (Browne, 1968; Varshney, 1985; Chandra, 1988; Yadav & Rizvi, 1994).

There is sexual dimorphism in the life-cycle of the insect. The males are winged while females are wingless. The emergence of both the adults occurrs in March - April. The adult female covered with a white mealy powder lays her eggs in an egg sac among the soil litter in May - june after mating with male. The eggs remain in the soil for about eight months.

The nymphs emerge in January - February and only the female nymphs crawl up into the crowns of trees. where they feed gregariously on the sap of leaves, shoots and twigs or at wounds on older branches completing their development and continuing to feed as adults. While the male nymphs usually remain in the middle portion of the trees and do not climb to the top. After transformation into imago they fly up and fertilize the female. The fertilized females feed less continuously and eventually crawl back to the ground, where they die soon after oviposition. Much honey dew, after appearing as a conspicuous whitish encrustation on the host is produced by the feeding mealy bugs, this and associated sooty mould by blocking the stomata of the leaves, aggravates the direct injury done by the drainage of the sap. Heavy infestation results in the death of shoots and twigs and deformed growth of saplings.

Chen, (1984) got more than 90% mortality of *Drosicha corpulenta* on walnut trees when he ringed the trees at 1 m above ground with 16.5 cm wide plastic strips covered with a mixture of DDVP (dichlorovos), machine oil and

grease in the proportion of 0.5:2:5 during February before large numbers of pests started to climb the stems. The literature review on the control of this insect showed that mostly the insect has been controlled through only chemical insecticides and treated sticky bands like Yoshimura *et al.* (1995) who evaluated the effectiveness of trap bands with three types of trap material, i.e. rice straw mat, vinyl-mat and corrugated paper in different environments against spiders, *Drosicha pinicola, Cinara piniformosana and Dendrolimus spectabilis*. More insect pests were caught in traps using corrugated paper and more natural enemies were caught in traps using rice straw mat The differences between catches using these materials were not great.

Guoguang *et al.* (1996) achieved the greatest level of control of *Drosicha corpulenta* by wrapping a plastic barrier coated with a sticky material around the tree trunk which prevented the upward movement of nymphs. Shiying *et al.* (1997) decreased more than 94% population of *D. corpulenta* by spraying monocrotophos or omethoate.

D. stebbingi appeared in epidemic form on *Alstonia virginia, Paulownia* spp., *Jacranda mymosipholia* and citrus hedges at the Pakistan Forest Institute Campus, Peshawar during 1995-96. The biology and seasonal history alongwith feeding behaviour of the pest were studied and weaker links were detected in the light of which an integrated approach using cultural, mechanical and chemical control measures were developed to control this obnoxious pest.

Materials and Methods

i. Cultural Practices

Trees of *J. mymosipholia* with *D. stebbingi* infestation were marked in May - June, 1995. The bases of these marked trees were hoed in November - December from 1.5 to 2 meter in radius and 10 - 15cm deep.

ii. Mechanical Practices

In following February tree stems were ringed with sticky bands. The width of sticky band was 10-15 cm and 1 to 1.5 meter above ground level.

iii. Chemical Application on *Paulownia* spp.

For determination of effective and economic doses of chemical insecticides (Pyrethroids) two chemical control experiments were conducted against mealy bugs. In the first experiment five pesticides, i.e. Buldock 25%EC, Endon 35%EC, Fenvelrate 20%Ec, Mepra 50%EC and Sherpa 5%EC were sprayed on stems of *Paulownia* spp. upto 3 meter height in March, 1997 using pneumatic knapsack sprayer. All the pesticides were used at the dose rate of 0.2% of given formulations. There were six treatments including control with three replications in a randomized complete block design. There were two trees for each treatment in either replication and 8 litre water was consumed for six trees of treatment for complete coverage. The pest population was counted from 15 x 15 cm^2 bark area five times per tree. Average was calculated and data were analyzed statistically applying analysis of variance (ANOVA) and Least significant difference tests.

iv. Chemical Application on *Jacranda mymosipholia*

In the second trial, the same five pesticides were sprayed on stems of *J.mymosipholia* at the dose rate of 0.1, 0.2 and 0.5% of active ingredients with the objective to determine the effective and economic doses. There were sixteen treatments including control with four replications and in each replication there were two trees per treatment. One litre water was consumed per tree for spraying stem from 1.5 to 2 metre height. The experiment was carried out in randomized complete block design. The pest population was counted from 15 x 15 cm^2 area of tree bark and there were five samples per tree. The averages were worked out and data were analyzed statistically applying analysis of variance (ANOVA) for overall significant impact and the differences among treatments by least significant difference test (LSD).

Results and Discussion

The population data of *D. stebbingi* recorded on *Paulownia* spp. treated with five pyrethroid pesticides are presented in table 1.

Table 1. Observations on population of *D. stebbingi* per 225cm^2 bark area of *Paulownia* spp. treated with chemical insecticides (Pyrethroids)

Treatments	Dose (%)	Population after treatment (hours/Week)			
		24 hours	48 hours	72 hours	1 weeks
Buldock 25%EC	0.2	3.1* a	5.0* a	1.8* a	8.3* a
Endon 35%EC	0.2	17.8 a	11.3 a	2.8 a	3.7 a
Fenvelrate 20%EC	0.2	4.7 a	7.9 a	2.8 a	8.2 a
Mepra 50%EC	0.2	2.4 a	1.8 a	0.97 a	4.3 a
Sherpa 5%EC	0.2	5.4 a	3.4 a	1.3 a	9.2 a
Control	-	149.9 b	159.9 b	132.5 b	136.2 b

* Significant at 99% level,

\- Figures sharing some alphabets in a column are non significant at 5% level among themselves.

The results showed that all the test insecticides reduced population of the pest highly significantly over control. However, the difference among the test insecticides was statistically non-significant. A similar trend in the efficacy of the insecticides was found throughout the experiment period, i.e. 24 hours till one week after treatment. Nevertheless Mepra, @ 0.2% afforded maximum control as the minimum population, i.e. 2.4, 1.8 and 0.97 individuals of *D. stebbingi* per 225 cm^2 bark area were found after 24, 48 and 72 hours of treatments, respectively.

The population data recorded on *J. mymosipholia* treated with pyrethroid insecticides in the seasonal trial are depicted in table 2.

Table 2. Observation on population of *D. stebbingi* per 225 cm^2 bark Area of Jacranda Treated with chemical insecticides (Pyrethroids)

Treatments	Doses (%)	Population recorded after treatment (Hours)			
		24	48	72	Overall
Buldock 25%EC	0.1	12.5* bcd	8.6* bc	8.5* bcd	9.9* bc
	0.2	7.4 bcde	7.0 bcd	4.5 bcd	6.3 bcde
	0.5	3.9 de	4.3 bcd	2.9 cd	3.7 cde
Endon 35%EC	0.1	13.0 bc	6.7 bcd	7.5 bcd	9.1 bcd
	0.2	8.1 bcde	2.9 cd	4.5 bcd	5.2 bcde
	0.5	3.5 e	0.9 d	2.1 d	2.2 e
Fenvelrate 20%EC	0.1	11.4 bcde	9.9 b	9.3 bc	10.2 b
	0.2	9.6 bcde	6.3 bcd	4.1 cd	6.7 bcde
	0.5	3.5 e	2.4 cd	3.1 cd	3.0 e
Mepra 50%EC	0.1	11.5 bcde	10.3 b	7.3 bcd	9.7 bc
	0.2	7.8 bcde	4.0 bcd	4.4 bcd	4.1 cde
	0.5	3.6 e	2.8 cd	1.5 d	2.6 e
Sherpa 5%EC	0.1	14.6 b	6.1 bcd	11.5 b	10.7 b
	0.2	8.3 bcde	5.1 bcd	6.0 bcd	6.5 bcde
	0.5	5.3 cde	2.4 cd	2.4 cd	3.4 cde
Control		144.8 a	133.2 a	131.6 a	136.5 a

* Significant at 1% level

\- Figures sharing same alphabets in a column are nonsignificant

The results indicated that all the tested insecticides reduced pest population over control. After 24 hours maximum pest protection was afforded by Endon 35%EC and Fenvelrate 20%EC at the rate of 0.5%. However, the difference among Buldock, Endon, Fenvelrate, Mepra and Sherpa at the dose rate of 0.2&0.5, 0.2 & 0.5, 0.1&0.2, 0.2&0.5, 0.2 &0.5 was statically non-significant, respectively. The least effective was Sherpa @ 0.1%. Nearly the same pattern of pesticide dose rate efficacy was observed after 48 hours and 72 hours. The difference among dose rates of 0.1 and 0.2% and 0.2 and 0.5%, Endon and 0.1 and 0.2% and 0.2 and 0.5% was statistically significant after 24 hours of treatment. Similarly after 48 hours dose rates of 0.1 and 0.2% and 0.2 and 0.5% of Fenvelrate, 0.1%, 0.2% and 0.2 and 0.5% of Mepra and 0.1 and 0.2% and 0.2 and 0.5% of Sherpa were nonsignificant. Three test doses of buldock

remained insignificant among themselves throughout observation period. Almost same was the case after 72 hours of treatment except Sherpa. After 48 hours and 72 hours minimum population of *D. stebbingi* 0.9 and 2.1 and 2.8 and 1.5 indviduals per 225cm^2 was recorded in Endon @ 0.5% and Mepra @ 0.5%, respectively. While maximum population other than control was recorded in Mepra @ 0.1% and Sherpa 0.1% after 48 and 72 hours of treatment. In case of overall efficacy, Endon, Fenvelrate and Mepra @ 0.5% were most effective. However, this dose rate was statistically non-significant with their respective lower dose rates. Therefore lower dose rates may be recommended for economical and ecological reasons.

Conclusion

In nutshell it is recommended that integrated approach for controlling *D. stebbingi* by integrating the mechanical collection, banding of the tree trunks, destruction of egg stage by soil working and application of insecticide was most effective. All the pesticides applied were effective, however Mepra 50%EC and Endon 35%EC @ 0.2% are recommended for economical, ecological and effective control of mango mealy bug.

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