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Effect of different botanical oils on the control of aphid *(Aphis craccivora)* population and incidence of Leaf Crinkle Virus of mungbean *(Vigna radiata* L.)

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Field efficacy of five botanical oils *viz.* Neem oil *(Azadirachta indica)*, Citronella oil *(Cymbopogon winterianus)*, Palmarosa oil *(Cymbopogon martini)*, Crozophera oil *(Crozophera plicata)* and Karonza oil *(Pongamia glabra)* were evaluated against the Leaf Crinkle Virus disease of mung bean (B-105) in the Instructional Farm at Mohanpur in Nadia district of West Bengal. All the oils reduced the population of the aphid vector. *Aphis craccivora* as well as Leaf Crinkle Virus disease as compared to untreated control. Among the treatments, three sprayings of Citronella oil @ 1 ml/l of water was found to be highly effective in reducing the Leaf Crinkle Virus disease incidence by reducing aphid population and increasing the yield over control, followed by Palmarosa oil, Coronza oil, Crozophera oil and Neem oil.

Key words : Mungbean, Leaf Crinkle Virus disease, botanical oils, incidence, aphid population, yield

INTRODUCTION

Mungbean *(Vigna radiata* L. Wilczek) is one of the important pulse crops in West Bengal as well as India. Among the diseases affecting this crop, Leaf Crinkle is one of the most destructive virus diseases, which causes heavy losses in yield. The disease is common throughout the country as-well as in West Bengal. This disease alone causes yield reduction up to 83.8% (Beninwal and Chaubey, 1979) under Uttar Pradesh condition. Bashir *et al.* (1991) have reported average yield loss per plant as 81% compared with uninfected plants. Because of the immense economic significance of the disease investigation are being carried out both at National and International levels on different aspects of the diseases particularly on the management by means of suitable tolerant varieties and control of insect vector by spraying of pesticides. But spraying of pesticides poses a great threat to environment and creates health hazards. Bharadwaj and Dubey (1988) have observed that application of plant oil is effective to manage the disease. Thirumalaisamy *et al.* (2003) have obtained similar results with the application of different plant products. With this view the present investigation has been undertaken to find out the effect of botanical oils on aphid population, disease incidence and yield of mungbean.

MATERIALS AND METHODS

The field experiment was conducted at the Instructional Farm, Bidhan Chandra Krishi Viswavidyalaya, located at Mohanpur, Nadia, West Bengal for consecutively two years i.e. 2005 and 2006 during pre-*kharif* season. The experiment was laid out in randomized block design with three replications and size of each plot was 2 m x 2 m. Seeds of mungbean B-105 variety were used and sown in the plots with a spacing of 30 cm row to row and 15 cm plant to plant. The land was prepared following the usual agro-technique used for mungbean cultivation. The seeds were sown at the end of March with the recommended doses of fertilizers of this region.

The botanical oils namely Neem oil *(Azadirachta indica)*, Citronella oil *(Cymbopogon winterianus)*, Palmarosa oil *(Cymbopogon martini)*, Crozophera oil *(Crozophera plicata)* and Karonza oil *(Pongamia glabra)* were used for this experiment. All the botanical oils were sprayed @ 1ml/l of water by add-

ing few drops of sticker "Tween-20". The spraying of botanical oils started from 10 days after sowing followed by 20 days and 40 days after sowing. Disease incidence was recorded at 10 days interval starting from the 15 days after sowing. Disease severity was recorded at 45 days after sowing. The incidence and severity of the disease was calculated by the following formulae :

$$\text{Disease incidence} = \frac{\text{No. of plant infected in a plot}}{\text{No. of plants in that plot}} \times 100$$

$$\text{Disease severity} = \frac{\Sigma \text{ Numerical rating}}{\text{No. of leaves observed x Highest rating scale}} \times 100$$

Scale

0 = No. of plants showing any symptoms
1 = Less than 1% plants showing symptoms
3 = 1-10% plants showing crinkling of leaves
5 = 11-20% plants showing crinkling of leaves.
7 = 21-50% plants showing crinkling of leaves.
9 = 51 % or more plants showing crinkling of leaves.

To count the number of aphids, five plants were selected at random in each plot and five leaves of selected plants at three different positions (one at the top, two in the middle and two at the bottom) were considered. The counts were taken in the morning.

The pods were picked up regularly and seeds were separated and weighed separately for each plot. The data obtained with respect to disease incidence were transformed to corresponding angular transformed value before statistical analysis.

RESULTS AND DISCUSSION

The two years pooled data presented in Table 1 indicated that the disease incidence varied from 3.77 to 13.18% and disease severity ranged from 13.82 to 40.73%. The lowest disease incidence and severity was recorded in Citronella oil treated plots (3.77% and 20.86%) followed by Palmarosa (8.05% and 20.86%), Coronza (9.0% and 20.86%), Crozophera (9.64% and 21.97%), Neem (13.82% and 30.55%) and control plot (13.18% and 40.73%) respectively. All the treatments were statistically significant in comparison to control plot except neem oil treated plot.

The effect on aphid population showed reduction

Table 1 : Effect of different botanical oils on the control of aphid populations, incidence of leaf crinkle virus and yield of mung bean (two years pooled data)

Varieties/ lines	Incidence (%) Days after sowing 15	25	35	45	Severity (%) at 45 das	Av. Yield in kg per plot	Yield q/ha	Aphid population at 45 DAS (average)
Neem oil	4.68 (12.49)	6.59 (14.87)	10.61 (19.01)	13.18 (21.28)	30.55 (33.55)	0.122	3.05	10.50
Citronella oil	3.01 (9.99)	4.60 (12.39)	3.77 (11.20)	3.77 (11.20)	13.82 (21.82)	0.185	4.63	4.00
Crozophera oil	4.38 (12.08)	4.97 (12.88)	8.54 (16.99)	9.64 (18.08)	21.97 (27.95)	0.142	3.55	8.25
Palmarosa oil	3.75 (11.17)	6.70 (15.00)	7.69 (16.09)	8.05 (16.48)	20.86 (27.17)	0.147	3.68	4.25
Coronza oil	3.31 (10.48)	5.57 (13.65)	7.90 (16.32)	9.00 (17.46)	20.86 (27.17)	0.147	3.68	5.25
Control	5.41 (13.45)	9.36 (17.82)	12.81 (20.97)	13.82 (21.82)	40.73 (39.66)	0.100	2.50	13.50
S.Em (±)	1.13	1.43	1.89	2.08		0.013		
CD. at 0.05%	2.91	3.66	4.83	5.33		0.035		

Figures in parenthesis indicate angular transformed values
*Average of 5 plants; DAS= Days after sowing.

in aphid population in all treatments compared to control ones. Maximum population of aphid was observed in control plot (13.50). Minimum population of aphid noted in Citronella oil treated plot (4.00) followed by Palmarosa (4.25), Coronza (5.25), Crozophera (8.25) and neem oil (10.50).

The influence of botanical oils in reducing the disease incidence severity and aphid population were manifested in increased in yield of mungbean when compared to the control. The maximum yield was obtained by application of Citronella oil (4.625 q/ha), Coronza (3.675 q/ha), Crozophera (3.55 q/a). Neem oil (3.05 q/ha) while the control plot yielded only 2.50 q/ha.

From the results obtained in this investigation it can be concluded that application of botanical oils helps to check the vector population directly and disease incidence severity indirectly and thereby yield. The application of botanical oil reduces the chances of health hazards and safe for the environment, so it may be recommended to the farmers of West Bengal.

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