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Population dynamics and efficacy of some insectides against mustard Sawfly, *Athalia lugens proxima* (Klug.) on mustard

Lipsa Dash[1*] and A. Konar[2]

[1]Department of Entomology, College of Agriculture, OUAT, BBSR, India
[2]Department of Agricultural Entomology, Faculty of Agriculture B.C.K.V., WB, India

**Corresponding author*

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A B S T R A C T

An experiment was conducted during rabi 2014-15 at In-check farm, BCKV, Nadia, West Bengal to study the population dynamics of mustard sawfly, *Athalia lugens proxima* (Klug) and efficacy of some insectides against it on mustard. The peak population of mustard sawfly was recorded in the second week of January, 2014 when minimum and maximum temperature was 9.30°C and 25.87°C respectively, the minimum and maximum relative humidity was recorded to vary between 55.43% and 83.86% respectively with 0 mm rainfall and 6.4 Sunshine hours. Dimethoate 30% EC @ 660ml/ha was found to be most effective in reducing population of aphids also gave the highest cost:benefit ratio.

Introduction

Indian mustard, *Brassica Juncea* Linn. Commonly known as 'mohari', 'rai' or 'raya' is one of the important edible oilseed crops grown in the country. Mustard plays an important role in human diet and it has an important place in Indian economy. The oil contents of mustard seeds vary from 32-40% and protein contents from 15-17%. The mustard crop grown well in west Bengal condition and is one of the important oilseed crops with 998kg/ha productivity. Mustard sawfly, *Athalia lugens proxima* (Klug) is an important pest of mustard, with many cruciferae being its host. Larvae alone are destructive, feeding from margin of leaves initially with grown up ones making holes prefering on young leaves and skeletonizing them (Jayanthi and Ramesha, 2014). Singh *et al.*, 1998 observed that irrigating the crop at the seedling stage reduced its infestation. Thus, abiotic factors play an important role in its population dynamics, and correlating the population with abiotic factors is critical (Kalasariya and Parmar, 2018). . Therefore,

the present investigation was carried out to study the population dynamics of mustard aphid and to evaluate the efficacy of some insecticides against the same.

Materials and Methods

All the experiments regarding population dynamics and efficacy of some insecticides against mustard aphid on mustard during rabi season of 2014-15 at In check Farm, BCKVV, Nadia, West Bengal. To study the population dynamics of mustard sawfly on mustard crop was planted during end of June at 30cm×10 cm in the plots of 3m×3m.Crop was raised following recommended package of practices. Total number of larvae and adult were counted from five tagged plants in each plot. Observations were recorded at weekly interval commencing from 30 days after planting. Then the population of sawfly was correlated with the selected weather parameters.

To study the efficacy of some insecticides against mustard sawfly on mustard, an experiment was laid out in RBD with three replications and seven treatments including untreated control. The insecticides, Chlorpyriphos 20% EC @ 400ml/ha (T_1), Chlorpyriphos 20% EC @ 500ml/ha (T_2), Chlorpyriphos 20%EC @600ml/ha (T_3), Chlorpyriphos 20% EC @500ml/ha (market sample, T_4) Thiamethoxam 25% WG @ 100ml/ha (T_5), Dimethoate 30% EC @ 660 ml/ha (T_6) were evaluated against mustard aphid along with thecontrol (T_7). Three consecutive sprays were given at 15 days interval starting from 30days after germination. Before each spray an observation on sawfly population was taken from randomly selected 10 plants per plot. Then four observations were recorded on the populations of aphid at 3 days, 5 days, 7 days and 10days after each spray from each replicated plots. The data thus recorded were statistically analyzed to compare the efficacy of different treatments.

Results and Discussion

The data collected in on the incidence of mustard aphid of mustard were pooled and presented in table1. Larvae of mustard sawfly, *Athalia lugens proxima* (Klug.) was recorded first during second week of December, 2014. During this period minimum and maximum temperature was 12.41°C and 26.84°C respectively, the minimum and maximum relative humidity was ranged between 53.71% and 84.86% respectively. Maximum larval population (35/ 5plants) was found during second week of January, 2014, when minimum and maximum temperature was 9.30°C and 25.87°C respectively, the minimum and maximum relative humidity was recorded to vary between 55.43% and 83.86% respectively. After the peak incidence of sawfly, it started to decline and its population disappear after second week of February. Correlation of sawfly with weather parameters were worked out and presented in table-1.

From the table it can be concluded that there is a positive correlation between sawfly population and relative humidity. This finding of present author is at par with Bhat *et al.*, (2004), who also stated that the population of the mustard sawfly showed positive and negative correlation, with evening relative humidity and minimum temperature respectively. The findings are also in conformity with Gour *et al*., (2003). Srivastava and Srivastava (1972) recorded the maximum incidence of sawfly occurred at 22-26°C temperature and 60 to 82% relative humidity which is again in conformity with findings of the present author.

There is a negative correlation between sawfly population and rainfall, where as sunshine hour is positively correlated with the population oscillation of mustard sawfly.

The data pertaining to the efficacy of some insecticides against aphid on okra in both the years has been pooled and presented in table-3. The data shows that among all the treatments namely Chlorpyriphos 20% EC @ 400ml/ha (T_1), Chlorpyriphos 20% EC @ 500ml/ha (T_2), Chlorpyriphos 20% EC @ 600ml/ha (T_3) Chlorpyriphos 20% EC @ 500ml/ha (market sample T_4) Thiamethoxam25% WG @ 100g/ha (T_5), Dimethoate 30% EC @ 660 ml/ha (T6) were found to be significantly superior providing high mortality over the T_7 control. The mortality population has been recorded on 3 DAS, 5DAS, 7DAS and 10DAS other than pretreatment population.

After the first round spray it was found that the highest (94.68%) mortality was observed in the plots treated with Dimethoate 30% EC followed by Thiamethoxam 25%WG (84.45%), Chloropyriphos 20%EC @ 600ml/ha (77.81%), Chloropyriphos 20%EC @ 500ml/ha (68.04%), Chloropyriphos 20%EC @ 500ml/ha, market sample (60.36%) and Chloropyriphos 20%EC @ 400ml/ha (55.97%) over control. However, after the second round spray with the same treatments, it was observed that Dimethoate 30% EC showed highest (80.04%) mortality followed by Thiamethoxam 25%WG (68.39%), Chloropyriphos 20%EC @ 600ml/ha (62.93%), Chloroyriphos 20%EC @ 500ml/ha (53.76%), Chloropyriphos 20%EC @ 500ml/ha market sample (45.96%) and Chloropyriphos 20%EC @ 400ml/ha (44.18%) over the control.

Thus from the overall mean across the different days across the different sprayings with all the 7 treatments showed that T6>T5>T3>T2>T4>T1>T7 throughout the crop season of mustard among which Dimethoate 30% EC @ 660ml/ha was found to be most effective causing highest mortality of mustard sawfly and maintaining mortality as high as more than 80% throughout the spray schedule.

Though much work has not been conducted on mustard sawfly, *Athalia lugens proxima* (Klug) still the findings of present author is at par with the findings of Krishnaiah and Lal (1975) who found that 0.03% dimethoate 30% EC to be effective against mustard sawfly at fortnightly intervals. This findings of the present investigation is also more or less in confirmity with Sarkar *et al.*, 2007 where application of phorate 10G at planting, dimethoate 30EC at 45 days and spraying of azadirachtin 5000 ppm at 60 days after sowing was significantly superior over other treatment schedules in controlling both mustard aphid and mustard sawfly.

Table.1 Pooled data of correlation of aphid population with weather parameters during 2014-15

		Aphid	Tmax	Tmin	RH_{max}	RH_{min}	SS(hr)	Rain fall
Aphid	Pearson Correlation	1	0.428	0.017	-0.814**	-0.483	0.264	- 0.003
	Sig. (2-tailed)		0.189	0.961	0.002	0.133	0.433	0.994

*, **Correlation is significant at the 0.05, 0.01 level (2-tailed) respectively

Table.2 Incidence of mustard aphid on mustard during 2014-15

Standard weeks, 2014-15	Sawfly population/5 plants	Max. temp(°C)	Min. Temp(°C)	Maximum RH (%) (RH-I)	Minimum RH(%) (RH-II)	Sunshine hour SS (Hr)	Rain fall(mm)
50th	0	26.34	12.79	87.14	59.71	3.87	0
51st	17.2	26.84	12.41	84.86	53.71	6.99	0
52nd	21.6	25.46	8.91	87.86	53.43	7.21	0
1st	27.6	26.07	15.89	87.29	70.43	1.50	0.36
2nd	31.6	25.30	11.16	86.14	59.57	6.03	0
3rd	35.2	25.87	9.3	83.86	55.43	7.44	0
4th	24.2	27.56	10.04	81.86	54.29	7.67	0
5th	19.8	27.03	11.79	79.71	52.86	6.4	0
6th	13.2	29.71	10.57	78.71	42.71	7.57	0
7th	7.2	30.01	13.84	79.57	43.43	5.94	0
8th	0	32.8	18.44	87.14	54.43	6.01	1.94

Table.3 Effect of insecticidal spray on the population reduction of mustard Aphid, *Lipaphis erysimi* (Kalt.)

Treatments	Dose (ml /ha)	First Spray						Second Spray						PTMCBS
		PTMCBS	Mean corrected Per cent Mortality				OAMADAS	PTMCBS	Mean corrected Per cent Mortality				OAMADAS	
			3DASP	5DASP	7DASP	10DASP			3DAS	5DAS	7DAS	10DAS		
T1	400	23.9 a	53.7 (47.16) b	56.37 (48.71) b	57.37 (49.27) b	53.7 (47.16) b	55.86 (48.4) b	18.61 f	37.68 (37.82) b	43.84 (41.46) b	48.03 (43.89) b	47.18 (43.36) b	44.18 (41.63) b	50.02 (45.02) b
T2	500	23.5a	65.46 (54.1) c	64.74 (53.7) bc	70.09 (56.89) c	65.46 (54.1) c	68.04 (55.71) d	14.69 d	44.8 (41.99) bc	49.36 (44.63) bc	61.77 (51.84) c	59.1 (50.41) b	53.76 (47.22) c	60.9 (51.46) c
T3	600	24.5a	77.34 (62) d	71.9 (58.29) c	78.69 (62.61) d	77.34 (62) d	77.81 (62.28) e	13.42 c	48.36 (44.07) bc	59.53 (50.7) cd	69.91 (57.02) cd	73.9 (59.88) c	62.93 (52.92) d	70.37 (57.6) d
T4	500	24a	58.72 (50.1) bc	60.35 (51.01) bc	61.54 (51.71) b	58.72 (50.1) bc	60.36 (51.04) c	17.26 e	39.79 (39.03) b	46.2 (42.83) bc	49.04 (44.48) b	48.82 (44.34) b	45.96 (42.67) b	53.16 (46.86) b
T5	100	23.67a	82.33 (65.68) d	82.8 (65.75) d	86.42 (68.43) e	82.33 (65.68) d	84.45 (67.16) f	10.86 b	57.24 (49.33) c	67.52 (56.26) d	75.11 (61.17) d	73.68 (60.07) c	68.39 (56.71) e	76.42 (61.93) e
T6	660	24a	95.06 (78.57) e	90.05 (73.64) e	96.98 (80.43) f	95.06 (78.57) e	94.68 (78.1) g	7.24 a	84.55 (67.41) d	71.14 (58.11) d	86.47 (68.8) e	78.02 (62.51) c	80.04 (64.21) f	87.36 (71.15) f
T7	-	24.33a	0.01 (0.58) a	0.01 (0.58) a	0.01 (0.58) a	0.01 (0.58) a	0.01 (0.58) a	25.83 g	0.01(0.56)a	0.01 (0.56) a	0.01 (0.56) a	0.01 (0.56) a	0.01 (0.56) a	0.01 (0.57) a
S.Em(±)			1.61	2.34	0.81	1.70			2.38	2.72	2.37	2.55		
CD at 5%			4.96	7.22	2.50	5.24			7.33	8.37	7.30	7.85		

PTMCBS=Pre-treatment Mean Count Before spray, OASP=Over All Significance of Pesticides, CD at 5 per cent level of significance, OAMADAS= Over All Mean Across Different Days After Spraying, OAMADADS= Over All Mean Across Different Days Across Different Spraying

Table.4 Cost effectiveness of different treatment schedules against mustard aphid of mustard during 2014-15

Treatment	Yield (q/ha)	Increase in yield over Control (q/ha)
T1	5.79	23.98
T2	6.78	45.18
T3	7.78	66.59
T4	6.67	42.82
T5	7.81	71.73
T6	8.38	79.44
Control	4.67	0.00
S.Em	0.67	NA
CD	2.07	NA

Effect of insecticides on yield of mustard

All the treatments showed increase in yield over control which has been showed in table 4. Among all the treatments highest yield (8.38q/ha which was 79.44% increase over control) was recorded in plots treated with dimethoate 30%EC, followed by thiamethoxam 25%WG (8.02q/ha), chloropyriphos 20%EC @ 600ml/ha (7.78q/ha), chloropyriphos 20%EC @ 500ml/ha (6.78q/ha), chloropyriphos 20%EC @ 500ml/ha, market sample (6.67q/ha), chloropyriphos 20%EC @ 400ml/ha (5.79q/ac) and control (4.67q/ha).

Thus, it may be inferred that population of aphid is highly correlated with the weather parameters i.e. temperature (maximum and minimum), minimum relative humidity, rainfall and total sunshine hours and Dimethoate can be used as effective and economic insecticide to reduce the infestation of aphid on mustard below ETL.

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