

POPULATION DYNAMICS OF MUSTARD SAWFLY, *A. LUGENS PROXIMA* AND CORRELATION STUDIES BETWEEN LARVAL POPULATIONS WITH WEATHER PARAMETERS

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ABSTRACT : A study on population dynamic showed that pest incidence commenced from third week of November on the mustard (variety GM-3) and the pest was found active up to February in mustard crop during *rabi* season. During the last week of November its population was recorded a peak level of 2.30 larvae per plant. Among the different weather parameters maximum temperature, morning relative humidity and sunshine hours showed positive correlation with the population of *A. lugens proxima* on the crop.

Key words : *Athelia lugens proxima*, mustard, population dynamic, weather parameters.

INTRODUCTION

Steep escalation of price of edible oils during last few years has increased importance of oilseed crops in our country. Among the major oilseed crops of the world, rapeseed-mustard ranks fifth after soybean, sunflower, groundnut and cotton. Mustard seed is rich in oil content 40 per cent. The seed also serve as an important raw material for the agro-based industries and are used as condiments and medicines (Singh, 1958). The residual cake is valuable by product used as a feed for animals and rich source of organic manure. India is one of the largest rapeseed mustard growing countries in the world, occupying the first position in area and second position in production after China. The world production of rapeseed-mustard has been increasing at a rapid rate in several countries largely in response to the continuing increase in demand for edible oils and its products. Under the names rapeseed and mustard several oilseed crops belonging to the cruciferous are grown in India. They are divided into four groups *viz.*, brown or Indian mustard commonly called rai (raya or laha) *Brassica juncea* (L.) (Czern and Coss), yellow sarson, *B. campestris*, toria (luhi or maghi lahi), *B. campestris* var, toria duth and taramira or tara, *Eruca sativa* Mill (Das, 1997). In India the area, production and productivity was 6.34 million ha, 7.82 million tonne and 1233 kg ha⁻¹ respectively, Anonymous (2012-13). Rajasthan, Madhya Pradesh, Uttar Pradesh, Haryana, Gujarat, Assam, West Bengal and Punjab are the major mustard and rapeseed growing states in India. Mustard is one of the most important

oilseed crops in Gujarat wherein North Gujarat is ideally suited for its cultivation. Presently, it is grown in about 2.04 lakh ha area with 2.40 lakh tonnes of total production and 1164 kg per ha productivity (Anonymous, 2012b). Mehsana, Banaskantha, Sabarkantha, Ahmedabad, Kheda and Gandhinagar are major mustard growing districts of Gujarat State. The success of mustard cultivation in our state can be attributed to the development of improved varieties *viz.*, Patan Mustard 67, Varuna, GM 1, GM 2 and GM 3, improved production technology, effective plant protection measures to control the pest and diseases and their high rate of adoption by the farmers. In Gujarat the important insect pests of mustard crop are aphid, sawfly, leaf webber and painted bug (Kapadia *et al.*, 1980). Among the above major pests, mustard sawfly, *A. lugens proxima* is a serious pest of rapeseed and mustard. It is an oligophagous pest attacking in the seedling stage. The mustard sawfly belongs to tenthredinidae family is one of the very few Hymenopterous insects reported as crop pests (Butani and Jotwani, 1984). The pest appears in October and causes maximum damage during October to December. They may eat all the leaves in case of heavy attack. Old plants when attacked do not have seed in the pods. They had peak infestation rate of 85 per cent. Now days, this pest occupies the major importance in mustard growing area of Gujarat state, but little information is available especially on chemical control of this pest. Therefore, investigations on following aspects were carried out on *A. lugens proxima* infesting mustard under North Gujarat conditions.

MATERIALS AND METHODS

To study the population dynamics of mustard sawfly on mustard, field experiment was carried out at Agronomy Instructional Farm, C. P. College of Agriculture, SDAU, Sardarkrushinagar. The mustard GM-3 was sown in a plot size of 20 x 20 m area with 45 x 15 cm spacing in the last week of October, 2011. All the recommended agronomical practices were followed for raising the crop. The crop was kept unsprayed throughout the crop season.

In order to record larval population of *A. lugens proxima*, twenty five plants from the plot were selected randomly and tagged. The weekly observations on larval population were recorded from each randomly selected plant starting from germination to harvesting of the crop. Mean larval population per plant was worked out. The correlation between larval population and weather parameters was worked out to ascertain the population fluctuation of the pest in relation to various environmental factors. The data on weather parameters recorded at meteorological observatory, Agronomy Instructional Farm.

RESULTS AND DISCUSSION

The data on incidence of mustard sawfly on the crop cultivar GM-3 during *rabi* season 2011-2012 are presented in Table 2. The results summarized in Table 1 showed that the infestation of mustard sawfly (*A. lugens proxima*) commenced on mustard after third week of sowing *i.e.* during third week of November (Std. week

46) with an average larval population of 1.40 larvae per plant. The pest population increased in the last week of November (Std. week 47) and recorded a peak level of 2.30 larvae per plant. During the peak level the minimum and maximum temperatures were recorded as 12.0 and 32.8°C, respectively with 57 per cent average relative humidity. However, it was slightly decreased (1.80 larvae per plant) during first week of December (Std. week 48). The population declined at a level of 0.40 larva per plant after 7th week of sowing *i.e.* third week of December. Again during last week of December and first week of January the population of *A. lugens proxima* was increased and recorded as 2.00 and 1.70 larvae per plant, respectively. Thereafter, the population gradually declined up to the harvesting of crop.

From the data, it can be seen that mustard sawfly was appeared during third week of November to third week of January (*i.e.* 3rd to 12th week after sowing) in the crop. There were two peak periods of pest population *i.e.* seedling stage and pod formation stage. The earlier reports indicated that mustard sawfly remained active from November to February with a peak during January in Uttar Pradesh (Srivastava *et al*, 1972), September to December (Butani and Juneja, 1984), peak in January (Parsana, 1999), fourth week of October to first week of December (Gour and Pareek, 2003), December to January (Bhatt and Bapodra, 2004), October to December (Gupta and Agrawal, 2006) and November to January (Singh *et al*, 2008). The variation in the active period might be due to climatic conditions and the host.

Table 1 : Population of *A. lugens proxima* recorded on mustard in relation to various weather parameters during *rabi* season 2011-2012.

S. No.	Standard of week	Period	Weeks after sowing	Average no. of larvae/plant	Average temperature (°C)		Relative humidity (%)		Sunshine hours
					Min.	Max.	Morning	Evening	
1.	44	03/11/2011 to 9/11/2011	01	0.00	15.9	34.1	68	26	7.7
2.	45	10/11/2011 to 16/11/2011	02	0.00	15.7	34.7	82	29	9.0
3.	46	17/11/2011 to 23/11/2011	03	1.40	14.2	34.6	85	26	9.4
4.	47	24/11/2011 to 30/11/2011	04	2.30	12.0	32.8	86	28	9.2
5.	48	01/12/2011 to 07/12/2011	05	1.80	13.2	31.1	81	29	7.1
6.	49	08/12/2011 to 14/12/2011	06	0.50	12.2	32.4	84	35	9.3
7.	50	15/12/2011 to 21/12/2011	07	0.40	4.9	28.0	74	18	8.4
8.	51	22/12/2011 to 28/12/2011	08	2.00	7.0	28.7	78	28	8.8
9.	52	29/12/2011 to 04/01/2012	09	1.70	6.0	26.8	92	28	8.0
10.	1	05/01/2012 to 11/01/2012	10	0.70	6.6	24.9	87	37	6.2
11.	2	12/01/2012 to 18/01/2012	11	0.50	4.6	24.5	63	21	9.0
12.	3	19/01/2012 to 25/01/2012	12	0.30	5.3	25.1	68	22	7.9
13.	4	26/01/2012 to 01/02/2012	13	0.00	5.5	25.6	84	29	7.5

Table 2 : Correlation coefficient between weather parameters and larval population of *A. lugens proxima*.

Population of larvae	Weather parameters				
	Temperature (°C)		Relative humidity (%)		Sunshine hours
	Min.	Max.	Morning	Evening	
	0.049	0.138	0.446	0.129	0.165

**Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (1-tailed).

Correlation studies between larval populations of *A. lugens proxima* and weather parameters

In order to determine the role of different weather parameters in fluctuation of larval population of mustard sawfly, correlation coefficients between the weather parameters and the population of mustard sawfly in mustard crop were worked out. The correlation study (Table 2) clearly showed that among the various physical factors of environment, minimum ($r = 0.049$) and maximum ($r = 0.138$) temperature, morning ($r = 0.446$) and evening ($r = 0.129$) relative humidity and sunshine hours ($r = 0.165$) showed positive correlation with the larval population of this pest, but the correlation was not significant. Earlier, Patel *et al* (1996) have reported that the population of mustard sawfly in the mustard crop sown on 25th October was decreased as the crop season advanced due to reduction in maximum temperature. There was a positive association between temperature and mustard sawfly. However, Parsana (1999) reported that the major abiotic factors *viz.*, maximum and minimum temperature, morning and afternoon relative humidity and sunshine hours did not influence the pest population.

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