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Effect of different date of sowing and application of selective insecticides against on population dynamics of mustard aphids in mustard crop (*Brassica juncea*) under climate condition of Allahabad

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Abstract
The effective of two insecticides viz. chlorpyrifas and imidacloprid against mustard aphid. The mustard plants were sprayed with the insecticides at 75 and 110 days after sowing. The mortality of mustard aphid was assessed at after first and second spraying of insecticides chlorpyrifas showed the most effectiveness insecticides among the causing the highest mortality of mustard aphid followed by imidacloprid.

Keywords: Mustard aphid, spray insecticides, effectiveness insecticides

Introduction

Brassica spp. belongs to the family Brassicaceae (Cruciferae) Rapeseed and mustard are the third most important edible oilseed crops of the world after soybean and oil palm. These crops are grown under a wide range of agro-climatic conditions. Indian mustard is the most important member of the group, accounting for more than 70 per cent of the area under rapeseed-mustard, followed by *toria*, yellow mustard and brown mustard *Taramira* is raised on very poor sandy soils with low rainfall.

Rapeseed and mustard are one of the most important edible oils of northern and eastern parts of India. The crop distribution in different states of India is Assam, Orissa, W.B, Meghalaya, Tripura, Haryana, H.P, U.P, Jammu, M.P, and Rajasthan. But the major Mustard growing states are Haryana, U.P., M.P., and Rajasthan representing 81 per cent of the total mustard and rai seed production. (Anonymous, 2015) Mustard is rich in minerals like calcium, magnesium, iron, vitamin A, C and proteins. 100 g mustard seed contains 508 kcal energy, 28.09 g carbohydrates, 26.08 g proteins, 36.24 g total fat, 12.2 g dietary fiber, 31 I.U. vitamin A, 7.1 mg vitamin C, 266 mg calcium, 9.21 mg iron, 370 mg magnesium and 738 mg potassium. (USDA, 2014) Mustard aphid, *Lipaphis erysimi* (Kalt.) is one of the most serious pest and is considered to be the limiting factor in the successful cultivation of rapeseed-mustard. The colonies of mustard aphids feed on the new shoots, inflorescence and underside of leaves. Loss in yield upto 91.3 per cent (Singh and Sachan, 1994) [6].

Mainly two aphid species viz., *L. erysimi* and *M. persicae* were recorded from the mustard plants in which *L. erysimi* was found to be the most active pest of mustard. These aphids have appeared in the fields especially with the onset of flowering (Singh, P. *et al.* 2011) [4] The damage is caused by both nymphs and the adults, these are louse-like and pale greenish insects, are seen feeding in large numbers, often covering the entire surface of the flower buds, shoots, pods etc (Ahmed S. *et al.* 2007).

It is therefore, essential to keep this pest under control so as to reap profitable harvest. To control this pest, different insecticides have been evaluated and recommended by many workers like However, in the present studies some new insecticides have been evaluated along with the already recommended insecticides for the control of mustard aphid. Malathion 50 EC (0.05%), chloropyriphos 20 EC (0.05%), dimethoate 30 EC (0.O3%), cypermethrin 10 EC (0.01%), endosulfan 35 EC (0.07%), imadacloprid 17.8 SL (0.0178%), neemarin 0.03% (1 ml/ l) and an untreated check. Choudhury and Pal (2005).

Materials and Methods

The experiment was carried out in field of Nursery college of Forestry, Sam Higginbottom University of Agriculture Technology & Sciences, Allahabad (U.P)., during Rabi season (2016-2017). Allahabad is located in the south-East part of Uttar Pradesh India. The site of experimental site (research and nursery area) situated 25.45° N 81.85° E and at an altitude of 98 meter above sea level. All the required materials and facilities necessary for the cultivation readily in the department. This region has a subtropical climate with extreme of summer and winter. These locations receive the mean annual rainfall ranges from 500 mm to 1500 mm. More than 70 per cent rains are received during S-W monsoon season 5 to 10 per cent rains are received in winter, 10-15 per cent in summer and 5-10 per cent during post monsoon season.

Temperatures vary greatly in these regions may June are the hottest and December and January are the coldest monthly mean temperature more than 25 ^{0}C prevails during 8-10 ^{0}C frost for one or two days may also occur during winter months. The weekly average data on weather condition during the experimentation period was recorded at meteorological observatory location at the research and nursery area of the college of forestry an, SHUATS, Allahabad (U.P.) Pre-sowing operations the field was prepares by ploughing with a tractor drawn disc plough two times, followed by cross harrowing and planking.

The field was thoroughly leveled by a scrapper before it was laid out. The weeds were picked up in order to get a clean field, after that lay out of the field was made according to plan of layout. Fertilizer application the basal dose of fertilizer at a rate of 40 kgha^{-1} N as urea, phosphorus and potash 60 kgha^{-1} , 40 kgha^{-1} through DAP and MOP and 20 kgha^{-1} S as gypsum was applied as a basal dose applied sowing tome treatment according to plan of layout Fertilizer were applied in nitrogen ½ half dose sowing time. Sowing of seed the Mustard variety used was Parasamani-8 Seed were sown at a depth of 2.5 to 5.0 cm in rows with a seed rate of 4-5 kg ha^{-1}.The rows were 30 cm apart. Post-sowing operations Gap filling Seed germinations was observed at five days of sowing. This continued up to 6th day. Seeds were re- sown in the gaps where the previous seeds failed to germinate. Thinning of plant was done at 25th day after sowing when the crop developed 6 to 7 leaves/plant.

This was done to maintain spacing of 15 cm between plants in a row as per treatment the optimum population in order to avoid overcrowding of the plants. Weeding one hand weeding was done by laboures with khurpi at 15 day after sowing, followed by second manual weeding at 30 days after sowing. This was done to control grassy as well as broad leaf weeds. Two irrigation was given during the crop growth period at 20 & 40 days after sowing by flood method of irrigation. Fertilizer application (Top dressing) the dressing was done with the remaining half dose of nitrogen as urea at 40 days after sowing. Urea was applied by furrow placement method at a distance of 10 cm from the crop rows.

For each sowing dates (treatments) three plots were maintained per replications [(2×2) m2]. The experiment has the following Date of sowing D_1-1st sowing date 25th October, D_2-2nd sowing date 04 November, D_3-3rd sowing date 14 November the observations on population dynamics of mustard were recorded on first day of every standard week between 08.00 to 13.30 hrs. for untreated plots throughout the stand of crop. When its appearance was first noticed, 5 plants were randomly selected and tagged to record aphid population in treated and untreated plots of each replication. The population was recorded from a 15 cm long top portion of central twig on a white paper sheet for treated plots, observation was recorded at 08.00 to 13.30 hrs. as.

A) 1st Spraying

a) 1 day before 1st spraying
b) 4 day after 1st spraying
c) 8 day after 1st spraying
d) 12 day after 1st spraying

B) 2nd Spraying

a) 1 day before 1st spraying
b) 4 day after 1st spraying
c) 8 day after 1st spraying
d) 12 day after 1st spraying

Results and Discussion

First Spraying Efficacy of insecticides mustard aphid (*Lipaphis erysimi*.)

A preliminary trial for evaluating the newer insecticides Chlorpyrifos, leaves extract, and spray was conducted to see their effect mainly on the aphids. Data on average aphid population 1 day before, 4, 8 and 12 days after spraying are presented in the Table (4.9.1) and Fig (4.9.1). In pre-treatment observation the aphid population was five tagged plant recorded from 15 cm terminal twig on randomly selected 5 plants in each plot.

First spraying One day before spraying it was found that there was significant in different date of sowing and in integration of pesticide but due to interaction it showed non-significant. The maximum number of aphids per plant was found in T_o (3rd DOS 14 November /control) with 24.60 and minimum number of aphids per plant was observed in T_1 (3rd DOS 14 November/ Chlorpyrifos 20 EC) with 19.47 number.

4 day after spraying it was found that there was significant in different date of sowing treatment. The maximum number of aphids per plant was found in T_0 (3rd DOS 14 November /control) with12.60 and minimum number of aphids per plant was observed in T_1 (2nd DOS 04 November/ Chlorpyrifos 20 EC) with1.27 number.

8 day after spraying it was found that there was significant in different date of sowing and in integration of pesticide but due to interaction it showed significant. The maximum number of aphids per plant was found in T_o (1st DOS 25 October/control) with 14.80 and minimum number of aphids per plant was observed in T_1(1st DOS 25 October/ Chlorpyrifos 20 EC) with 1.13 number.

12 day after spraying it was found that there was significant in different date of sowing treatment. the maximum number of aphids per plant was found in T_o (2nd DOS 04 November/control) with 29.07 and minimum number of aphids per plant was observed in T_1(3rd DOS 14 November/ Chlorpyrifos 20 EC) with 2.07 number.

Second spraying

The data number of aphids per plant presented in table value 4.9.2.reveal that:

One day after spraying it was found that there was significant in different date of sowing and in integration of pesticide but due to interaction it showed non significant. the maximum number of aphids per plant was found in T_0 (1st DOS 25 October/control) with 45.20 and minimum number of aphids

per plant was observed in T_1 (1st DOS 25 October/ Chlorpyrifos 20 EC) with 13.00 number.

4 day after spraying it was found that there was significant in different date of sowing treatment. The maximum number of aphids per plant was found in T_0 (3rd DOS 14 November/ control) with26.73 and minimum number of aphids per plant was observed in T_1 (3rd DOS 14 November/ Chlorpyrifos 20 EC) with 0.47 number. 8 day after spraying it minimum number of aphids per plant was observed in T_2 (2nd DOS imidacloprid) with no aphid no number.

12 day after spraying it was found was found that there was significant in different date of sowing and in integration of pesticide but due to interaction it showed significant. the maximum number of aphids per plant was found in T_1 (3rd DOS 14 November/ Chlorpyrifos 20 EC) with 30.40 and that there was significant in different date of sowing treatment. the maximum number of aphids per plant was found in T_0 (3rd DOS 14 November/ control) with 31.60 and minimum number of aphids per plant was observed in T_1 (3rd DOS 14 November/ Chlorpyrifos 20 EC) with 0.60 number.

Conclusion

It was concluded that Chlorpyrifos @20 EC ha^{-1} in was found to be the best to control aphid population in mustard crop on 2nd DOS (4th November) followed by imidacloprid @200 SC ha^{-1} on 2nd DOS (4th November).

Table 1: Treatment combination of the experimental plan

Treatment	Treatment combination	Code
T_1	1st Sowing Date / Control	D_1C_0
T_2	1st sowing date / Chlorpyrifos	D_1C_1
T_3	1st sowing date / imidacloprid	D_1C_2
T_4	2nd sowing date / control	D_2C_0
T_5	2nd sowing date / Chlorpyrifos	D_2C_1
T_6	2nd sowing date / imidacloprid	D_2C_2
T_7	3rd sowing date / control	D_3C_0
T_8	3rd sowing date / Chlorpyrifos	D_3C_1
T_9	3rd sowing date / imidacloprid	D_3C_2

Table 2: Mean weekly weather parameter during crop growth rabi season (2016-17)

Standard week	Temperature		Relative humidity		Rainfall (mm)	Wind speed (Km hrs^{-1})	Sun shine (24 hrs)
	T_{max}	T_{min}	7 A.M.	2 P.M.			
October							
43	34.37	24.80	90.29	53.71	0	1.01	8.76
44	33.97	19.83	90.71	54.43	0	1.08	8.57
November							
45	33.14	18.20	91.86	55.71	0	1.03	6.91
46	32.74	16.91	91.43	53.86	0	0.66	8.51
47	31.97	15.37	92.00	48.57	0	0.61	8.43
48	29.51	15.16	92.86	54.00	0	0.56	6.37
December							
49	23.80	14.14	94.29	67.71	0	0.57	0.69
50	24.97	12.06	94.71	55.57	0	0.60	3.34
51	26.20	11.23	92.43	47.86	0	0.53	6.03
52	23.98	9.78	90.75	57.00	0	0.48	2.85
January							
1	19.66	9.11	91.57	60.86	0	0.53	1.11
2	23.91	8.14	91.57	49.00	0	0.55	4.09
3	24.43	9.71	91.00	45.57	0	0.66	5.40
4	27.83	11.86	90.29	41.57	0	0.60	8.11
5	27.97	11.66	92.57	43.29	0	0.64	7.49
February							
6	29.14	12.60	89.57	42.29	0	0.63	8.57
7	30.26	11.91	84.57	39.57	0	0.76	8.71
8	31.97	12.54	77.71	38.71	0	1.43	9.11
9	33.54	13.40	76.43	37.14	0	1.76	9.31
March							
10	33.46	13.09	79.00	37.67	0	1.49	9.31
11	34.97	12.14	77.86	35.14	0	1.19	9.29
12	35.86	12.34	78.71	35.29	0.029	1.69	9.31
13	39.33	14.49	75.00	30.71	0	3.07	9.44
April							
14	42.21	18.34	78.86	28.00	0	3.18	9.34

Table 3: Effect sowing dates and application of insecticides on aphid population at 1st Spraying.

Treatments	Number of aphids Before spraying	4 DAS	8 DAS	12 DAS	Mean
D_1T_1	22.87	1.33	1.27	2.27	1.62
D_1T_2	20.80	1.47	3.53	4.13	3.04
$D_2T_{control}$	23.80	10.27	15.07	29.07	18.14
D_2T_1	22.67	1.27	1.73	5.13	2.71
D_2T_2	21.07	1.93	1.93	9.60	4.49
$D_3T_{control}$	24.60	12.60	14.13	20.87	15.87
D_3T_1	19.47	2.20	1.13	2.07	1.80
D_3T_2	21.20	3.20	1.80	3.33	2.78
Overal Mean	21.91	4.53	6.15	10.76	7.15
F- test	NS	S	S	S	S
S. Ed. (±)	2.376	0.558	0.680	1.190	2.840
C. D. (P = 0.05)	5.036	1.183	1.442	2.524	6.022

Table 4: Effect of sowing date and application of insecticides on aphids population at 2nd Spraying.

Treatments	Number of aphids Before spraying	4 DAS	8 DAS	12 DAS	Mean
D_1T_1	13.00	1.53	0.47	0.80	0.93
D_1T_2	17.20	1.87	0.73	1.20	1.27
$D_2T_{control}$	34.91	21.60	11.47	7.87	13.65
D_2T_1	15.40	1.00	0.00	0.87	0.62
D_2T_2	20.27	2.20	0.33	0.93	1.15
$D_3T_{control}$	43.87	26.73	30.40	31.60	29.58
D_3T_1	14.73	0.47	1.00	0.60	0.69
D_3T_2	20.47	1.07	1.20	1.60	1.29
Overall Mean	25.01	8.77	8.14	8.20	8.37
F- test	NS	S	S	S	S
S. Ed. (±)	11.834	0.766	1.100	1.151	2.386
C. D. (P = 0.05)	25.088	1.623	2.331	2.440	5.058

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