

Effect of Irrigation, Date of Sowing and Nitrogen on the Incidence of Mustard Aphid, *Lipaphis erysimi* Kalt.

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ABSTRACT

Investigation were carried out on the effect of irrigation, date of sowing and nitrogen on population of mustard aphid during *rabi* 1995-96 and 1996-97 at College Farm, Gujarat Agricultural University, Junagadh.

Pooled results revealed that the frequent irrigation (15 days interval) increase the incidence (24 aphids/ 10 cm tender shoot during 13th WAS) of mustard aphid. The early sown crop (up to 15 October) escaped from infestation of aphid, but infestation was highest from pod formation stage to harvest (15.80 to 102.73 aphids / 10 cm tender shoot) in crop sown on 15th November. In case of fertilizer, the crop receiving heavy dose of nitrogen (75 kg/ha) suffered more as 26.12 aphids / 10 cm tender shoot were recorded during 13th WAS. Interaction effects indicated that the crop escaped from the incidence of aphid in early sown crop (up to 15th October) when irrigated at an interval of 20 days (4 irrigations). Similar interaction effects was recorded in early sown crop fertilized with 25 kg N/ha.

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INTRODUCTION

Mustard is an important winter grown oilseed crop in India. In area and production of rapeseed and mustard, India ranks first in the world. It occupies 6.3 million hectares of land with the production of 5.4 million tonnes (Anonymous, 1996). But, an average productivity of this crop at national level is very low (907 kg/ha) due to non adoption of improved production technology and large area being rainfed on marginal land of low fertilizer. In addition, the insect pests and diseases cause heavy losses to these crop especially mustard.

The mustard aphid, *Lipaphis erysimi* (Kalt.) is a key pest of mustard. Although, the aphid remains present throughout the year in the fields but its population becomes very high during December to March. As a

results of sucking the sap, the plants lose their vigour, remain stunted and fail to produce yield. Emphasis has been laid primarily on the chemical control of insect pests. But much work has not been done on the effect of cultural practices and there is a need to undertake the study in a detail in the state.

MATERIALS AND METHODS

The field experiment was conducted in a split plot design during *rabi* seasons of 1995-96 and 1996-97 at the College Farm, College of Agriculture, Gujarat Agricultural University, Junagadh. Row to row distance was kept 45 cm and plant to plant distance was maintained 15 cm by thinning at 15 days after sowing. In each plot, the plant population was maintained by gap filling and thinning.

The treatments consisted of all combinations of two levels of irrigation, four levels of date of sowing and three levels of nitrogen which were tried in a split plot design. Each treatment was replicated three times with a main plot size of 5.00 to 32.40 m while the size of sub plot and sub sub plot was 5.0 x 8.10 m and 5.00 x 2.25 m, respectively. The details of individual treatment were as below :

a. Main treatment-irrigation

I_1 = Five irrigations at an interval of 15 days after two common irrigations.

I_2 = Four irrigations at an interval of 20 days after two common irrigation. (First irrigation was given at the time of sowing and second irrigation at 7 days after sowing as common irrigation).

b. Sub treatment - Date of sowing

D_1 = 1st October
 D_2 = 15th October
 D_3 = 1st November
 D_4 = 15th November

c. Sub sub treatment - Nitrogen

N_1 = 25 kg N/ha
 N_2 = 50 kg N/ha
 N_3 = 75 kg N/ha

The population of aphid was recorded from ten randomly selected plants in each plot from ten cm length of tender shoot of the plant. The observations were recorded at weekly intervals during initiation of the incidence of aphid till the maturity of the crop.

RESULTS AND DISCUSSION

Irrigation

The pooled results (Table-1) indicated that the incidence of aphid appeared from

9th WAS and continued throughout the season. The population of this pest was significantly higher being 2.26, 8.92, 13.64, 20.02 and 24.00 aphids / 10 cm tender shoot during 9, 10, 11, 12 and 13th WAS in crop irrigated with five irrigations as compared to four irrigations. Peak activity of mustard aphid was observed during 13th WAS in both the treatments. It can be seen from the results that the more number of irrigations induced the incidence of mustard aphid. Similar results were also obtained by Ram *et al.* (1989).

Date of sowing

The data of two years experimental results (Table-1) indicated that the crop was escaped from aphid infestation when it was sown on October-1. Further, the lower infestation (0.00 to 0.65 aphid / 10 cm tender shoot) was also observed throughout the season when the crop was sown on October 15. In third date of sowing i.e. November 1, 0.35, 4.34, 13.34, 42.27, 53.96 and 57.27 aphids / 10 cm tender shoot was recorded during 9, 10, 11, 12, 13 and 14th WAS, respectively. Among all four date of sowing, November 15 sown crop was heavily infested with 15.82, 65.17, 79.78, 91.28, 102.73 and 87.11 aphids / 10 cm tender shoot during 9, 10, 11, 12, 13 and 14th WAS, respectively. Bhagat and Singh (1989), Varma *et al.* (1993), Singh *et al.* (1995) and Upadhyay (1996) had reported that early sown crop (September or early in October) either escaped from aphid infestation or have low incidence than late sown crop.

Nitrogen

The pooled results showed that significantly lowest population i.e. 1.63, 6.00, 10.06, 16.23, 19.75 and 17.99 aphids / 10 cm tender shoot during 9, 10, 11, 12, 13

TABLE 1

Effect of irrigation, date of sowing and nitrogen on the incidence of mustard aphid, *L. erysimi* (pooled of 1995-96 and 1996-97).

Treatment	Aphid population/10 cm tender shoot at different week after sowing					
	9	10	11	12	13	14
Irrigation						
5 irrigations (I ₁)	1.66* (2.26)	3.07* (8.92)	3.76* (13.64)	4.53* (20.02)	4.95* (24.00)	4.67* (21.31)
4 irrigations (I ₂)	1.52 (1.81)	2.79 (7.28)	3.40 (11.06)	4.31 (18.08)	4.75 (22.06)	4.52 (19.93)
S. Em ±	0.04	0.07	0.05	0.07	0.03	0.05
C.D. at 5%	0.13	0.20	0.17	0.20	0.10	NS
C. V. %	21.91	36.48	12.55	12.69	4.50	9.41
Date of Sowing						
October 1 (D ₁)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)
October 15 (D ₂)	0.71 (0.00)	0.71 (0.00)	0.93 (0.36)	0.85 (0.22)	1.16 (0.85)	0.71 (0.00)
November 1 (D ₃)	0.92 (0.35)	2.20 (4.34)	3.72 (13.34)	6.54 (42.27)	7.38 (53.96)	7.60 (57.27)
November 15 (D ₄)	4.04 (15.82)	8.11 (65.27)	8.96 (79.78)	9.58 (91.28)	10.16 (102.73)	9.36 (87.11)
S.Em ±	0.14	0.38	0.09	0.36	0.20	0.71
C.D. at 5%	0.64	1.74	0.26	1.60	0.89	3.17
C.V. %	20.90	20.08	14.60	10.49	10.01	9.65
Nitrogen						
25 kg N/ha (N ₁)	1.46 (1.63)	2.55 (6.00)	3.25 (10.06)	4.09 (16.23)	4.50 (19.75)	4.30 (17.99)
50 kg N/ha (N ₂)	1.64 (2.19)	2.97 (8.32)	3.59 (12.39)	4.46 (19.39)	4.89 (23.41)	4.62 (20.84)
75 kg N/ha (N ₃)	1.67 (2.36)	3.27 (10.19)	3.89 (14.63)	4.71 (21.68)	5.16 (26.12)	4.86 (23.12)
S.Em ±	0.06	0.10	0.08	0.07	0.08	0.07
C.D. at 5%	0.17	0.29	0.23	0.22	0.24	0.20
C.V. %	25.51	24.28	15.66	12.29	12.20	10.79
Interaction						
C. D. at 5 %	ID	0.23	0.41	NS	NS	NS
	IN	NS	NS	NS	NS	NS
	DN	0.33	0.58	0.46	0.44	0.40
	IDN	NS	NS	NS	NS	NS

* $\sqrt{x + 0.5}$ transformation.

Figures in parentheses are retransformed values.

TABLE 2

Population of *L. erysimi* influenced by interaction of irrigation and date of sowing in mustard crop pooled of (1995-96 and 1996-97).

Treatments	I_1	I_2
After 9th week of sowing		
D ₁	0.71* (0.00)	0.71* (0.00)
D ₂	0.71 (0.00)	0.71 (0.00)
D ₃	0.96 (0.42)	0.88 (0.27)
D ₄	4.27 (17.73)	3.80 (13.94)
S. Em. $\pm$	0.80	
C. D. at 5 %	0.23	
After 10th week of sowing		
D ₁	0.71 (0.00)	0.71 (0.00)
D ₂	0.71 (0.00)	0.71 (0.00)
D ₃	2.30 (4.79)	2.10 (3.91)
D ₄	8.57 (72.94)	7.65 (58.02)
S. Em. $\pm$	0.14	
C. D. at 5 %	0.41	

* $\sqrt{x + 0.5}$ transformation.

Figures in parentheses are retransformed values.

TABLE 3

Population of *L. erysimi* influenced by interaction of date of sowing and nitrogen level in mustard crop (pooled of 1995-96 and 1996-97).

Treatments	N_1	N_2	N_3
After 9th week of sowing			
D ₁	0.71* (0.00)	0.71* (0.00)	0.71* (0.00)
D ₂	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)
D ₃	0.80 (0.14)	1.04 (0.58)	0.93 (0.36)
D ₄	3.64 (12.75)	4.12 (16.47)	4.35 (18.42)
S. Em. $\pm$	0.12		
C. D. at 5 %	0.33		
After 10th week of sowing			
D ₁	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)
D ₂	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)

34	2	3	4
1	1.61	2.15	2.85
D ₃	(2.09)	(4.12)	(7.62)
	7.18	8.34	8.81
D ₄	(51.05)	(69.05)	(77.12)
	0.21		
S. Em. ±	0.58		
C. D. at 5 %			
After 11th week of sowing			
D ₁	0.71	0.71	0.71
	(0.00)	(0.00)	(0.00)
	0.78	0.96	1.05
D ₂	(0.11)	(0.42)	(0.60)
	3.38	3.69	4.08
D ₃	(10.92)	(13.12)	(16.15)
	8.13	9.01	9.73
D ₄	(65.60)	(80.68)	(94.17)
	0.16		
S. Em. ±	0.46		
C. D. at 5 %			
After 12th week of sowing			
D ₁	0.71	0.71	0.71
	(0.00)	(0.00)	(0.00)
	0.71	0.71	0.71
D ₂	(0.00)	(0.00)	(0.00)
	5.95	6.71	6.98
D ₃	(34.90)	(44.52)	(48.72)
	8.99	9.61	10.14
D ₄	(80.32)	(91.85)	(102.32)
	0.15		
S. Em. ±	0.44		
C. D. at 5 %			
After 13th week of sowing			
D ₁	0.71	0.71	0.71
	(0.00)	(0.00)	(0.00)
	0.98	1.16	1.34
D ₂	(0.46)	(0.84)	(1.29)
	6.68	7.56	7.90
D ₃	(44.12)	(56.65)	(61.91)
	9.62	10.15	10.71
D ₄	(92.04)	(102.52)	(114.20)
	0.17		
S. Em. ±	0.51		
C. D. at 5 %			
After 14th week of sowing			
D ₁	0.71	0.71	0.71
	(0.00)	(0.00)	(0.00)
	0.71	0.71	0.71
D ₂	(0.00)	(0.00)	(0.00)
	7.19	7.60	8.02
D ₃	(51.20)	(57.26)	(63.82)
	8.59	9.47	10.01
D ₄	(73.29)	(89.18)	(99.70)
	0.14		
S. Em. ±	0.40		
C. D. at 5 %			

* $\sqrt{x + 0.5}$ transformation.

Figures in parentheses are retransformed values.

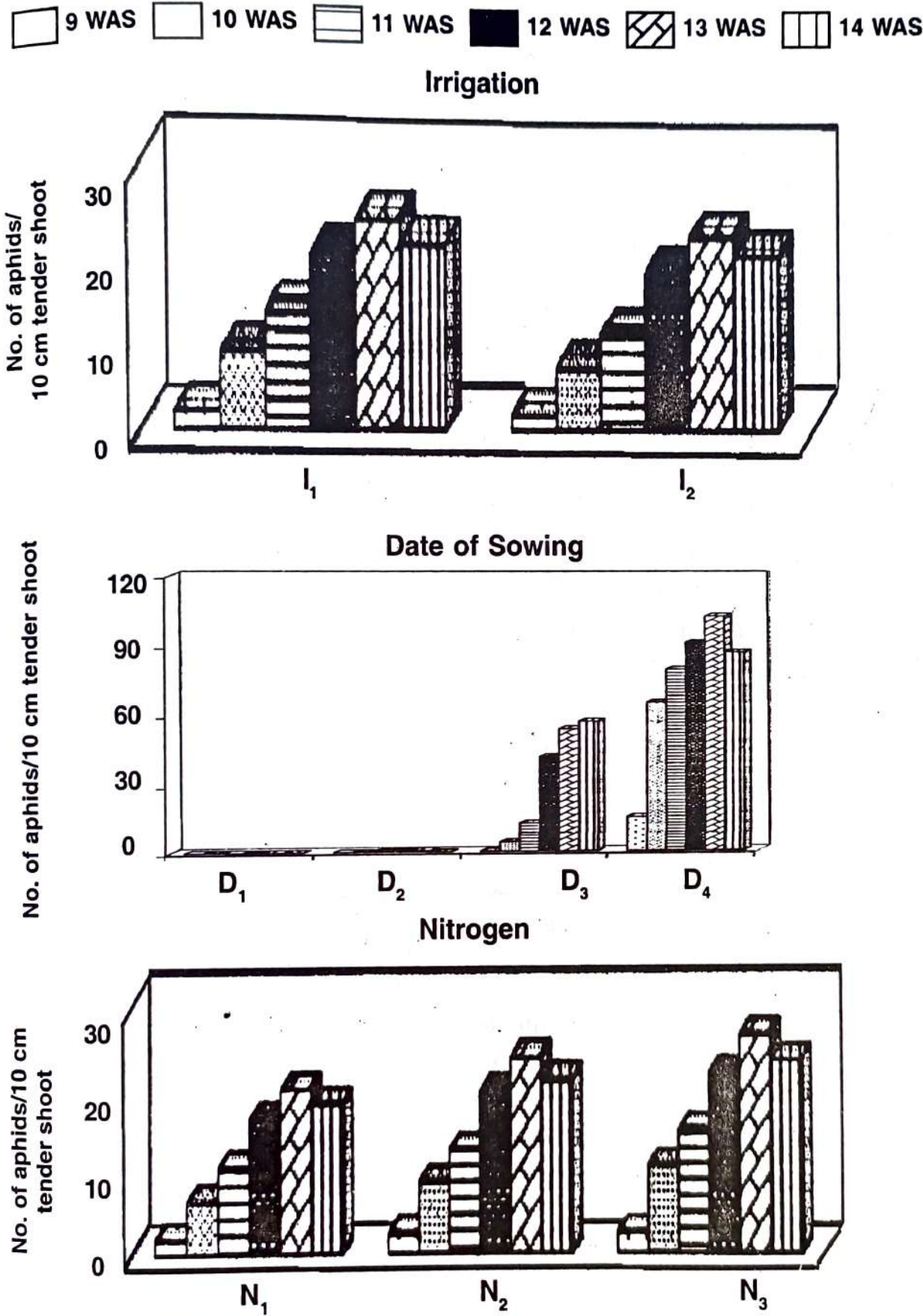


Fig. 4 : Effect of various cultural practices on the incidence of mustard aphid, *L. erysimi*.

and 14 th WAS, respectively was noted in treatment consisting lowest dose of nitrogen fertilizer (25 kg/ha) while, treatment consisting highest dose of nitrogen showed significantly highest population i.e. 2.36, 10.19, 14.63, 21.68, 26.12 and 23.12 aphids/ 10 cm tender shoot during 9, 10, 11, 12, 13 and 14th WAS, respectively. The population did not differ significantly among two doses of nitrogenous fertilizer i.e. 50 kg/ha and 75 kg/ha during 9th WAS. It can be seen from the results that the higher doses of nitrogenous fertilizer increased the incidence of aphid in mustard because of succulent growth of the crop. Similar trend was also observed by Singh *et al.* (1995a) and Upadhyay (1996).

Interaction effect (I X D)

The results (Table-2) showed that among various treatment combinations, incidence of aphid did not appear in treatment combination of I1D1, I1D2, I2D1 and I2D2 during 9 and 10th WAS. Significantly highest population was recorded in treatment combination of I1D4 (17.73 and 72.94 aphids / 10 cm tender shoot during 9 and 10th WAS, respectively.

Interaction effect (D x N)

Interaction effect between date of sowing and nitrogenous fertilizer levels (Table-3) was found significant for the build up of aphid population from commencement of the pest (9th WAS) up to harvest of mustard crop. Mustard crop was completely free from aphid infestation in treatment combinations of D1N2, D1N3, D2N1, D2N2 and D2N3 during 9th, 10th and 14th WAS, D1N1, D1N2 and D1N3 during

11 and 13th WAS and D1N1, D1N2, D1N3 and D2N1 during 12th WAS. Treatment combination of D4N3 recorded significantly highest population being 18.42, 77.12, 94.17, 102.32, 114.20 and 99.70 aphids / 10 cm tender shoot during 9, 10, 11, 12, 13 and 14th WAS, respectively and followed by D4N2 (16.47 aphids / 10 cm tender shoot) and D4N1 (12.75 to 92.04 aphids / 10 cm tender shoot) during these periods.

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