MULTIPLICATION OF LIPAPHIS ERYSIMI /KALT./ ON BRASSICA JUNCEA AS INFLUENCED BY K AND S LEVELS IN SOIL

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Mustard aphid, Lipaphis erysimi /Kalt./ is the most important insect pest of rape seed and mustard crops in India. This pest may cause heavy losses in yield to this crop. The most common practice to manage this pest in field is by the use of chemical insecticides which on the other hand may lead to problems like insect resistance, mortality of non target insect species, hazards to warm blooded animals, etc. The integrated pest management, of late, is more often being applied of which alteration in the cultural practices is an important component /Kalra et.al., 1983/. Some practices like application of nitrogen /N/, phosphorous /P/ and potassium /K/, /Emden, 1966; Kundu and Pant, 1967/ and sulphur /S/, /Atwal, 1955/ as plant nuterients, have been reported to influence the multiplication of various insect pests on different host plants. However, no information regarding sulphur and very little regarding K is available on the multiplication of L.erysimi on mustard. An experiment, to study these factors, was conducted during 1983-84 and 1984-85.

Material and methods

The experiment was conducted under screen house conditions using sand in pots. Indian mustard, Brassica juncea sub species juncea was grown in pots to which various combinations of five levels each of K /0,50,100,150,300 ppm/ and S /0,30,60,90,180 ppm/ were applied as plant nuterients in completely randomised design /factorial/. To this five times replicated experiment, the N and P were applied only in recommended quantities i.e. 40 ppm and 15 ppm through urea and mono calcium phosphate, respectively. Potassium chloride and ammonium sulphate were used for applying K and S, respectively. The amount of N applied through ammonium sulphate was adjusted while applying urea. The data on the number of times the aphis multiplied on various treatments were recorded every 10 days from recording initial population.

Results and discussions

The data on multiplication of aphids, *Lipaphis erysimi* on *Brassica campestris*, from the present studies revealed that potassium /K/ and sulphur /S/ levels in soil provided different responses, by the time aphid colonies got established on the plants /upto 20 days of recording initial population/ as compared to later stages /table 1/. Upto 10 days, the aphid multiplication was more where K levels were higher /4.04 times in K 300 ppm level/. It was almost similar in all the treatments with different levels of S. However, after a lapse of another ten days /20 days after initial population/, the multiplication was more where both K and S levels were highest i.e. K 300 ppm and S 180 ppm. By this time, the aphid colonies had got established. In another 10 days time, the response of S levels in soil was very clear.

The higher the S levels, the higher the multiplication of aphids was recorded. At this period of time aphids could multiply only six times in the treatment where S level was zero as compared to 15.22, 21.48, 19.32 and 32.12 times in treatments S 30, S 60, S 90 and S 180 ppm, respectively. During this observation, although the multiplication of *L.erysimi* was different in vatious K treatments, yet no clear cut trent was visible. Here more than 20 times multiplication of aphids was recorded both in treatments K 0 and K 150 ppm.

In another 10 days /40 days/, this trend became further clear when the aphid multiplied 40 times in K " as compared to only 7.59 times with K levels of K 300 ppm. However, the responses with different levels of S were similar to those of the previous observation i.e. increased proportionately with increase in S level in soil. Almost similar trend was observed in the multiplication of L.erysimi in the next observation i.e. 30 days after recording initial population.

There are conflicting reports regarding the role of K and S levels in soils in multiplication/incidence of different pests on various crops. Kundu and Pant /1967/ and Negm et.al. /1978/ observed no effect on multiplication of L.erysimi and Aphis craccivora on B.campestris and cowpeas, respectively with different levels of K in soil. However, McMurtry /1962/ working with Therioaphis maculata on alfalfa, Schwessing and Wilde /1972/ working with Schizaphis graminum on sorghum and Kalra /1986/ working with Phytomyza horticola on B.juncea reported less multiplication of insects at higher level of K in soil. On the contrary, Michel and Chouteau /1963/ observed more multiplication of Myzus persicae on tobacco with more K level in soil.

Similarly, like the response of multiplication/incidence with various levels of S in soil have been observed by LeRoux /1959/ and Kalra /1986/ while working with Tetranychus telarius on cucumber and P.horticola on B.juncea, respectively.

Vigorous growth of the plant resulted due to higher levels of S in soil and reverse with K levels in soil /Kalra, 1986/. This, alongwith aphid infestation, ultimately affected the seed yield contributing factors of the plant. While most of these factors were affected very little by different levels of K in soil, the various S levels had a marked influence. The higher the level of S in soil, the more is the plant height, total siliquae per plant, siliqua length, seeds per siliqua and seed yield per plant /table 2/. Maximum of 185 cm height, 167 siliquae per plant and 15 g. seed yield per plant, were recorded in treatments K 100, S 180; K 50, S 180 and K 0, S 180, respectively.

It could be concluded that higher levels of S in soil resulted in luxuriant growth of mustard crop which in turn afforded increased multiplication of aphids, L.erysimi on them. On the other hand, lower rate of multiplication of aphids resulted on plants grown in soil having high K level showing, to some extent, resistance of the plant to this pest.

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Table 1. Mean* increase (times) in aphid, *Lipaphis erysimi* (Kalt.) population, days after recording initial population, as influenced by different levels (ppm) of Potassium (K) and Sulphur (S) in soil.

Treatment	Mean initial aphid population per plant	S_0	S_{30}	S_{60}	S_{90}	S_{180}	Av.	C.D. 5 % K	C.D. 5 % S	C.D. 5 % KxS
	10 days									
K_0	38.2	2.18	2.20	1.10	0.94	1.34	1.55			
K_{50}	51.6	1.38	1.56	1.70	1.78	1.06	1.50			
K_{100}	25.2	1.70	1.96	1.80	1.40	2.50	1.87			
K_{150}	18.6	1.62	3.44	3.64	2.88	3.26	2.97			
K_{300}	23.0	5.34	3.96	3.14	3.86	3.90	4.04			
Av.		2.44	2.62	2.28	2.17	2.41		0.23	0.23	0.50
	20 days									
K_0	89.0	1.56	8.30	2.14	2.40	7.00	4.28			
K_{50}	41.2	5.16	3.18	3.84	8.26	3.06	4.7			
K_{100}	41.4	2.72	4.14	5.58	5.26	11.78	5.90			
K_{150}	49.6	2.68	5.12	10.82	4.28	8.92	6.36			
K_{300}	13.4	12.58	5.70	11.58	10.80	12.28	10.59			
Av.		4.84	5.29	6.79	6.2	8.61		0.52	0.52	1.17
	30 days									
K_0	84.6	2.32	31.36	10.44	13.38	63.50	24.20			
K_{50}	137.0	4.22	17.90	15.00	48.54	7.48	18.63			
K_{100}	71.0	2.20	5.80	4.74	12.56	26.04	10.27			
K_{150}	75.0	2.16	12.06	42.28	11.86	52.40	24.15			
K_{300}	23.0	19.10	8.98	34.94	10.24	11.16	16.88			
Av.		6.0	15.22	21.48	19.32	32.12		1.22	1.22	2.74
	40 days									
K_0	79.6	2.68	64.65	3.52	68.46	61.38	40.34			
K_{50}	85.8	0.88	7.20	4.36	81.32	2.48	19.25			
K_{100}	97.0	0.52	2.12	1.24	8.18	25.04	7.42			
K_{150}	112.2	0.32	2.94	30.14	7.48	99.56	28.09			
K_{300}	169.0	7.00	2.64	16.72	3.52	8.08	7.59			
Av.		2.28	16.11	11.20	33.79	39.31		1.95	1.95	4.36
	50 days									
K_0	66.4	0.68	9.20	1.82	24.24	10.90	9.37			
K_{50}	42.4	1.24	1.46	0.70	21.98	0.64	5.20			
K_{100}	106.0	0.10	0.78	0.62	2.12	8.80	2.48			
K_{150}	45.0	0.10	2.10	7.68	2.74	22.90	7.12			
K_{300}	73.2	0.40	0.52	5.02	2.90	2.04	2.18			
Av.		0.50	2.81	3.17	10.80	9.06		0.70	0.70	1.56

* Mean of aphid population on five plants.

Table 2. Yield contributing traits as influenced by Potassium (K) and Sulphur (S) levels (ppm) in soil and aphid infestation.

	S_0	S_{30}	S_{60}	S_{90}	S_{180}	Av.	C.D. (5 %) K.	S.	KxS
a) Plant Height (cm):									
K_0	76.40	108.20	143.20	160.80	161.80	130.08			
K_{50}	75.80	143.40	160.40	164.80	183.00	145.48			
K_{100}	79.60	140.20	148.40	160.60	185.20	142.80			
K_{150}	114.40	137.60	154.40	164.40	152.80	144.72			
K_{300}	112.40	139.80	154.40	166.00	166.60	147.84			
Av.	91.72	133.84	152.16	163.32	169.88		9.83	9.83	21.98
b) Total Siliquae Per Plant:									
K_0	4.50	31.10	69.9	92.1	155.1	70.54			
K_{50}	3.3	64.3	77.3	103.9	167.1	83.18			
K_{100}	7.7	45.1	64.7	113.9	130.4	72.36			
K_{150}	26.5	44.3	78.7	89.7	143.3	76.5			
K_{300}	17.5	40.9	66.3	86.5	138.5	69.94			
Av.	11.9	45.14	71.38	97.22	146.88		3.79	3.79	8.48
c) Average siliqua length (cm):									
K_0	0.14	2.74	3.5	3.9	3.9	2.84			
K_{50}	0.10	2.92	3.40	3.66	3.92	2.80			
K_{100}	2.34	3.28	3.10	3.22	3.44	3.08			
K_{150}	3.38	2.78	3.20	3.42	3.76	3.31			
K_{300}	2.78	3.02	3.24	3.60	3.76	3.08			
Av.	1.75	2.95	3.29	3.56	3.76		0.20	0.24	0.46
d) Total seeds per siliqua:									
K_0	2.06	5.94	8.66	10.90	13.34	8.18			
K_{50}	0.10	9.50	10.26	10.02	13.22	8.62			
K_{100}	2.14	7.38	9.22	9.06	11.90	7.94			
K_{150}	6.50	8.96	8.78	8.16	11.02	8.68			
K_{300}	8.18	7.94	9.98	9.90	12.38	9.68			
Av.	4.55	7.94	9.38	9.61	12.37		0.68	0.68	1.52
e) Average seed yield per plant:									
K_0	0.14	0.34	1.22	1.44	3.06	1.44			
K_{50}	0.10	0.86	1.06	1.08	2.24	1.07			
K_{100}	0.10	0.30	0.68	1.08	2.12	0.96			
K_{150}	0.32	0.70	0.60	1.46	1.28	0.87			
K_{300}	0.54	0.70	1.20	1.66	2.24	1.27			
Av.	0.24	0.58	0.95	1.34	2.19		0.10	0.10	0.22