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EFFICACY OF CHEMICAL AND BOTANICAL INSECTICIDES AGAINST CORIANDER APHID, *HYADAPHIS CORIANDER* (DAS) ON CORIANDER

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ABSTRACT

Efficacy of seven chemical insecticides and two botanicals were evaluated against coriander aphid. Two sprays of the treatments *viz.* imidacloprid, thiamethoxam and acetamiprid were found highly effective against the aphid whereas, dimethoate, dichlorvos, carbosulfan and malathion were moderately effective. However, the botanicals NSKE and azadirachtin were found less effective in reducing the aphid population. The maximum seed yield was observed in imidacloprid treated plots followed by thiamethoxam and acetamiprid, whereas, minimum yield was recorded in azadirachtin treated plots. Benefit cost ratio was highest for thiamethoxam treatment and lowest for azadirachtin.

Key Words: Coriander, insecticides, botanical and *Hyadaphis coriandari*

INTRODUCTION

Insect pests are one of the limiting factors in bridging yield gaps as well quality coriander leaves and seeds. The important pests of coriander include *Myzus persicae* (Sulzer), *Spodoptera litura* (Hub.), *Bemisia tabaci* (Genn.), *Chrotogonus trachypterus* (Blanch) and *Thrips tabaci* (Linn.), besides, a phytophagous mite, *Petroba latens* (Muller) (Jain and Yadav, 1989), seed midges (Kalra, 2006) and coriander aphid, *Hyadaphis coriandri* (Das) (Jain, 1984) have also been reported on this crop.

Among these, coriander aphid, *H. coriandri* (Aphididae, Hemiptera) has been reported to be of regular nature and attained major pest status in Rajasthan and other parts of the country. In Rajasthan, it attacks fennel and coriander crops regularly and causes yield losses up to 50 per cent (Lekha and Jat 2004). Both nymphs and adults cause damage to the crop by sucking the cell sap from tender stem, leaves, inflorescence and developing grains and indirect damage by secreting honey dew and subsequent development of sooty mould is also caused. Due to their fast multiplication rate, aphids cover the entire surface of apical shoots within a short time. Continuous feeding by large aphid colonies causes yellowing, curling and subsequent drying of leaves leading to poor and shriveled seed formation. This study was aimed at identify some effective and safe insecticides including botanicals for evolving an effective management schedule for coriander as a seed spices.

MATERIALS AND METHODS

The experiment was conducted at Agronomy Farm, Department of Agricultural Zoology and Entomology, College of Agriculture, Bikaner during *rabi*, 2009–10 in randomized block design with ten treatments including control, each replicated thrice. Sowing of RCr–684 was done on 10 November, 2009. The plot size was 3×2 m^2, row to row and plant to plant distance of 30 and 15 cm, respectively. Recommended package of practices were followed to raise the crop. The aphid population was recorded visually on three umbels per plant on five randomly selected plants in each plot from first appearance of the pest. The crop was sprayed for the first time on 16th February, 2010 with 600 l ha^{-1} spray solution using a foot sprayer and second application was made 15 days later. Pre–treatment count of aphids was taken a day before the application of treatments. The post treatment data were recorded after 1, 3, 7 and 15 days of application. Pretreatment and post treatment aphid count was used to find out the per cent reduction in aphid population as per the method given by Henderson and Tilton (1955) to be a modification of Abbot's (1925) formula.

RESULTS AND DISCUSSION

Imidacloprid (0.005%) was the most effective treatment against *H. coriandri* on coriander followed by thiamethoxam (0.005%) and acetamiprid (0.04%). The next effective treatments were dimethoate (0.03%), dichlorvos

Table 1. Bio–efficacy of insecticides against *Hyadaphis coriandri* on coriander at different intervals

Insecticides with formulation	Conc. (%)	Per cent reduction in aphid population/ five plants*									
		Pre treatment population	1st spray					2nd spay			
			After 1 day	After 3 day	After 7 day	After 15 day	Mean	After 1 day	After 3 day	After 7 day	After 15 day	Mean
Imidaclorpid 17.8 SL	0.005	31.03 (5.61)#	79.44 (63.04)**	85.13 (67.32)	79.06 (62.78)	60.48 (51.05)	76.03	78.05 (62.08)	82.39 (65.26)	83.52 (66.06)	88.55 (70.27)	83.13
Thiamethoxam 25 WG	0.005	29.87 (5.51)	75.56 (60.38)	78.35 (62.39)	73.61 (59.09)	58.82 (50.08)	71.58	74.02 (59.40)	75.68 (60.50)	80.94 (64.29)	86.73 (68.84)	79.34
Acetamiprid 20 SP	0.004	29.33 (5.46)	72.17 (58.17)	76.50 (61.01)	69.73 (56.63)	57.03 (49.04)	68.86	70.89 (57.56)	75.07 (60.08)	78.46 (62.41)	83.80 (66.30)	77.06
Dimethoate 30 EC	0.03	28.27 (5.36)	66.30 (54.52)	73.47 (59.01)	68.86 (56.11)	54.45 (47.56)	65.77	61.81 (51.92)	64.03 (53.17)	68.68 (56.01)	75.20 (60.16)	67.43
Dichlorvos 76 EC	0.05	30.27 (5.55)	63.79 (53.02)	67.53 (55.27)	56.27 (48.61)	44.75 (41.98)	58.08	57.02 (49.04)	60.88 (51.40)	63.34 (52.08)	72.50 (58.48)	63.44
Carbosulfan 25 EC	0.05	30.73 (5.58)	58.96 (50.17)	58.65 (49.98)	51.07 (45.61)	42.54 (40.70)	52.81	53.29 (46.89)	57.18 (49.15)	65.92 (54.33)	71.91 (58.31)	62.08
Malathion 50 EC	0.05	27.60 (5.30)	52.78 (46.60)	53.16 (46.82)	52.10 (46.21)	34.08 (35.65)	48.03	50.82 (45.48)	54.40 (47.55)	58.30 (49.82)	65.73 (54.22)	57.31
NSKE	5.0	29.63	44.05 (41.58)	46.76 (43.14)	43.11 (41.03)	37.11 (37.53)	42.76	34.21 (35.78)	38.00 (38.05)	52.25 (46.30)	60.85 (51.59)	46.33
Azadirachtin	0.5	31.20 (5.62)	35.69 (36.67)	44.62 (41.90)	39.58 (38.98)	29.77 (33.06)	37.41	28.41 (31.85)	36.19 (36.94)	48.49 (44.14)	53.39 (46.95)	41.62
Control	–	27.43 (5.28)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00
S.Em±		0.136	1.69	2.19	1.78	1.69		2.59	1.89	1.96	2.90	
C.D. (5%)		NS	5.02	6.51	5.27	5.03		7.69	5.62	5.83	8.62	

* Data presented are mean of three replications, # figures in parentheses are $\sqrt{X + 0.5 \text{values}}$

** Figures in parentheses are angular transformed values, NS = Non–significant

Table 2. Comparative economics of insecticides and assessment of losses and increase in yield over control in coriander

Treatments	Mean yield (q ha^{-1})	Avoidable losses		Increase yield over control		Incremental B:C ratio
		(q ha^{-1})	(%)	(q ha^{-1})	(%)	
Imidaclorpid	12.25*	0.00	0.00	4.59	59.92	15.27
Thiamethoxam	11.94	0.31	2.53	4.28	55.87	18.63
Acetamiprid	10.88	1.37	11.18	3.22	42.04	17.63
Dimethoate	10.46	1.79	14.61	2.80	36.55	13.60
Dichlorvos	9.52	2.73	22.29	1.86	24.28	8.35
Carbosulfan	9.26	2.99	24.41	1.60	20.89	3.05
Malathion	8.92	3.33	27.18	1.26	16.45	6.43
NSKE	8.82	3.43	28.00	1.16	15.14	1.64
Azadirachtin	8.80	3.45	28.16	1.14	14.88	0.80
Control	7.66	4.59	37.47	0.00	0.00	–

* Highest yield among the treated plots

(0.03%), carbosulfan (0.05%) and malathion (0.05%), respectively. NSKE (5%) and azadirachtin (0.5%) were less effective. Imidaclorpid reduced the aphid population on coriander up to 76.03 per cent in first spray (Table 1) and 83.13 per cent in second spray. Thiamethoxam and acetamiprid were effective next to imidacloprid in reducing aphid population up to 71.58 and 68.86 respectively after first spray 79.34 and 77.06 pe cent in second spray. The present results are in agreement with that of Bana *et al.* (2011) who found imidacloprid as most effective against *H. coriandri* on coriander. Similarly, Choudhary (2006) reported imidacloprid highly effective against *H. coriandri* on fennel. However, application of thiamethoxam was highly effective against *Aphis gossypii* (Glover) on okra, *L. erysimi* on mustard and *H. coriandri* on coriander (Misra, 2002, Rohilla *et al.*, 2004 and Bana *et al.*, 2011). The treatment with acetamiprid was also reported to be highly effective against *A. gossypii* on chilli, cotton and okra as reported by Jayewar *et al.* (2003), Kumar *et al.* (2003) and Gosalwad *et al.* (2008), respectively.

Dimethoate, dichlorvos, carbosulfan and malathion were moderately effective against *H. coriandri* on coriander reducing the population up to 65.77, 58.08, 52.81 and 48.03 per cent, respectively in the Ist spray and 67.43, 63.44, 62.08 and 57.31 per cent the IInd spray. Gour and Pareek (2003), Jat *et al.* (2004) and Nath *et al.* (2004) reported dimethoate as most effective against *L. erysimi* on mustard and *H. coriandri* on coriander, respectively.

The present findings are also in agreement with those of Meena (1993), Lekha and Jat (2004), who reported malathion as moderately effective against the *H. coriandri* on coriander. Similarly, Gour and Pareek (2003) and Sharma (2004) also reported moderate efficacy against *L. erysimi* on mustard and *H. coriandri* on cumin, respectively.

The neem based products *viz.*, NSKE and azadirachtin were less effective than synthetic chemical insecticides, resulting in 42.76 and 37.41 per cent reduction in aphid population, after first spray and 46.33 and 41.42 per cent after the second spray, respectively. The present findings are in accordance with those of Lekha and Jat (2004), Choudhary (2006) who reported NSKE as less effective against *H. coriandri* respectively on coriander and fennel. Banna *et al.* (2011) reported Nimbecidin less effective against *H. coriandri* on coriander.

Significantly higher seed yields were recorded in all treatments compared to control. The highest seed yield of 12.25 q ha^{-1} was obtained from the plots treated with imidacloprid (Table 2) followed by thiamethoxam and dimethoate respectively. The next best group included dimethoate, dichlorvos, carbosulfan and malathion with 10.46, 9.52, 9.26 and 8.92 q ha^{-1} of seed yield, respectively. The lowest seed yield was obtained from the plots treated with azadirachtin (8.80 q ha^{-1}) followed by NSKE (8.82 q ha^{-1}). Bana *et al.* (2011) also recorded maximum seed yield of coriander from the imidacloprid treatment.

The 'avoidable losses' in seed yield of coriander under aphid infestation was the maximum in untreated plots (4.59 q ha^{-1}) followed by azadirachtin and NSKE (Table 2). The per cent increase in yield over control was maximum for imidacloprid (59.52%), followed by thiamethoxam (55.87%) and acetamiprid (42.04%), whereas it was minimum in plot treated with azadirachtin (14.88%), followed by NSKE (15.14%). The present findings corroborate observations of Bana *et al.* (2011), who recorded highest yield increase in the treatment of imidacloprid (47.03%).

While judging the utility of any insecticide in the pest management programme, it is not only evaluated by its relative potency against the target pest and the period for

which its application provides protection to the crop, but also the economics of treatments remains a major consideration. Hence, the benefit cost ratio was also worked out in the present investigation. The maximum benefit cost ratio was obtained in thiamethoxam treatment (18.63), followed by acetamiprid (17.63) and imidacloprid (15.27), respectively. Minimum benefit cost ratio was obtained in azadirachtin (0.80). However, Tetarwal (2009) recorded the highest B: C ratio in the treatment of phosphamidon (17.95) followed by imidacloprid (12.27). The present findings are partially supported by Bana *et al.* (2011) who reported the highest B: C ratio in oxy–demeton methyl treatment (19.21), followed by malathion (15.83) and imidacloprid (14.02).

REFERENCES

Abbott, W.S. 1925. A method of computing the effectiveness of insecticides. *Journal of Economic Entomology.* **18**: 265–267.

Bana, J.K., Deshwal, H.L., Jat, B.L. and Singh, H. 2011. Bio–efficacy and Economics of Insecticides against aphid, *Hyadaphis Coriandri* (Das) On Coriander. *Journal of Insect Sciences.* **24**: 96–98.

Choudhary, R.K. 2006. Bio–ecology and management of insect–pests of fennel (*Foeniculum vulgare* Mill.). A thesis submitted for Ph.D. to Rajasthan Agricultural University, Bikaner.

Gosalwad, S.S., Kwathekar, B.R., Wadnekar, D.W., Asewar, B.V. and Dhutraj, D.N. 2008. Bio–efficacy of newer insecticide against sucking pest of okra (Abelmoschus esculentus (L.) Moench). *Journal Maharashtra Agricultural University.* **33**: 343–346.

Gour, I.S. and Pareek, B.L. 2003. Field evaluation of insecticides against mustard aphid, *Lipaphis erysimi* (Kalt.) under semi–arid region of Rajasthan. *Indian Journal of Plant Protection*. **31**: 25–27.

Handerson, C.F. and Tilton, E.W. 1955. Tests with acaricides against brown wheat mite. *Journal of Economic Entomology*. **48**: 157–161.

Jain, P.C. 1984. Incidence of pests and their control on coriander (*Coriandrum sativum* L.). Ph.D. Thesis, submitted to Sukhadia University, Udaipur.

Jain, P.C. and Yadav, C.P.S. 1989. Incidence of pests and their control on coriander. *Indian Cocoa, Arecanut and Spices Journal*. **13**: 61–62.

Jat, B.L., Pareek, B.L. and Choudhary, R.K. 2004. Efficacy of some newer insecticides against *Hyadaphis coriandri* (Das) on fennel, *Foeniculum vulgare* Mill. In: National Seminar on New Perspectives in Commercial Cultivation, Processing, Marketing of Seed Spices and Medicinal Plants held at Jobner (March 25–26, 2004), pp. 75.

Jayewar, N.E., Mundhe, D.R. Wadnerkar, D.W. Zanwar, P.R. and Narwade, B.P. 2003. Evaluation of acetamiprid 20 SP against sucking pest of chilli. *Pestology.* **23**: 17–20.

Kalra, V.K. 2006. Insect pests of seed spice crops and their management, pp. 136–142. In: Chhillar B.S., Saini, R.K. and Roshal Lal (eds), *Emerging trend in Economic Entomology*, Center for Advance Studies, Department of Entomology, HAU, Hissar.

Kumar, V.D.V.N.H., Ramnath Subramanian and Natarajan, P. 2003. Evaluation of acetamiprid – a new insecticidal compound against cotton aphid *Aphis gossypii* and jassids *Amrasca biguttula biguttula*. *Pestology.* **23:**28–33.

Lekha and Jat, B.L. 2004. Evaluation of some insecticides against *Hyadaphis coriandri* on coriander. *Indian Journal of Applied Entomology*. **18**: 32–35.

Meena, N.L. 1993. Biology and management of coriander aphid, *Hyadaphis coriandri* (Das) on coriander. M.Sc. (Ag.) Thesis, submitted to Rajasthan Agricultural University, Bikaner.

Misra, H.P. 2002. Field evaluation of some newer insecticides against aphids and jassids on okra. *Indian Journal of Entomology.* **64**: 80–84.

Nath, L., Singh, A.K. and Singh, H.M. 2004. Relative resistance of coriander (*Coriandrum sativum* L.) germplasm against aphid, *Hyadaphis coriandri* (Das). *Shaspa.* **11**: 87–88.

Pruthi, J.S. 1976. Spices and condiments. National Book Trust, India, New Delhi, 269 pp.

Rohilla, H.R., Bhatnagar, P. and Yadav, P.R. 2004. Chemical control of mustard aphid with newer and conventional insecticides. *Indian Journal of Entomology.* **66**: 30–32.

Sharma, K.L. 2004. Management of insect pest complex on cumin, *Cuminum cyminum* Linn. with special reference to aphid. A thesis submitted for M.Sc. (Ag.) to Rajasthan Agricultural University, Bikaner.

Tetarwal, A. 2009. Varietal preference and management of coriander aphid, *Hyadaphis coriandri* (Das). Thesis M.Sc. (Ag) (unpub.). Rajasthan Agricultural University, Bikaner. Campus Jobner.