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BIO-EFFICACY OF SOME INSECTICIDES AGAINST APHID, *HYADAPHIS CORIANDARI* (DAS) ON FENNEL (*FOENICULUM VULGARE* MILLER)

S.D. RATNOO, L.K. JAIN, K.C. AHIR AND H.P. PAREWA
ZDR, Agriculture Research Station, Keshwana, Jalore, Agriculture University, Jodhpur

ABSTRACT

The experiment was conducted at ARS Jalore during *Rabi* 2013-14, 2014-15 and 2015-16 to evaluate the bio-efficacy and economics of different insecticides against aphid, *Hyadaphis coriandri* (Das) in Fennel, *F. vulgare.* The study revealed that the treatment thiomethoxam 25 WG @ 100gm/ha was found most effective in controlling aphid in Fennel. Next effective treatments were acetamiprid 20 SP @ 100 gm /ha and imidacloprid 17.8 SL @150ml/ha. The B:C ratio of thiomethoxam 25 WG @ 100 gm/ha, acetamiprid 20 SP @ 100gm /ha and imidacloprid 17.8 SL @ 150ml/ha were14.32, 8.65 and 10.93,respectively.

Key words : Fennel, Aphid, Thiomethoxam, Insecticides, Bio-efficacy

INTRODUCTION

Fennel, *Foeniculum vulgare* (Miller) is believed to bc nativc of Southcrn Europc, North Amcrica and coastal Mediterranean area of India (Tanira *et al.,* 1996; Marino *et al.,* 2007; Aprotosoaie *et al.,* 2010; Bayazit, 2010 and Meena *et al.,* 2010). It is commonly known as "*Sawf*" in Hindi and considered as an important spices crop. Fennel is dried fruit of *F. vulgare* which is perennial herbaceous plant belonging to family Umbelliferae, reaches a height of 90 to 150 cm. It is mainly cultivated for its seeds (fruits), which have a pleasing fragrance and an aromatic taste. It is known for its therapeutic, carminative and stimulants properties and it has theraptic value against diseases like cholera, bile, anti-inflammatory, nervous disorder, constipation, dysentery, diarrhoea and for disease affecting chest, lung, spleen and kidneys. The leaves are reported to have diuretic properties, whereas, the root are purgative (El-Awadi and Hassan, 2011; Singh and Singh, 1996). India is the largest producer of fennel, in which Rajasthan & Gujrat contribute largely. There are many insect-pests which are causing damage to the fennel crop. Among the different pests there are some sucking insects which causes economic loss to the crop *viz.,* aphids, *Hyadaphis coriandri* Das and *Aphis gossypii* (Glover); jassid, *Empoasca kerri* (Das); thrips, *Thrips tabaci* (Lindeman), *Thrips flavus* (Schrank), *Scirtothrips dorsalis* (Hood); pentatomid bugs, *Calcoris noregicus* (Gml); fennel flower bug, *Otinotus spp;* lygus bug, *Lygus spp.* and seed midges, *Systole coriandri* (Nikol) and *Systole albipenniz* (Walker). Further, some lepidopteran, coleopteran and dipteran pests are also causing damage to the fennel crop (Mittal and Butani, 1990). Among the different pests, aphid, *H. coriandri* causes maximum damage to the fennel crop as both nymph and adults suck the cell sap from the leaves, stem and umbels and as a result plant becomes weak and stunted. Aphid causes 50 per cent losses in yield of fennel (Mittal and Butani, 1989). Several chemical insecticides have been recommended for combating *H. coriandri.* However, problems like residues in seeds and environmental contamination are the result of injudicious use of chemical insecticides. Such reliance on insecticides has created many problems such as very frequent application of insecticides, excessive residues on market spices that concern general consumer health and the environment, insecticide resistant, trade implications, poisoning, hazards to non-target organism, increased production costs etc. Among the several avenues to overcome the insecticidal resistance problem, replacement with new molecules of insecticides is one of the important considerations. Considering above facts, the experiment was carried out to evaluate bioefficacy of different insecticides against aphid, *H. coriandri* in fennel.

MATERIALS AND METHODS

The experiment was laid out in a Randomized Block Design with six treatments replicated fourtimes during *Rabi* 2013-14, 2014-15 and 2015-16 at Agriculture Research Station, Jalore. Fennel variety RF-125 was sown at a spacing of 45 x 20 cm in November, 2013, 2014 and 2015. All agronomical practices were adopted as per the recommendation in vogue. The first insecticidal treatment was carried out when the pest crossed its ETL (1.0 aphid index /plant) and subsequent

Table 1. Bio-efficacy of different treatments against aphid in fennel

Tr. No.	Treatment	PTP	Mean aphid population*/10 cm. plant part					
			First spray			Second spray		
			3 DAS	7 DAS	14 DAS	3 DAS	7 DAS	14 DAS
T-1	Dimethoate 30 EC @1lit/ha	27.06 (5.25)	9.99 (3.24)	11.82 (3.51)	19.12 (4.43)	3.66 (2.04)	4.16 (2.16)	5.11 (2.37)
T-2	Imidacloprid 17.8 SL @ 150 ml/ha	29.86 (5.51)	8.08 (2.93)	11.12 (3.41)	17.81 (4.28)	3.42 (1.98)	3.78 (2.07)	4.56 (2.25)
T-3	Thiomethoxam 25 WG @100 g/ha	27.37 (5.28)	7.45 (2.82)	9.61 (3.18)	17.64 (4.26)	3.30 (1.95)	3.66 (2.04)	4.16 (2.16)
T-4	Acetamiprid 20 % SP @ 100gm/ha	28.44 (5.38)	8.86 (3.06)	11.47 (3.46)	18.07 (4.31)	3.50 (2.00)	4.08 (2.14)	4.69 (2.28)
T-5	Malathion 50 EC @ 1.0 lit/ha	29.97 (5.52)	10.25 (3.28)	12.96 (3.67)	19.84 (4.51)	4.43 (2.22)	5.90 (2.53)	7.34 (2.80)
T-6	Control	28.66 (5.40)	33.48 (5.83)	21.49 (4.69)	24.40 (4.99)	15.90 (4.05)	10.45 (3.31)	13.34 (3.72)
	S Em±	0.26	0.18	0.14	0.15	0.08	0.08	0.11
	CD% at 5%	0.80	0.56	0.43	0.49	0.25	0.26	0.36
	CV%	9.69	10.37	7.80	7.15	6.99	7.37	9.22

* Figures in parenthesis are √x+0.5 ** Mean of five plants PTP = Pre treatment population

Table 2. Seed yield (q/ha) of fennel of different treatments

S. No.	Treatment	Seed yield (q/ha)				ICBR
		2013-14	2014-15	2015-16	Mean	Ratio
T-1	Dimethoate 30 EC @1lit/ha	12.37	15.40	11.40	13.05	5.55
T-2	Imidacloprid 17.8 SL @ 150 ml/ha	15.02	14.48	13.56	14.35	10.93
T-3	Thiomethoxam 25 WG @100 g/ha	15.54	17.16	13.58	15.43	14.32
T-4	Acetamiprid 20%SP@100gm/ha	14.38	13.85	13.23	13.82	8.65
T-5	Malathion 50 EC @ 1.0 lit/ha	10.99	12.78	10.63	11.47	2.27
T-6	Control	10.43	12.70	9.18	10.77	
	S Em±	0.36	0.985	0.26		
	CD% at 5%	1.12	2.971	0.79		
	CV%	5.56	13.70	4.37		

sprays was applied at 15 days interval, through manually operated hydraulic knapsak sprayer. The quantity of spray solution was used @ 500 l /ha. The observations on aphid index from 10 cm terminal twigs from five randomly selected plant was recorded from the net plot prior to spray and 3, 7, 14 days after each spray. The data obtained were statistically analyzed after following appropriate transformation. Fennel seed yield (Kg /ha) was recorded from the net plot area in each treatment.

RESULTS AND DISCUSSION

The data of pooled over periods on mean aphid population after first and second application of insecticides presented in Table 1 revealed that all the treatments recorded significantly lower aphid population than control. Thiomethoxam 25 WG @ 100 g/ha was found most superior than other treatment having lowest aphid population with highest yield of 15.54, 17.16 and

Table 3. Economics of different treatments

S. No.	Treatments	Mean Yield (q/ha)	Gross Return income	Add. Return (Rs/ha)	Treat. Cost (Rs./ha)	Net Return (Rs./ha)	ICBR Ratio (Rs./ha)
T-1	Dimethoate 30 EC @1lit/ha	13.05	65250	11400	1740	9660	5.55
T-2	Imidacloprid 17.8 SL @ 150 ml/ha	14.35	71750	17900	1500	16400	10.93
T-3	Thiomethoxam 25 WG @100 g/ha	15.43	77150	23300	1520	21780	14.32
T-4	Acetamiprid 20%SP@100gm/ha	13.82	69100	15250	1580	13670	8.65
T-5	Malathion 50 EC @ 1.0 lit/ha	11.47	57350	3500	1070	2430	2.27
T-6	Control	10.77	53850	–	–	–	–

13.58 q/ha during 2013-14, 2014-15 and 2015-16, respectively. Next effective treatment was imidacloprid 17.8 SL @ 150 ml/ha followed by acetamiprid 20% SP @ 100gm/ha, dimethoate 30 EC @ 1lit/ha and malathion 50 EC @ 1.0 lit/ha. The treatment thiomethoxam 25 WG @100gm/ha, acetamiprid 20 % SP @ 100 gm /ha and imidacloprid 17.8 SL @150ml/ha found significantly superior to all other treatments and having maximum B:C ratio of 14.32, 8.65 and 10.93, respectively (Table-1, 2 & 3).The obtained results are in close conformity with the earlier workers as Hirpara (2000) found dimethoate 0.03% and imidacloprid 0.006% to be the most effective for the control of aphid on fennel. According to Jat *et al.* (2008) and Sachan *et al.* (2010), dimethoate 0.03 per cent gives best result by reducing the aphid population in fennel and coriander, respectively. Thiomethoxam 25 WG (0.005%) and imidacloprid (0.005%) stood as a most effective and economical insecticide against fennel aphid in coriander (Bana *et al.*, 2011 &Tetarwal and Sharma, 2012). Imidacloprid proved to be most effective in reducing the aphid population (95.20%) followed by thiomethoxam (91.40%) and dimethoate (87.00%) (Hake *et al.*, 2015). In the present investigation, more or less same trend was also observed.

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