Research Paper :

Efficacy of Different Newer Chemicals and Seed Treatment Against Foliage Feeding Wheat Aphids

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SUMMARY

The present investigation was undertaken to find out the effective and economical control measures for the management of foliage feeding wheat aphids, for which four insecticides as sprays *viz.*, Imidacloprid 17.8 SL, Thimethoxam 25 WS, Quinolphos 25 EC and Oxy-demeton methyl 25 EC and two seed treatments *viz.*, Imidocloprid 70 WS and Thiamethoxam 70 WS were evaluated .The pooled data for consecutive three years pertaining to efficacy of various insecticides treatments were significantly effective against control foliage feeding wheat aphids. Imidocloprid 17.8 SL@ 20g.a./ha proved to be significantly most effective followed by thiamethoxam 25 WS @ 12.5g.a./ha, imidocloprid 70WS @ 0.35g.a./kg of seed, thaimethoxam 70WS @ 0.35g.a./kg of seed, oxy-demeton methyl 25EC @ 12.5g.a./ha and quinolphos 25EC @ 125g.a./ha against the control of foliage feeding wheat aphids. The treatment with imidacloprid 17.8SL @ 20g.a./ha (51.86g/ha) recorded significantly highest yield, over rest of the treatments and untreated control (39.53g/ha). The highest additional income (Rs.13, 738/ha) net profit (Rs.13,140.00/ ha) and benefit cost ratio (2.48) were observed in the treatment with imidacloprid 17.8SL @ 20g.a.i/ha.

Key words : *Coccinellid*, Seed treatment, Wheat aphids, Spray insecticides

Wheat is one of the most important food crops in India. The post -green revolution period which exhibited phenomenol growth in wheat production also witnessed an increase in pest problems. Among the insect pest attacking wheat crop in India, cereal aphids have assumed economic importance during past three decades and have become regular pests in all major wheat growing areas (Singh, 1986 and 1998).

Due to shift of sowing time of wheat, availability of relatively photo insensitive varieties, temperature tolerant genotypes and also due to considerable changes in agro techniques involving higher fertilizer inputs and irrigation led changes in pest complex of wheat. The major insect pests problems in India are termites, aphids, shoot fly, brown wheat mites, gujhia weevil etc. Among these, wheat aphids, *Rhopalosiphum padi*, *Rhopalosiphum maidis*, *Hemiptera*, *Aphididae* are most serious pests of wheat. On this basis, an attempt was made to find out the effectiveness of some chemical insecticides against foliar aphids of wheat and their bio safety to *Coccinellid* predator.

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MATERIALS AND METHODS

A field experiment was conducted during *rabi* 2006-07, 2007-08 and 2008-09 on the research farm of Agricultural Research Station, Niphad, Dist-Nasik (M.S.), India. A field experiment was carried out in Randomized Block Design with seven treatments *viz*.imidacloprid 17.8 SL, imidaclorid 70 WS and thiamethoxam70 WS (as seed treatment), thiamethoxam 25 WG, quinolphos 25 EC, oxy-demeton methyl 25 EC and untreated control and three replications on wheat variety Trimbak (NIAW-301) in plot size 6 x 1.35m (six rows of six meter row length).

The insecticidal sprays were applied at an internal of 15 days, initiating just after average infestation of aphids 10 aphids/shoot/plant. Five shoots from each treatment were selected randomly for recording observations. Observations were recorded on the basis of average population of survival aphids. Pre-count was taken 24 hours before spray and post-count was taken on 1, 2, 7 and 15 days after spray. The average population of aphids survived per shoot was worked and the data were subjected to square root transformation. The experimental data were subjected to statistical analysis (Panse and Sukhatme, 1967).

RESULTS AND DISCUSSION

The pooled data on efficacy of tested

insecticides at 1, 2, 7 and 15 days after spray and seed treatment at the time of sowing are presented in Table 1 and 2 on foliage feeding wheat aphids in wheat. The pre-treatment count for aphids population recorded 24 hrs before insecticidal application varied from 2.88 to 18.03 per shoot/plant. The data indicated significant differences among the treatments.

During pre-count the insecticidal treatment with seed treatment to wheat seed with imidacloprid seed treatment 70 WS @ 0.35 g.a.i/kg of seed, recorded minimum number of foliage feeding wheat aphids (2.88/shoot/plant) followed the seed treatment with thiamethoxam 70 WS 0.35 g.a.i/kg of seed (3.59/shoot/plant). In plots treated with insecticidal seed treatment minimum no. of aphids was recorded up to 50 days after sowing (Table 1).

The pooled data indicated that all the insecticidal treatments were significantly superior over untreated control at 1, 2 , 7 and 15 DAS after spray. The treatment with imidacloprid 17.8 SL @ 20g.a.i/ha recorded minimum (0.99, 0.40, 0.17 and 5.93) population of foliage feeding wheat aphids per shoot/plant at 1, 2, 7 and 15 days after spray at is was at par with thiamethoxam 25 WG @ 12.5 g.a.i/ha, imidacloprid 70 WS @ 0.35 g.a.i/kg thiamethoxam 70 WS @ 0.35g.a.i/kg of seed, oxydemeton methyl 25 EC @ 12.5 g.a.i/ha and quinolphos 25EC @ 125 g.a.i/ha respectively at 1 days after spray. At 2, 7 and 15 DAS the treatment with imidacloprid 17.8 SL @ 20g.a.i/ha recorded significantly lowest no. of aphids/ shoot/plant (0.40, 0.17, and 5.93) followed by thiamethoxam 25 WG@ 12.5 g.a.i/ha (2.81, 2.13, 5.37). The untreated control recorded significantly maximum number of 35.61, 38.85, 42.28 and 44.77 foliage feeding wheat aphids/shoot per plant at 1, 2, 7 and 15 days after spray. The population of foliage feeding wheat aphids found to be increased after 15th days in almost all the insecticidal treatments except the treatment with imidcloprid 70WS and thiamethoxam 70 WS @ 0.35g.a.i/ kg of seed treatment. The treatment with imidacloprid 70 WS @ 0.35g.a.i/kg and thiamethoxam 70 WS @ 0.35g.a.i/kg of seed recorded minimum increase of foliage feeding wheat aphids is (2.88 and 3.59, 4.14 and 5.40, 5.50 and 5.57, 5.74 and 6.92, 9.07and 10.13) over untreated control (18.03, 35.61, 38.85, 42.28 and 44.77) at percount 1, 2, 7 and 15 days after spray. The same trend was also observed during each year under study.

The yield (Table 2) differences due to different insecticidal treatments were observed to be significant during each year and the pooled analysis the treatment with imidacloprid 17.8 SL @ 20g.a.i/ha (51.86g/ha) recorded significantly highest yield over rest of the insecticidal treatments and untreated control (39.53q/ha). It was followed by the treatment with thiamethoxam 25 WG @ 12.5 g.a.i/ha (49.85q/ha), imidacloprid 70WS seed treatment @ 0.35 g.a.i/kg of seed (48.07q/ha),

Table 1 : Average population of survived foliage feeding wheat aphids /shoot/plant as influenced by various insecticidal treatments

Sr. No.	Treatment details	Dose g.a.i/h	Average population of survived foliage feeding wheat aphids /shoot/plant											
			Pre-count				1 DAS				2 DAS			
			06-07	07-08	08-09	Pooled Mean	06-07	07-08	08-09	Pooled Mean	06-07	07-08	08-09	Pooled Mean
1.	Imidacloprid 17.8 SL	20	4.47	9.40	23.46	12.44	1.30	1.40	0.27	0.99	0.67	0.53	0.0	0.40
			(2.33)	(3.22)	(4.94)	(3.67)	(1.52)	(1.55)	(1.10)	(1.41)	(1.29)	(1.24)	(1.00)	(1.18)
*2.	Imidacloprid 70 WS	0.35	5.93	0.40	2.33	2.88	5.13	0.13	7.17	4.14	4.37	0.06	12.07	5.50
			(2.61)	(1.18)	(1.82)	(1.97)	(2.46)	(1.06)	(2.86)	(2.27)	(2.31)	(1.03)	(3.61)	(2.55)
*3.	Thiamethoxam 70	0.35	2.37	8.40	0.0	3.59	0.77	5.80	10.17	5.40	0.67	6.53	9.53	5.57
	WS		(1.83)	(3.07)	(1.00)	(2.14)	(1.32)	(2.61)	(3.34)	(2.52)	(1.29)	(2.74)	(3.24)	(2.56)
4.	Quinalphos 25 EC	125	6.57	10.00	28.53	15.03	5.27	6.07	6.00	5.78	2.50	3.27	2.87	2.88
			(2.75)	(3.32)	(5.43)	(4.00)	(2.50)	(2.66)	(2.64)	(2.60)	(1.86)	(2.07)	(1.96)	(1.97)
5.	Thiamethoxam 25	12.5	7.00	10.87	27.93	15.26	6.33	5.00	0.37	3.90	5.03	3.40	0.0	2.81
	WG		(2.81)	(3.45)	(5.37)	(4.03)	(2.64)	(2.45)	(1.17)	(2.21)	(2.43)	(2.10)	(1.00)	(1.95)
6.	Oxy demeton methyl	125	7.70	10.47	28.00	15.39	5.40	4.20	6.76	5.45	3.33	3.47	3.23	3.33
	25 EC		(2.93)	(3.39)	(5.38)	(4.05)	(2.46)	(2.28)	(2.78)	(2.54)	(2.07)	(2.11)	(2.05)	(2.08)
7.	Untreated control	-	16.23	9.73	28.13	18.03	20.30	12.33	74.20	35.61	19.57	13.53	83.47	38.85
			(4.13)	(3.28)	(5.39)	(4.36)	(4.61)	(3.65)	(8.67)	(6.05)	(4.53)	(3.81)	(4.94)	(6.31)
	S.E. $\pm$		0.17	0.10	0.24	0.57	0.25	0.11	0.12	0.68	0.15	0.07	0.08	0.43
	C.D. (P=0.05)		0.53	0.31	0.72	1.75	0.78	0.33	0.37	2.08	0.47	0.21	0.24	1.33
						NS								

Table 2 : Average population of survived foliage feeding wheat aphids /shoot/plant and yield q/ha as influenced by various insecticidal treatments

Sr. No.	Treatment details	Dose g.a.i/h	Average population of survived foliage feeding wheat aphids /shoot/plant								Yield q/ha			
			7 DAS				15 DAS							
			06-07	07-08	08-09	Pooled mean	06-07	07-08	08-09	Pooled mean	06-07	07-08	08-09	Pooled mean
1.	Imidacloprid 17.8 SL	20	0.43 (1.19)	0.07 (1.03)	0.0 (1.00)	0.17 (1.08)	4.47 (2.33)	1.53 (1.59)	11.80 (3.57)	5.93 (2.63)	48.21	49.15	58.23	51.86
*2.	Imidacloprid 70 WS	0.35	3.40 (2.09)	0.33 (1.15)	13.50 3.81	5.74 (2.60)	5.93 (2.61)	0.40 (1.18)	20.90 4.68	9.07 (3.17)	45.42	49.82	48.97	48.07
*3.	Thiamethoxam 70 WS	0.35	0.47 (1.21)	11.00 (3.46)	9.30 3.20	6.92 (2.81)	2.37 (1.83)	9.00 (3.16)	19.03 4.48	10.13 (3.34)	47.14	44.65	50.62	47.47
4.	Quinalphos 25 EC	125	1.60 (1.61)	1.60 (1.61)	4.00 (2.23)	2.40 (1.84)	6.57 (2.75)	3.67 (2.16)	24.80 (5.07)	11.68 (3.56)	44.09	45.32	51.02	46.81
5.	Thiamethoxam 25 WG	12.5	4.07 (2.24)	2.33 (1.82)	0.0 (1.00)	2.13 (1.77)	7.00 (2.81)	2.93 (1.98)	6.20 (2.68)	5.37 (2.52)	45.66	45.47	58.43	49.85
6.	Oxy demeton methyl 25 EC	125	1.70 (1.64)	1.80 (1.67)	5.07 (2.46)	2.85 (1.96)	7.70 (2.93)	2.93 (1.98)	18.80 (4.44)	9.81 (3.29)	44.40	44.94	51.44	46.92
7.	Untreated control	-	22.40 (4.83)	19.27 (4.50)	85.17 (9.28)	42.28 (6.58)	16.23 (4.13)	7.60 (2.93)	110.5 (10.55)	44.77 (6.76)	38.03	39.83	40.74	39.53
	S.E. ±		0.13	0.07	0.13	0.68	0.17	0.14	0.20	0.75	2.01	1.29	1.16	1.56
	C.D. (P=0.05)		0.40	0.21	0.40	2.08	0.53	0.42	0.61	2.26 NS	5.92	3.90	3.51	4.80

thiamethoxam 70 WS seed treatment @ 0.35g.a.i/kg of seed, oxy-demeton methyl @ 125g.a.i/ha (46.92 q/ha) and quinolphos 25 EC @ 125 g.a.i/ha (46.81 g/ha) and these treatments were at par with each other.

The data regarding the population of *Coccinellid* predator was non- significant (Table 3 and 4). However, all the treatments were found comparatively safe for the *Coccinellid* predators of wheat aphids. The data regarding economics of different treatments in Table 5 and 6 revealed that the highest additional income (Rs. 13,738 / ha) net profit (Rs.13,022/ ha) and benefit cost ratio (2.48) were observed in the treatment with

Table : 3 Average Population of *Coccinellid* grubs (beetles)/m^2 as influenced by various insecticidal treatments

Sr. No.	Treatment details	Dose g.a.i/h	Average Population of *Coccinellid* grubs (beetles)/m^2											
			Precount				1 DAS				2 DAS			
			06-07	07-08	08-09	Pooled Mean	06-07	07-08	08-09	Pooled Mean	06-07	07-08	08-09	Pooled Mean
1.	Imidacloprid 17.8 SL	20	1.40 (1.55)	0.58 (1.26)	0.58 (1.26)	0.85	1.35 (1.51)	0.41 (1.19)	0.41 (1.19)	0.72	0.94 (1.39)	0.49 (1.22)	0.49 (1.22)	0.64
*2.	Imidacloprid 70 WS	0.35	1.07 (1.43)	0.45 (1.20)	0.62 (1.27)	0.71	1.23 (1.49)	0.61 (1.27)	0.82 (1.35)	0.88	1.48 (1.56)	0.41 (1.19)	0.45 (1.20)	0.78
*3.	Thiamethoxam 70 WS	0.35	0.70 (1.30)	0.62 (1.27)	0.53 (1.24)	0.61	0.63 (1.28)	0.82 (1.35)	0.66 (1.29)	0.70	1.19 (1.48)	0.45 (1.20)	0.45 (1.20)	0.69
4.	Quinalphos 25 EC	125	0.82 (1.34)	0.53 (1.24)	0.53 (1.24)	0.62	0.82 (1.35)	0.66 (1.29)	0.53 (1.24)	0.67	0.90 (1.38)	0.45 (1.20)	0.53 (1.24)	0.62
5.	Thiamethoxam 25 WG	12.5	0.67 (1.29)	0.53 (1.24)	0.82 (1.35)	0.67	1.81 (1.68)	0.53 (1.24)	0.66 (1.29)	1.00	1.40 (1.53)	0.53 (1.24)	0.49 (1.22)	0.80
6.	Oxy demeton methyl 25 EC	125	1.03 (1.41)	0.82 (1.35)	0.45 (1.20)	0.76	1.48 (1.57)	0.66 (1.29)	0.61 (1.27)	0.91	1.56 (1.60)	0.49 (1.22)	0.41 (1.19)	0.82
7.	Untreated control	-	1.28 (1.50)	0.78 (1.33)	0.78 (1.33)	0.94	1.24 (1.47)	0.66 (1.29)	0.66 (1.29)	0.85	1.35 (1.53)	0.41 (1.19)	0.41 (1.19)	0.72
	S.E. ±		0.09	0.14	0.14	0.04	0.10	0.14	0.14	0.05	0.10	0.10	0.10	0.03
	C.D. (P=0.05)		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table 4 : Average Population of *Coccinellid* grubs (beetles)/m^2 as influenced by various insecticidal treatments

Sr. No.	Treatment details	Dose g.a.i/h	Average Population of *Coccinellid* grubs (beetles)/m^2							
			7 DAS				15 DAS			
			06-07	07-08	08-09	Pooled Mean	06-07	07-08	08-09	Pooled Mean
1.	Imidacloprid 17.8 SL	20	1.19 (1.48)	0.60 (1.26)	0.60 (1.26)	0.79	0.66 (1.28)	0.57 (1.25)	0.57 (1.25)	0.60
*2.	Imidacloprid 70 WS	0.35	1.19 (1.48)	0.66 (1.29)	0.66 (1.29)	0.83	0.74 (1.31)	0.45 (1.20)	0.57 (1.25)	0.58
*3.	Thiamethoxam 70 WS	0.35	0.91 (1.36)	0.66 (1.29)	0.66 (1.29)	0.74	0.66 (1.28)	0.57 (1.25)	0.45 (1.20)	0.56
4.	Quinalphos 25 EC	125	1.11 (1.45)	0.66 (1.29)	0.45 (1.20)	0.74	0.37 (1.16)	0.45 (1.20)	0.41 (1.19)	0.41
5.	Thiamethoxam 25 WG	12.5	1.05 (1.43)	0.49 (1.22)	0.49 (1.22)	0.67	0.41 (1.18)	0.41 (1..19)	0.41 (1.19)	0.41
6.	Oxy demeton methyl 25 EC	125	1.15 (1.45)	0.45 (1.20)	0.66 (1.29)	0.75	0.41 (1.18)	0.41 (1.19)	0.45 (1.20)	0.42
7.	Untreated control	-	0.94 (1.39)	0.53 (1.24)	0.53 (1.24)	0.66	0.62 (1.27)	0.49 (1.22)	0.49 (1.22)	0.53
	S.E. ±		0.10	0.15	0.15	0.02	0.09	0.10	0.10	0.02
	C.D. (P=0.05)		NS	NS	NS	NS	NS	NS	NS	0.05

Table 5 : Economics of different insecticidal spray treatments

Sr. No.	Treatment details	Dose g.a.i/h	Yield q/ha				Additional yield over control				Additional income over control			
			06-07	07-08	08-09	Pooled Mean	06-07	07-08	08-09	Pooled Mean	06-07	07-08	08-09	Pooled Mean
1.	Imidacloprid 17.8 SL	20	48.21	49.15	58.23	51.86	10.18	9.22	17.49	12.29	9162	11064	20988	13738
*2.	Imidacloprid 70 WS	0.35	45.42	49.82	48.97	48.07	7.39	9.89	8.23	8.50	6651	11868	9876	9465
*3.	Thiamethoxam 70 WS	0.35	47.14	44.65	50.62	47.47	9.11	4.82	9.88	7.94	8199	5784	11856	8613
4.	Quinalphos 25 EC	125	44.09	45.32	51.02	46.81	6.06	5.39	10.28	7.24	5454	6468	12336	8086
5.	Thiamethoxam 25 WG	12.5	45.66	45.47	58.43	49.85	7.63	5.54	17.69	10.28	6867	6648	21228	11581
6.	Oxy demeton methyl 25 EC	125	44.40	44.94	51.44	46.92	6.37	5.01	10.70	7.36	5733	6012	12840	8195
7.	Untreated control	-	38.03	39.83	40.74	39.53	-	-	-	-	-	-	-	-

Total cost of cultivation except insecticide control : Rs.21800 /-(2006-07) Rs.22600 /-(2007-08) Rs.22797/-(2008-09)
Net income from untreated control : Rs.34227 /-(06-07) *i.e.* wheat price @ Rs.900/q
Rs.47796 /-(07-08) *i.e.* wheat price @ Rs.1200/q
Rs.48888 /-(08-09) *i.e.* wheat price @ Rs.1200/q

Cost of insecticides :
1. Imidacloprid 17.8 SL :Rs.1850/l 2.
2. Imidacloprid 70 WS :Rs.75/5 g 3. Thiamethoxam 70 WS Rs.75/ 5 g
5. Quinolphos 25 EC :Rs.350/l 6. Thiamethoxam 25 WG Rs.3250/kg
7. Oxy-demeton methyl 25 EC :Rs.290/lit

imidacloprid 17.8 SL @ 20g.a.i/ha. It was followed by the treatment with thiamethoxam 25 WG @ 12.5g.a.i/ha, imidocloprid 70 WS @ 0.35 g.a.i/kg seed and thiamethoxam 70 WS @ 0.35 g.a.i/kg of seed.

Elbert *et al.* (1991) reported that imidacloprid has outstanding insecticidal activity against sucking pests with longer persistent toxicity. Mckirdy and Jones (1996) observed that wheat seed dressed with imidacloprid followed by foliar application of alpha cypermethrin markedly decreased the number of aphids. Kumar (1998) studied the bio-efficacy of imidacloprid against sucking pests of cotton and reported that 200 SL foliar spray at

Table : 6 Economics of different insecticidal spray treatments

Sr. No.	Treatment details	Dose g.a.i/h	Additional expenditure over control				Net profit over control				Benefit cost ratio			
			06-07	07-08	08-09	Pooled Mean	06-07	07-08	08-09	Pooled Mean	06-07	07-08	08-09	Pooled Mean
1.	Imidacloprid 17.8 SL	20	716	716	716	597.33	8446	10348	20272	13022	1.93	2.53	2.97	2.48
*2.	Imidacloprid 70 WS	0.35	760	760	760	766.66	5891	11108	9116	8705	1.81	2.56	2.49	2.29
*3.	Thiamethoxam 70 WS	0.35	760	760	760	766.66	7439	5024	11096	7853	1.88	2.29	2.58	2.25
4.	Quinalphos 25 EC	125	650	650	650	595	4804	5818	11686	7436	1.77	2.34	2.61	2.24
5.	Thiamethoxam 25 WG	12.5	625	625	625	613.33	6242	6023	20603	10956	1.83	2.35	2.99	2.39
6.	Oxy demeton methyl 25 EC	125	670	670	670	610	5063	5342	12170	7525	1.78	2.32	2.63	2.24
7.	Untreated control	-	-	-	-	-	-	-	-	-	1.57	2.11	2.14	1.94

100 and 150 ml/ha persisted 22 days against aphids and 30 days against jassids. Rajendrakumar and Dikshit (2001) reviewed that imidacloprid is a new generation, effective and prospective insecticide. It is reported to be highly effective against major insects including sucking pests due to its high intrinsic acute and residual activity. Srinivasa Babu and Sharma (2003) studied compatability of imidacloprid (confidor) against foliar aphids and *Coccinellid* predators of wheat and found that the insecticide imidacloprid was highly effective in controlling the wheat aphids. It is also found comparatively safer than the other conventional insecticides tested against *Coccinellid* predators of wheat ecosystem. The present results are in corroboration with these workers.

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