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Screening of Wheat Varieties Against Aphid Complex in Himachal Pradesh

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Abstract

The present investigation was undertaken at Experimental Farm of Department of Entomology, CSK HPKV, Palampur during 2013-14 and 2014-15. Sixteen wheat varieties viz., VL 829, HPW 349, HPW 249, HS 295, HPW 251, HPW 147, VL 616, HPW 42, VL 907, HPW 184, HS 490, HPW 155, VL 892, HPW 89, HS 507 and HPW 236 were screened for their performance against the pest. Rating of wheat varieties done on the basis of aphid grading scale revealed that two varieties i.e. VL 616 and HPW 42 were found to be resistant and five were moderately resistant. Seven varieties were found to be susceptible and two varieties i.e. HPW 147 and HPW 251 were highly susceptible. VL 616 was the most resistant and HPW 147 was found to be highly susceptible variety among sixteen tested varieties against aphids in wheat.

Key words: wheat, varieties, screening, aphids, rating

Introduction

Wheat (Triticum aestivum L.) is the second most important cereal in India after rice and it covers an area of 30 million hectares with the production of 93.50 million tonnes (Anonymous 2014a). In Himachal Pradesh, during 2013-14, it was grown an area of 371.06 thousand hectares with the production of 538.52 thousand tonnes (Anonymous 2014b). Wheat being a premier winter cereal crop in India, and is attacked by number of insect pests viz., termites, armyworm, shoot fly, brown wheat mite and cutworms (Dhadwal et al. 2014). More than eleven aphid species infest wheat crop out of them four species viz., Sitobion avenae (Fabricius), S. miscanthi (Takahashi), Rhopalosiphum padi (Linnaeus) and R. maidis (Fitch) are reported to be the most predominant (Jarosik et al. 2003). A complex of four species viz., R. maidis, S. miscanthi, R. padi and S. avenae was reported to infest wheat crop and losses were estimated to the tune of 3.53-21.05 per cent in Punjab (Deol et al.1987; Singh and Deol 2003). The aphid problem can be tackled with the application of commonly used insecticides but the drawback lies with their haphazard use resulting in problems of health hazards, environmental pollution and development of resistance in insects against insecticides. To overcome such ill effects resulting from

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indiscriminate use of pesticides, the identification of resistant wheat varieties/ lines is of utmost importance.

Rana and Ombir (1999) screened sixty three wheat varieties against wheat aphid, S. avenae. Out of these, 30 varieties were found resistant falling in grade I (0-5 aphids/ shoot) twenty were moderately resistant and were grouped in grade II (6-10 aphids/ shoot), while seven varieties were susceptible with 11-20 aphids/shoot and were grouped in grade III. Singh et al (2001) conducted a screening trial of 38 wheat strains and reported the least infestation in VL 616 and maximum in Hindi 62. Aslam et al. (2004) monitored the population of aphid (S. graminum) on twelve varieties of wheat and reported that Inqalab-91 was the most resistant and PND-1 was the most susceptible variety.

Keeping in view the above facts, the present studies were conducted with the objective to screen various varieties of wheat against aphids.

Material and Methods

The experiments were laid out at Experimental Farm of the Department of Entomology, during the year 2013-14 and 2014-15. Sixteen wheat varieties were screened for their reaction against the pest by sowing a 5 m row of each variety. The wheat varieties included for field screening against aphids in natural conditions were VL 829, HPW 349, HPW 249, HS 295, HPW 251, HPW 147, VL 616, HPW 42, VL 907, HPW 184, HS 490, HPW 155, VL 892, HPW 89, HS 507 and HPW 236 and source of these varieties was Rice and Wheat Research Station, Malan. Ten shoots in each row were randomly selected and data on number of aphids on selected shoots were recorded at weekly intervals. The average number of aphids/ shoot were calculated and graded as per the grading system given in table 1.

Table 1. Aphids Grading Scale

Grade	Approx. No. of aphids/ shoot	Rating
I	0	Immune
II	1-5	Resistant
III	6-10	Moderately Resistant
IV	11-20	Susceptible
V	21 and above	Highly Susceptible

Results and Discussion

Field screening of varieties against aphid complex during Rabi 2013-14

As evident from the data, the infestation period of aphid complex in wheat was fifteen weeks. The data presented in (Table 2) revealed that all the varieties suffered certain level of infestation and the aphids started appearing on the wheat crop during the second week of January and the maximum population of aphids was observed during third week of March. The present findings are in close proximity with the results of Rios and Conde (1986) who observed peak aphid population during the third week of March.

The mean aphid population varied between 4 to 22.5, 2.5 to 13.0, 3.8 to 15.2, 1.6 to 11.3 , 6.5 to 31.0, 7.1 to 33.4, 0 to 7.4, 0.1 to 8.5, 4.7 to 23.1, 5.5 to 30.3, 2.9 to 13.2, 3.9 to 19.0, 5.2 to 24.4, 2.0 to 18.0, 3.2 to 14.3 and 3 to 20 aphids/ shoot in VL 829, HPW 349, HPW 249, HPW 295, HPW 251, HPW 147, VL 616, HPW 42, VL 907, HPW 184, HS 490, HPW 155, VL 892, HPW 89, HS 507 and HPW 236, respectively.

Peak population of aphids was observed during the third week of March in the varieties VL 829, HPW 349, HPW 249, HPW 295, HPW 251, HPW 147, VL 616, HPW 42, VL 907, HPW 184, HS 490, HPW 155, VL 892, HPW 89, HS 507 and HPW 236 was 22.5, 13.0, 15.2, 11.3, 31.0, 33.4, 7.4, 8.5, 23.1, 30.3, 13.2, 19.0, 24.4, 18.0, 14.3 and 20 aphids/ shoot, respectively.

The minimum number of aphids (mean) was recorded in variety VL 616 followed in ascending order by HPW 42, HS 295, HPW 349, HS 490, HS 507, HPW 249, HPW 89, HPW 155, HPW 236, VL 829, VL 907, HPW 184, HPW 251 and HPW 147, respectively. Similar results were observed by Singh et al. (2001) in variety VL 616 in the range of (0-2 aphids/ shoot). In case of response of genotypes to the infestation by aphid complex in wheat the data revealed (Table 2) that VL 616 had the lowest population (3.54 aphids/ shoot) as compared to HPW 147, which hosted 24.01 aphids/ shoot. Maximum population of aphids in variety HPW 147 was also reported (Anonymous 2012).

Field screening of varieties against aphid complex during Rabi 2014-15

The data presented in table 3 revealed that the aphids started appearing on the wheat crop during the second week of January and the maximum population of aphids was observed during third week of March. Similar trend of aphid population was also observed by Sharma et al. (2013), they reported that the maximum or the peak population of aphids was recorded during the 3rd week of March under Palampur conditions of Himachal Pradesh.

The mean aphid population varied between 4 to 21.8, 2.9 to 16.4, 2.4 to 15.4, 3.5 to 17.2, 6.9 to 39.6, 5.9 to 36.7, 0 to 7.9, 0 to 8.2, 4.4 to 21.3, 4.9 to 24.9, 2.4 to 13.7, 5.1 to 27.7, 2.5 to 21.8, 3.3 to 22.8, 1.4 to 14.5 and 3.9 to 18.8 aphids/ shoot in varieties viz., VL 829, HPW 349, HPW 249, HPW 295, HPW 251, HPW 147, VL 616, HPW 42, VL 907, HPW 184, HS 490, HPW 155, VL 892, HPW 89, HS 507 and HPW 236. Peak population of aphids observed during the third week of March in the varieties VL 829, HPW 349, HPW 249, HPW 295, HPW 251, HPW 147, VL 616, HPW 42, VL 907, HPW 184, HS 490, HPW 155, VL 892, HPW 89, HS 507 and HPW 236 was 21.8, 16.4, 15.4, 17.2, 39.6, 36.7, 7.9, 8.2, 21.3, 24.9, 13.7, 27.7, 21.8, 22.8, 14.5 and 18.8 aphids/ shoot, respectively.

Minimum number of aphids (mean) was recorded in genotype VL 616 followed in ascending order by HPW 42, HS 507, HS 490, HPW 249, HPW 349, HPW 236, HS 295, VL 892, VL 829, HPW 89, VL 907, HPW 184, HPW 155, HPW 147 and HPW 251, respectively. In case of response of genotypes to the infestation by aphid complex in wheat the data revealed that VL 616 had the lowest population (2.92 aphids/ shoot) as compared to HPW 147, which haboured (3.75 aphids/ shoot).

Rating of the wheat varieties as per aphid grading scale during Rabi 2013-14 and 2014-15

The wheat varieties were rated on the basis of mean number per shoots according to the aphid grading scale. The data presented in table 4 revealed that the variety HPW 147 was found to be the highly susceptible among the sixteen varieties screened showing 24.0 and 22.9 aphids per shoot followed by HPW 251 with 22.3 and 21.3 aphids per shoot, respectively during 2013-14 and 2014-15. The variety HPW 184 was found to be susceptible with (20.5 and 19.1 aphids/ shoot) followed by VL 892, VL 907, VL 829, HPW 236, HPW 155 and HPW 89 having 17.2, 15.5, 14.8, 13.1,12.5 and 12.0 aphids per shoot, respectively during 2013-14 and 16.3, 14.8, 14.1, 12.5, 11.9 and 11.4 aphids per shoot, respectively during 2014-15.

The varieties HPW 249, HS 507, HS 490, HPW 349 and HS 295 were found to be moderately resistant with 10.1, 9.0, 8.1, 8.0 and 6.6 aphids per shoot during 2013-14 and 9.4, 8.6, 7.7, 7.5 and 6.2 aphids per shoot, respectively during 2014-15. The number of aphids per shoot was recorded to be 3.5 and 4.4 aphids per shoot in VL 616 and HPW 42, respectively during 2013-14 and 3.3 and 4.1 aphids per shoot during 2014-15 which were rated as resistant. The variety HPW 147 24.0 and 22.9 aphids/ shoot showed (Table 4) the highly susceptible response, HPW 184 (20.5 and 19.1 aphids/ shoot) susceptible response whereas HPW 249 (10.1 and 9.4 aphids/ shoot) proved moderately resistant against aphids and VL 616 with 3.5 and 3.3 aphids/ shoot during 2013-14 and 2014-15 showed the resistance against aphids. The present findings are in agreement with those of Anonymous (2012). The significant variations lead to the conclusion that there seems to be some genetic variations which contributed to resistance and is an effective strategy for protecting the wheat crop from aphid infestation.

Table 2. Field screening of varieties against aphid complex in wheat during Rabi 2013-14

Sampling	Mean number of aphids/ shoot in each variety																
date VL	HP	W 829	HPW 349	HS 249	HPW 295	HPW 251	VL 147	HPW 616	VL 42	HPW 907	HS 184	HPW 490	VL 155	HPW 892	HS 89	HPW 507	MEAN 236
18.01.2014	4.0	2.5	3.8	1.6	6.5	7.1	0.0	0.1	4.7	5.5	2.9	3.9	5.2	2.0	3.2	3.0	3.5
25.01.2014	7.3	3.7	5.7	2.6	11.1	14.7	0.5	0.7	8.2	10.1	3.8	4.8	9.5	4.6	5.7	5.6	6.2
01.02.2014	11.2	5.1	6.8	4.1	16.0	18.8	1.3	1.8	12.0	14.2	5.6	8.1	12.6	7.7	7.3	9.2	8.9
08.02.2014	14.1	6.9	8.5	5.8	19.0	21.8	2.5	3.2	14.9	18.6	6.9	11.2	15.8	10.3	9.4	12.1	11.3
15.02.2014	16.0	8.0	9.8	6.7	22.4	24.6	3.7	4.2	16.7	21.4	7.7	13.4	18.9	12.5	10.6	14.2	13.2
22.02.2014	17.9	9.4	10.7	7.9	25.2	27.7	4.9	5.5	18.0	25.6	9.3	15.1	21.8	14.1	11.9	16.1	15.1
01.03.2014	19.1	10.7	12.8	8.8	28.0	29.3	5.7	6.8	19.9	27.6	10.7	16.4	23.7	15.8	12.8	17.4	16.6
08.03.2014	20.2	11.8	13.9	10.0	30.0	31.5	6.2	7.3	21.3	29.1	11.8	17.1	27.6	16.9	13.7	18.0	17.9
15.03.2014	22.5	13	15.2	11.3	31.0	33.4	7.4	8.5	23.1	30.3	13.2	19.0	24.4	18.0	14.3	20.0	19.0
22.03.2014	21.7	12.2	14.5	10.1	29.7	30.8	6.1	7.3	22.5	28.3	11.7	18.8	23.8	17.3	12.5	19.0	17.9
29.03.2014	20.2	10.6	13.8	8.8	28.6	29.4	4.8	6.6	19.8	26.6	10.8	17.5	20.5	16.2	9.7	18.4	16.4
05.04.2014	15.3	8.2	11.5	7.0	25.6	26.7	3.4	4.8	16.0	23.2	9.5	14.5	16.7	15.6	8.5	15.1	13.9
12.04.2014	12.3	6.1	10.6	4.9	22.7	24.2	2.1	2.8	13.4	19.4	6.8	10.0	13.8	11.1	6.5	10.5	11.1
19.04.2014	5.6	3.5	4.1	2.7	15.8	16.2	1.0	1.3	6.5	7.2	3.0	5.0	6.5	5.5	3.1	5.0	5.8
MEAN	**14.8**	**8.0**	**10.1**	**6.6**	**22.3**	**24.0**	**3.5**	**4.4**	**15.5**	**20.5**	**8.1**	**12.5**	**17.2**	**12.0**	**9.2**	**13.1**	

Table 3. Field screening of varieties against aphid complex in wheat during Rabi 2014-15

Sampling	Mean number of aphids/ shoot in each variety																
date VL	HP	W 829	HPW 349	HS 249	HPW 295	HPW 251	VL 147	HPW 616	VL 42	HPW 907	HS 184	HPW 490	VL 155	HPW 892	HS 89	HPW 507	MEAN 236
09.01.2015	4.0	2.5	3.8	1.6	6.5	7.1	0.0	0.1	4.7	5.5	2.9	3.9	5.2	2.0	3.2	3.0	3.5
16.01.2015	7.3	3.7	5.7	2.6	11.1	14.7	0.5	0.7	8.2	10.1	3.8	4.8	9.5	4.6	5.7	5.6	6.2
23.01.2015	11.2	5.1	6.8	4.1	16.0	18.8	1.3	1.8	12.0	14.2	5.6	8.1	12.6	7.7	7.3	9.2	8.9
30.01.2015	14.1	6.9	8.5	5.8	19.0	21.8	2.5	3.2	14.9	18.6	6.9	11.2	15.8	10.3	9.4	12.1	11.3
06.02.2015	16.0	8.0	9.8	6.7	22.4	24.6	3.7	4.2	16.7	21.4	7.7	13.4	18.9	12.5	10.6	14.2	13.2
13.02.2015	17.9	9.4	10.7	7.9	25.2	27.7	4.9	5.5	18	25.6	9.3	15.1	21.8	14.1	11.9	16.1	15.1
20.02.2015	19.1	10.7	12.8	8.8	28.0	29.3	5.7	6.8	19.9	27.6	10.7	16.4	23.7	15.8	12.8	17.4	16.6
08.02.2015	20.2	11.8	13.9	10.0	30.0	31.5	6.2	7.3	21.3	29.1	11.8	17.1	27.6	16.9	13.7	18.0	17.9
06.03.2015	22.5	13.0	15.2	11.3	31.0	33.4	7.4	8.5	23.1	30.3	13.2	19.0	24.4	18.0	12.5	20.0	18.9
13.03.2015	21.7	12.2	14.5	10.1	29.7	30.8	6.1	7.3	22.5	28.3	11.7	18.8	23.8	17.3	11.4	19.0	17.8
20.03.2015	20.2	10.6	13.8	8.8	28.6	29.4	4.8	6.6	19.8	26.6	10.8	17.5	20.5	16.2	9.7	18.4	16.4
27.03.2015	15.3	8.2	11.5	7.0	25.6	26.7	3.4	4.8	16.0	23.2	9.5	14.5	16.7	15.6	8.5	15.1	13.9
03.04.2015	12.3	6.1	10.6	4.9	22.7	24.2	2.1	2.8	13.4	19.4	6.8	10.0	13.8	11.1	6.5	10.5	11.1
10.04.2015	5.6	3.5	4.1	2.7	15.8	16.2	1.0	1.3	6.5	7.2	3.0	5.0	6.5	5.5	3.1	5.0	5.8
17.04.2015	4.3	0.4	0.0	0.0	7.5	8.0	0.0	0.0	4.8	0.0	1.5	3.5	4.1	3.5	2.0	3.5	2.7
MEAN	**14.1**	**7.5**	**9.4**	**6.2**	**21.3**	**22.9**	**3.3**	**4.1**	**14.8**	**19.1**	**7.7**	**11.9**	**16.3**	**11.4**	**8.6**	**12.5**	

Table 4. Grading of the wheat varieties as per aphid grading scale during Rabi 2013-14 and 2014-15

Varieties	Mean number of aphids/ shoot			Rating
	2013-14	2014-15	Grade	
VL 829	14.8	14.1	IV	S
HPW 349	08.0	07.5	III	MR
HPW 249	10.1	09.4	III	MR
HS 295	06.6	06.2	III	MR
HPW 251	22.3	21.3	V	HS
HPW 147	24.0	22.9	V	HS
VL 616	03.5	03.3	II	R
HPW 42	04.4	04.1	II	R
VL 907	15.5	14.8	IV	S
HPW 184	20.5	19.1	V	S
HS 490	08.1	07.7	III	MR
HPW 155	12.5	11.9	IV	S
VL 892	17.2	16.3	IV	S
HPW 89	12.0	11.4	IV	S
HS 507	09.0	08.6	III	MR
HPW 236	13.1	12.5	IV	S

*S= Susceptible, R= Resistant, MR= Moderately Resistant, MS= Moderately Susceptible

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