

Original Research Paper

Screening of Coriander Genotypes for their Relative Susceptibility against Aphids under Field Conditions

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ABSTRACT

The field experiments were conducted during Rabi 2013-14 and 2014-15 to screen out twelve varieties/entries of coriander (*Coriandrum sativum* L.) for their relative susceptibility against aphids. None of the varieties/entries escaped the infestation of aphids. The build-up of aphid infestation started from second half of December and reached to its maximum in the first to third week of February in both years and then gradually declined. On the basis of grade index of mean aphid population, coriander varieties RCr-684 (25.45 aphids/plant), RCr-446 (26.45 aphids/plant), ACr-1 (26.60 aphids/plant), RCr-436 (41.75 aphids/plant), Gujarat Coriander-2 (42.45 aphids/plant), Pant Haritma (43.50 aphids/plant) and Gujarat Coriander-1 (43.70 aphids/plant) were categorized as least susceptible, Rajendra Swati and RCr-41 were moderately susceptible, whereas, Swati (CS-6), Sadhna (CS-4) and Sindhu (CS-2), 73.88, 70.60 and 69.50 aphids/plant, respectively were categorized as highly susceptible varieties of coriander against aphids under field conditions. Coriander variety RCr-684 received maximum yield (16.82 and 16.63 q/ha) for both the years followed by ACr-1 and RCr-446.

Key words: Aphids, Coriander Genotypes, Semi-arid region and Susceptibility.

INTRODUCTION

Coriander (*Coriandrum sativum* L.) is an important major seed spice crop, grown for leaves as well as seed purpose. It belongs to the family Apiaceae, is a native of southern Europe and northern Africa to southwestern Asia. The coriander plants are annual herb, stems erect, branched or bushy, diploid, chromosome number $2n=22$. Coriander seeds and leaves contain essential oils, which account for aromatic character of the plant (Sankaracharya and Sankaranarayana, 1989). The seeds have a lemony citrus flavour when crushed, due to the linalool, terpenes, pinene, and limonene, among others (Zheljzkov *et al.*, 2014). Coriander seeds are considered as carminative, diuretic, stomachic, antibilious, refrigerant and aphrodisiac (Butani, 1984). The fresh leaves are an ingredient in many South Asian foods (such as rasams, chutneys, and salads); in Chinese and Thai dishes; in Mexican cooking, particularly in salsa and guacamole and as a garnish; and in salads in Russia and other CIS countries (Moulin, 2002). It is mainly grown

in Rajasthan, Madhya Pradesh, Andhra Pradesh, Gujarat and Assam in a large area as major Rabi season crop and cultivated in many more states in large to small areas. Coriander is most susceptible crop to aphids in semi-arid region, if plant protection measures not applied on time; it causes nearly 40-50% yield losses. In present situation of agriculture, farmers are using a number of pesticides for aphid control resulting development of pest resistance to various commonly used insecticides, pest resurgence, and outbreaks as well as severe mortality of natural enemies and pollinators particularly honeybees, hence the identification of resistance source against aphids is the main factor to manage the pest.

Keeping these in view, field experiment were conducted at research farm, ICAR-National Research Centre on Seed Spices, Ajmer to evaluate twelve varieties/entries of coriander *viz.*, Gujarat Coriander-1, Gujarat Coriander-2, Sadhna (CS-4), ACr-1, Swati (CS-6), RCr-41, RCr-436, RCr-684, Hisar Sugandh, Pant Haritma, Sindhu (CS-2) and Rajendra Swati for their resistance/susceptibility

against aphids during *Rabi* 2013-14 and 2014-15 to find out the resistance sources as breeding material against aphids.

MATERIALS AND METHODS

The field experiments on screening of different varieties/entries of coriander for their relative susceptibility against aphids were conducted at ICAR-National Research Centre on Seed Spices, Ajmer for two consecutive years 2013-14 and 2014-15. The study location is lying between 74° 35' 39" to 74° 36' 01" E longitude and 26° 22' 12" to 26° 22' 31" N latitude at an altitude of 486 m above mean sea level. The region falls under III agro-climatic zone of Rajasthan is considered under semi-arid region. Soil fertility status of institute's experimental field is sandy loam, poor fertility and water holding capacity, having pH 8-8.3, EC 0.07-0.12 and organic carbon 0.15-0.23 percent along with available N 178.5 kg/ha (low), P₂O₅ 12kg/ha (Medium), K₂O kg/ha (low). The area receives annual rainfall 250-350 mm and temperature range 22-36 °C (maximum) and 5-20 °C (minimum) with 64-80% relative humidity during cropping *Rabi* season.

Twelve varieties/entries *i.e.* Rajendra Swati, ACr-1, Gujarat Coriander-1, RCr-41, Pant Haritma, RCr-684, Sadhna (CS-4), Swati (CS-6), RCr-446, Sindhu (CS-2), Gujarat Coriander-2 and RCr-436 were sown in well prepared and statistically laid out fields in Randomized Block Design concept with 03 replications. The seeds of above varieties/entries were sown in the plot sized of 3x3 meter, under specified geometry adopted in pop of the institute. Seeds were treated with *Trichoderma viride* @ 6g/kg of seed to avoid the seed borne diseases. Plant protection measures were not applied during standing crop to allow the aphid incidence on the crops. The observations on aphid population were recorded at weekly intervals from five randomly selected and tagged plants/plot. Initially, whole plants were taken in to study and later on it was sifted to 10 cm twig when crop was in full grown and umbels during flowering and finally it was considered as aphid population per plant. The relative susceptibility was determined on the basis of grade index worked out on peak infestation by using formulae $X \pm \sigma$ (X : mean of peak aphid population; σ : standard deviation for insect population) as given below, wherein, the

incidence was measured on the basis of mean aphid population per plant.

Grade	Mean aphid population/plant
Least susceptible	<48.36
Moderately susceptible	48.36-66.13
Highly susceptible	>66.13

The data were obtained and transformed in $\sqrt{x + 0.5}$ values and subjected to analysis of variance to find out the critical difference (Gomez and Gomez, 1983).

RESULTS AND DISCUSSION

Twelve varieties/entries of coriander were screened out for their relative susceptibility to aphids (*Hyadaphis coriandri* Das and *Myzus persicae* Sulzer) and the data on mean aphid's mixed population per plant were taken for two consecutive years and presented in Table 1 and 2, revealed that, none of the varieties/entries was free from aphid infestation. Initially, the aphid infestation started in second half of December (35 DAS) with very less in populations in both the years. In 2013-14, the aphid infestation started on second half of December with few aphids per plant on some coriander varieties, whereas RCr-684, RCr-446 and ACr-1 were remained free from the aphid infestation at this stage. Then after, pest infestation increased gradually and reached to its maximum during February month with three peaks depending upon the varieties/entries (Table 1). The coriander variety RCr-684 received lowest aphid infestation (23.70 aphids/plant) followed by RCr-446 and ACr-1 with 24.10 and 24.20 aphids/plant, respectively. The maximum aphid infestation was observed on variety Swati (CS-6) 71.10 aphids/plant followed by Sadhna (CS-4) Sindhu (CS-2) and RCr-41 having aphids population of 66.40, 65.00 and 64.20 aphids/plant, respectively. The remaining varieties/entries were received the aphid infestation with ranged from 41.70 to 52.30 aphids/plant. Over the season, the lowest mean aphid infestation (9.21 aphids/plant) was recorded on variety RCr-684 followed by ACr-1 and RCr-446, whereas, maximum on Swati (CS-6) and Sadhna (CS-4) and Sindhu (CS-2). The highest yield of coriander seed was also recorded from the variety RCr-684 (16.82 q/ha) followed by ACr-1 (15.74q/ha) and RCr-446 (12.89 q/ha), while minimum yield 4.14 q/ha was obtained



Table 1: Screening of popular coriander varieties for their relative susceptibility against aphids during 2013-14

Varieties	Average population of aphids per plant												Mean	Yield (q/ha)
	23 rd Dec	31 st Dec	7 th Jan	14 th Jan	21 st Jan	28 th Jan	04 th Feb	11 th Feb	18 th * Feb	25 th ** Feb	04 th Mar	11 th Mar		
Rajendra Swati	0.33# (4.55)	0.40 (4.78)	1.40 (7.00)	4.60 (11.40)	15.00 (19.80)	21.30 (23.40)	42.20 (32.60)	52.30 (36.60)	31.70 (28.00)	32.00 (28.10)	18.40 (21.30)	9.20 (15.40)	19.07 (19.41)	10.55
ACr-1	0.00 (3.54)	0.20 (4.12)	1.00 (6.10)	3.10 (9.70)	9.60 (16.10)	14.00 (19.10)	18.20 (21.80)	24.20 (24.60)	15.00 (19.80)	16.20 (20.20)	10.80 (16.70)	5.20 (12.00)	9.79 (14.48)	15.74
Gujarat	0.40 (4.83)	0.60 (5.23)	3.10 (9.40)	4.60 (11.20)	13.70 (19.00)	19.00 (22.20)	36.00 (30.40)	35.80 (30.40)	43.20 (32.90)	30.30 (27.90)	18.20 (21.80)	5.60 (12.50)	17.54 (18.98)	11.15
RCr-4I	0.66 (5.32)	1.60 (7.36)	1.90 (7.60)	5.20 (12.10)	16.30 (20.70)	20.00 (22.60)	34.20 (25.80)	35.00 (29.80)	41.30 (29.20)	64.20 (40.50)	20.10 (22.90)	11.10 (17.20)	20.97 (20.10)	4.14
Pant Haritma	0.60 (5.23)	2.00 (7.86)	2.00 (8.00)	7.10 (13.80)	10.00 (16.30)	16.40 (20.60)	30.10 (27.80)	43.00 (29.60)	21.80 (23.80)	22.00 (23.20)	17.20 (20.80)	10.10 (16.40)	15.19 (17.78)	10.66
RCr-684	0.00 (3.54)	0.00 (3.54)	1.20 (6.50)	1.20 (6.50)	8.30 (14.90)	12.40 (17.80)	14.20 (19.10)	18.60 (21.70)	23.70 (24.70)	17.70 (21.70)	10.20 (16.50)	3.10 (9.20)	9.21 (13.81)	16.82
Sadhna (CS-4)	0.60 (5.14)	2.00 (8.02)	1.80 (7.80)	6.00 (13.10)	19.80 (22.50)	25.10 (25.30)	35.00 (30.00)	35.40 (30.00)	66.40 (41.00)	55.20 (37.00)	23.00 (24.50)	10.20 (16.60)	23.38 (21.74)	5.55
Swati (CS-6)	1.00 (6.12)	2.33 (8.32)	2.10 (8.10)	6.60 (13.20)	23.00 (24.70)	24.10 (24.80)	39.20 (31.60)	40.00 (31.60)	42.10 (32.60)	71.10 (38.00)	36.20 (30.40)	13.10 (18.10)	25.07 (22.29)	8.48
RCr-446	0.00 (3.54)	0.00 (3.54)	1.20 (6.50)	1.00 (6.30)	10.20 (16.40)	11.00 (17.10)	12.30 (17.70)	21.20 (23.40)	24.10 (24.70)	18.20 (22.00)	14.70 (19.30)	6.20 (13.00)	10.01 (14.45)	12.89
Sindh (CS-2)	0.20 (4.12)	1.60 (7.25)	2.00 (8.00)	4.90 (11.70)	18.20 (21.60)	22.70 (24.10)	34.50 (29.70)	41.30 (32.30)	65.00 (40.70)	54.10 (37.10)	20.30 (23.00)	10.00 (16.50)	22.90 (21.34)	7.65
Gujarat	0.40 (4.72)	0.80 (5.78)	1.60 (7.20)	5.70 (12.80)	20.10 (22.70)	20.00 (22.60)	22.10 (23.80)	29.60 (27.60)	41.80 (32.30)	27.20 (26.20)	11.60 (17.20)	6.70 (13.30)	15.63 (18.01)	7.23
RCr-436	0.00 (3.54)	2.40 (8.57)	1.80 (7.70)	5.60 (12.20)	14.10 (19.00)	18.30 (21.60)	20.40 (22.90)	28.60 (26.90)	41.00 (31.90)	41.70 (32.50)	12.00 (17.50)	5.40 (11.40)	15.94 (17.98)	10.54
SEM±	0.04	0.05	0.11	0.12	0.11	0.09	0.39	0.41	0.56	0.74	0.21	0.17	0.69	
CD (p=0.05)	0.10	0.15	0.33	0.34	0.33	0.28	1.15	1.20	1.65	2.18	0.63	0.51	2.06	

Mean of three replications.

* Peak population of aphids

Figure in parenthesis are sqrt. X + 0.5 transformed values

Table 2: Screening of popular coriander varieties for their relative susceptibility against aphids during 2014-15

Varieties	Average population of aphids per plant												Mean	Yield (q/ha)
	20 th Dec	27 th Dec	03 rd Jan	10 th Jan	17 th Jan	24 th Jan	31 st Jan	07 th Feb	14 th Feb	21 st Feb	28 th Feb	07 th Mar		
Rajendra Swati	0.20# (4.17)	0.00 (3.54)	3.56 (10.20)	13.80 (19.13)	20.22 (22.98)	23.60 (24.77)	40.36 (31.69)	51.53 (36.29)	47.66 (34.65)	44.20 (33.73)	25.00 (25.11)	13.60 (19.17)	23.64 (22.12)	10.92
ACr-1	0.00 (3.54)	0.00 (3.54)	0.10 (3.80)	2.33 (8.48)	6.18 (12.87)	14.40 (19.40)	23.20 (24.22)	29.00 (27.09)	25.22 (25.52)	20.44 (22.63)	17.33 (20.80)	8.00 (14.17)	12.18 (15.50)	14.75
Gujarat Coriander-1	0.00 (3.54)	1.10 (6.36)	2.56 (8.60)	14.20 (19.42)	18.66 (21.72)	20.60 (23.18)	38.20 (31.39)	41.60 (32.56)	44.20 (33.34)	32.66 (28.83)	21.00 (23.30)	12.20 (17.79)	20.58 (20.84)	10.80
RCr-41	1.20 (6.59)	1.20 (6.48)	2.40 (8.32)	14.26 (18.97)	24.97 (25.49)	24.00 (25.01)	36.20 (30.47)	40.33 (32.25)	56.38 (38.52)	65.10 (40.79)	25.33 (25.76)	14.33 (19.58)	25.48 (23.19)	6.65
Pant Haritma	1.00 (6.26)	0.80 (5.69)	2.40 (8.66)	12.40 (17.70)	16.22 (19.93)	21.00 (23.67)	36.80 (30.98)	44.00 (31.13)	40.12 (31.78)	27.20 (26.38)	17.30 (20.87)	10.20 (16.51)	19.12 (19.96)	10.62
RCr-684	0.00 (3.54)	0.00 (3.54)	0.20 (4.17)	3.66 (10.10)	5.00 (11.48)	13.20 (18.53)	21.45 (23.43)	22.00 (23.70)	27.20 (26.66)	19.20 (22.68)	13.00 (18.67)	5.33 (12.02)	10.85 (14.88)	16.63
Sadhna (CS-4)	0.60 (5.14)	2.00 (8.02)	3.20 (9.55)	8.60 (14.98)	25.22 (25.57)	28.10 (26.97)	36.40 (30.70)	53.20 (37.03)	74.80 (43.85)	65.00 (40.76)	34.10 (29.69)	12.00 (18.15)	28.60 (24.20)	6.00
Swati (CS-6)	1.33 (6.47)	2.00 (7.68)	2.20 (8.15)	6.66 (13.25)	26.10 (25.98)	27.00 (26.88)	38.60 (31.31)	53.00 (36.60)	53.10 (36.89)	76.66 (39.37)	50.20 (36.13)	13.30 (18.23)	29.18 (23.91)	8.72
RCr-446	0.00 (3.54)	1.02 (6.16)	0.60 (5.33)	1.33 (7.01)	7.56 (13.69)	15.33 (20.06)	16.00 (20.37)	24.53 (25.31)	28.80 (27.22)	19.20 (22.69)	16.10 (20.25)	7.00 (13.86)	11.46 (15.46)	14.89
Sindhua (CS-2)	1.20 (6.48)	2.10 (8.07)	3.60 (10.26)	10.00 (16.50)	18.20 (21.64)	31.77 (28.69)	35.92 (30.40)	60.10 (39.38)	74.00 (43.70)	50.00 (35.50)	23.20 (24.75)	10.00 (16.47)	26.67 (23.49)	7.82
Gujarat Coriander-2	1.10 (6.48)	1.40 (6.86)	1.40 (6.73)	7.60 (13.94)	16.00 (19.76)	16.66 (20.06)	35.60 (29.99)	35.00 (30.17)	36.20 (29.37)	43.10 (32.79)	15.80 (20.51)	11.20 (17.37)	18.42 (19.50)	6.95
RCr-436	0.00 (3.54)	1.00 (6.03)	2.00 (8.06)	8.04 (14.22)	15.60 (20.11)	16.00 (19.85)	36.10 (30.22)	40.00 (32.21)	41.80 (32.25)	21.66 (23.89)	14.20 (18.98)	9.80 (15.35)	17.18 (18.73)	11.24
SEm±	0.06	0.06	0.09	0.20	0.17	0.37	0.47	0.56	0.59	0.79	0.32	0.27	0.75	
CD (p=0.05)	0.19	0.19	0.27	0.59	0.50	1.10	1.37	1.64	1.75	2.34	0.93	0.79	1.68	

Mean of three replications.

* Peak population of aphids

Figure in parenthesis are sqrt. X + 0.5 transformed values

from the variety RCr-41, which was highly susceptible to aphid.

Similarly, in 2014-15 the aphid infestation started in third week of December with few aphids per plant on some coriander varieties, whereas RCr-684, RCr-446 and ACr-1 were remained free from the aphid infestation at this stage. Then after pest infestation increased gradually and reached to its maximum during the month of February with three peaks *i.e.* 7th February (on varieties Rajendra Swati, and Pant Haritma), 14th February (on varieties Gujarat Coriander-1, RCr-684, Sadhna (CS-4), RCr-446, Sindhu (CS-2) and RCr-436) and 21st February (RCr-41, Swati (CS-6) and Gujarat Coriander-2) depending upon the varieties/entries (Table 2). The coriander variety RCr-684 received lowest aphid infestation (27.20 aphids/plant) followed by RCr-446 and ACr-1 with 28.80 and 29.00 aphids/plant, respectively. Meena *et al.* (2002b) also reported that coriander varieties RCr-446 and RCr-436 were found least susceptible against aphids are in accordance the present finding. These three varieties were found statistically at par for aphid infestation. The maximum

aphid infestation was observed on variety Swati (CS-6) 76.66 aphids/plant followed by Sadhna (CS-4) Sindhu (CS-2) and RCr-41 having aphids population of 74.80, 74.00 and 65.10 aphids/plant, respectively. The remaining varieties/entries were received the aphid infestation with ranged from 41.80 to 51.33 aphids/plant. The highest yield of coriander seed was recorded from the variety RCr-684 (16.63 q/ha) followed by RCr-446 (14.89 q/ha) and ACr-1 (14.75q/ha), while minimum yield 6.00 q/ha was obtained from the variety Sadhna (CS-4) and RCr-41 (6.65q/ha), which were highly susceptible to aphid. Based on two year results, it was evident from the study that the coriander varieties *i.e.* RCr-684 (25.45 aphids/plant), RCr-446 (26.45 aphids/plant), ACr-1 (26.60 aphids/plant), RCr-436 (41.75 aphids/plant), Gujarat Coriander-2 (42.45 aphids/plant), Pant Haritma (43.50 aphids/plant) and Gujarat Coriander-1 (43.70 aphids/plant) are moderately susceptible, whereas, Swati (CS-6), Sadhna (CS-4) and Sindhu (CS-2) with aphid population 73.88, 70.60 and 69.50 aphids/plant, respectively were categorized as highly susceptible varieties of coriander against aphids under field conditions.

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(Received on 30.9.2017, Revised and accepted on 30.11.2019)