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Evaluation of coriander genotypes for resistance against coriander aphid, *Hyadaphis coriandri* (Das.) on Coriander

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Abstract

The investigation entitled, "Evaluation of coriander genotypes for resistance against coriander aphid, *Hyadaphis coriandri* (Das.) on coriander" was conducted at the Vegetable Research Farm, Kalyanpur, C.S. Azad University of Agriculture and Technology, Kanpur during *Rabi* season 2021-22. The population of aphid started in the last week of January, increased and reached to peak (196.4 aphids/umbel/plant) at 27.4 °C maximum temperature, 12.3 °C minimum temperature, 64.5 percent average relative humidity in the second week of February, thereafter, the population declined gradually and completely disappeared in the third week of February. The result of screening of various varieties/germplasm of coriander against *H. coriandri* indicate that the least susceptible germplasm viz. KS-1908, KS-2006, KS-2003 and KS-9903 having (1.8, 2.8, 3.4 and 4.2 aphids/umbel/plant). The germplasm KS-8911 and KS-8901 was found moderately resistant with the aphid population was observed (15.0 and 6.2 aphids/umbel/plant). The susceptible varieties like, KS 8903 and KS-9501 having (15.2&23.6 aphid/umbel/plant). The highest infestation was observed in varieties KS-8906 and KS-9109 having Population 40.2, and 26.8 (aphids/umbel/plant) respectively. None of the varieties were found free from the attack of coriander aphid (*Hyadaphis coriandri* Das) on coriander.

Keywords: *Hyadaphis coriandri* (Das), susceptible, infestation, weather parameters

Introduction

Coriander commonly known as *Dhania*, is one of the important spice crop grown throughout the world. It is botanically known as *Coriandrum sativum* L. with the natural order Umbelliferae. It is mainly grown in *Rabi* season. The main coriander growing states in India are Rajasthan and Andhra Pradesh. In India grown in about 639.50 hectares and produces 811.04 metric tonnes (T) of seeds during 2020-21.

The coriander leaves are used in chutneys, sauce, curry and other preparations because of its pleasant aroma. The coriander seeds are also used as spices in the preparations of curry powder, pickling spices, meat, fish, soda, syrups, candy preserves and liquors (Raju, 1990) [9]. Like any other crop coriander is also damaged by a number of insect pests from the time of sowing till harvest. Nayar *et al.* (1976) had listed only four insect-pests attacking on coriander, among which cotton white fly, *Bemisia tabaci* G., Indigo caterpillar, *Spodoptera exigua* Hub. and Coriander aphid, *Hyadaphis coriandri* Das are considered to be major pests. The coriander aphid, *H. coriandri* was recorded for the first time from Iran (Hodjat and Mossadegh, 1979) [3]. In India it was first reported on coriander crop in Himachal Pradesh (Hameed *et al.* 1977) [2] and is known to cause adverse effect both on yield and quality. The coriander aphid is a minute, soft bodied and yellowish green insect. The reproduction is parthenogenic under our conditions. The number of nymphs produced per mother aphid ranged from 10.68 to 57.27 and the reproductive rate varied from 1.93 to 3.84 nymphs/aphid per day from the last week of January to the second week of June (Narinder Kumar and Premsagar, 1996). Nymphs pass through 3 instars to become adults. The damage is caused by nymphs and adults which suck the sap from leaves, inflorescence and other parts of the plant in large colonies. The yield losses due to this nefarious pest vary with the variety, agro-technological practices and the environmental factors. Coriander aphid, *Hyadaphis coriandri* is a serious pest of coriander. The severe infestation at flowering stage results in the heavy loss of the crop yield. The yield reduction of 1.75 and 2.01 q/ha by this noxious pest has been reported by Jain and Yadav (1986) [4, 5]. At the flowering stage a population of 55-70 aphids/5 plants could reduce yield by 50% Jain and Yadav (1989b) [5].

This aphid inflicts 1.87 to 64:05% yield loss in various genotypes (Upadhyay *et al.* 1996) ^[11].

Materials and Methods

The experiment was conducted in Randomized Block Design with three replication to evaluate the 50 germplasm of coriander to find out the resistant source against *Hydaphis coriandri*.

The crop was laid with 30 x 15 (R x P) spacing. All the facility were available to raise good crop.

Method of observation

Due to large populations of plant in the plots, it was rather

difficult to record the observation in each plant in the experimental field. The occurrence of insect pests was recorded on randomly selected five plants from each germplasm by adopting the method of observation as follows:

Grading for coriander aphid's damage

The coriander germplasm/varieties were categorized in following grades on the basis of earlier screening of coriander germplasms for field resistant to *Hyadaphis coriandari* (Das). The pest intensity is classified in the scale of different grades which are based on mean numbers of aphid as given in Table. 2.

Table 1: Meteorological parameter during experiment

Standard week	Temperature Max (°c)	Temperature Min (°c)	Relative humidity Max (%)	Relative humidity Min (%)	Wind speed (km/h)	Rainfall (mm)
44	29.7	14.2	93	43	1.7	0
45	28.8	12.8	93	42	1.8	0
46	27.5	11.9	95	44	1.1	0
47	26.9	13.3	83	42	2.5	1.2
48	26.3	11.9	95	47	1.2	0
49	26	13.5	92	47	2.4	0
50	23.7	8.6	95	44	1.7	0
51	22.1	7.1	85	43	4.1	0
52	20	9	97	75	1.7	8.6
1	20.4	8.5	96	70	3	23.5
2	19.6	10.3	94	74	4.1	14.6
3	15.7	4.9	93	72	3.5	0
4	17.9	7.7	95	66	4.8	3
5	21.2	7.5	91	58	5.9	13
6	22.7	8.1	93	52	4.3	0
7	25	8.1	93	50	3.9	0
8	27.4	12.3	87	42	6.2	0
9	27.8	11.7	90	46	3.5	0
10	29.2	13.9	87	44	4.8	0
11	33.4	17.4	83	44	4.4	0
12	36.4	18.6	79	30	3.7	0
13	38.2	18.4	72	28	5	0

Source: Agro- Meteorology observatory, dept. of Agronomy, C.S.A.U.A. &T, Kanpur 2021-22

Table 2: Grading of coriander germplasm based on number of aphid/umbel /plants

S. No.	Grade	Symbol	Intensity of aphid/umbel/plant
I	Resistant	R	0.00
II	Least Susceptible	L.S.	1.0-5.0
III	Moderately Susceptible	M.S.	5.1-15.0
IV	Susceptible	S	15.1-25.0
V	Highly Susceptible	H.S.	> 25.1

Reference: Thesis submitted to CSAUA&T, Kanpur, by Shantanu Mishra

Table 3: Categorisation of germplasm evaluated under experiment

S. No.	Germplasm	Intensity of aphid/umbel/plant	Categorisation of resistance
1	KS-1908	1.8	Least susceptible
2	KS-2006	2.8	Least susceptible
3	KS-2003	3.4	Least susceptible
4	KS-9903	4.2	Least susceptible
5	KS – 8901	6.2	Moderately susceptible
6	KS – 8907	6.6	Moderately susceptible
7	KS – 8913	7.4	Moderately susceptible
8	KS - 8918	8.2	Moderately susceptible
9	KS – 9106	9.4	Moderately susceptible
10	KS – 9504	10.2	Moderately susceptible
11	KS – 9708	11.4	Moderately susceptible
12	KS – 9007	12.2	Moderately susceptible

13	KS – 2010	12.4	Moderately susceptible
14	KS – 8904	12.6	Moderately susceptible
15	KS – 9904	12.8	Moderately susceptible
16	KS – 8923	13.2	Moderately susceptible
17	KS – 9902	13.7	Moderately susceptible
18	KS – 2000	13.4	Moderately susceptible
19	KS – 9107	13.8	Moderately susceptible
20	KS – 9802	14.6	Moderately susceptible
21	KS – 2005	14.8	Moderately susceptible
22	KS – 8911	15.0	Moderately susceptible
23	KS – 8903	15.2	Susceptible
24	KS – 8912	15.8	Susceptible
25	SL – 1	16.6	Susceptible
26	KS – 9200	18.2	Susceptible
27	KS – 9003	18.6	Susceptible
28	KS - 8909	18.6	Susceptible
29	KS - 8905	19.4	Susceptible
30	DC – 1	20.4	Susceptible
31	KS – 8917	20.8	Susceptible
32	KS – 9105	21.2	Susceptible
33	KS – 9601	21.8	Susceptible
34	KS – 9005	21.8	Susceptible
35	KS – 8920	22.2	Susceptible
36	KS – 9307	22.6	Susceptible
37	KS – 9801	23.2	Susceptible
38	KS – 9501	23.6	Susceptible
39	KS – 9109	26.8	Highly susceptible
40	KS – 9502	27.4	Highly susceptible
41	KS – 9701	28.2	Highly susceptible
42	KS – 8924	30.2	Highly susceptible
43	KS -9004	32.2	Highly susceptible
44	KS – 8919	32.4	Highly susceptible
45	NS – 1	32.6	Highly susceptible
46	KS – 9901	35.4	Highly susceptible
47	KS – 8914	35.8	Highly susceptible
48	KS – 2002	37.4	Highly susceptible
49	KS – 8910	38.6	Highly susceptible
50	KS – 8906	40.2	Highly susceptible

Results and Discussion

Resistant germplasm

Out of 50 germplasm, none of the germplasm was found resistant against coriander aphid *H. coriandari* on coriander plant as given parameters, whereas Verma and Jaiswal, (2004) [12] were also screened the coriander varieties/germplasm against the infestation of the coriander aphid. Their results were also same i.e. none of the germplasms were found resistant for aphid infestation evaluated 73 germplasm and reported that 7 germplasm JCO-123, RD-63, JCO-70, ATP-02, UD-303, DH-53 and UD-28 showed better tolerance to the pest as compared to others.

Least susceptible germplasm

Under the least susceptible category, 4 germplasm were possessing 1.0 to 5.0 aphids per plant i.e. KS-1908, KS-2006, KS-2003 and KS-9903 having Intensity of aphid/umbel/plant 1.8, 2.8, 3.4 & 4.2 respectively. Coriander germplasm collected by Naresh Kumar (2007) from different districts of Madhya Pradesh were screened against the infestation of coriander aphid. Out of them, PMIN-5 was the most promising, least susceptible to aphid and showed, good yield. Ghadage *et al.*, (2009) [1] also screened 20 genotypes of coriander against aphid *H. coriandari* and showed that the genotype Dhana-98 was found least susceptible.

Moderately susceptible

The data pertaining to moderately susceptible germplasm is given in Table-3. 18 germplasms having 6.1-15.0 aphids/plant were found moderately susceptible. 18 germplasms viz. KS-8901, KS-8907, KS-8913, KS-8918, KS 9106, KS-9504, KS-9708, KS-9007, KS-2010, KS-8904, KS-9904, KS-8923, KS-9902, KS- 2000, KS-9107, KS- 9802, KS-2005 and KS-8911 having 6.2, 6.6, 7.4, 8.2, 9.4, 10.2, 11.4, 12.2, 12.4, 12.6, 12.8, 13.2, 13.7, 13.4, 13.8, 14.6, 14.8 and 15.0 aphids/plant respectively were found moderately susceptible.

Jain and Yadav (1989a) [4] evaluated twenty varieties of coriander, *Coriandrum sativum* for resistance to *Hydaphis coriandri* in the field in Rajasthan. None of the varieties were resistant, 9 categorized as moderately susceptible and 11 as highly susceptible is supporting the present investigation.

Susceptible germplasm

The data pertaining to susceptible germplasm is given in Table-3. 16 germplasms having 15.1-25.0 aphids/plant were found susceptible. 16 germplasms viz. KS-8903, KS-8912, SL-1, KS-9200, KS-9003, KS-8909, KS8905, DC-1, KS-8917, KS-9105, KS-9601, KS-9005, KS-8920, KS-9307, KS9810 and KS-9501 having 15.2, 15.8, 16.6, 18.2, 18.6, 18.6, 19.4, 20.4, 20.8, 21.2, 21.8, 21.8, 22.2, 22.6, 23.2 and 23.6 aphids/plant respectively were found susceptible.

Similar results were also reported by Ghadage *et al.* (2009) [1].

He studied on the screening of twenty genotypes of coriander against aphid, *Hyadaphis coriandari* (Das) that the genotype Dhana-98 was least susceptible, which was statistically at par with K-Selection, Gcr-2, Jcr-391 and Gcr-1. Whereas, the genotype EC-363974 was found as the most susceptible. The remaining genotypes were found to be moderately susceptible.

Highly Susceptible germplasm

The data pertaining to highly susceptible germplasm is given in Table-3. 12 germplasms having more than 25.0 aphids/plant were found highly susceptible. 12 germplasms viz. KS-9109, KS-9502, KS-9701, KS-8924, KS 9004, KS-8919, NS-1, KS-9901, KS-8914, KS-2002, KS-8910 and KS-8906 having 26.8, 27.4, 28.2, 30.2, 32.2, 32.4, 32.6, 35.4, 35.8, 37.4, 38.6 and 40.2 aphids/plant respectively were found highly susceptible.

Jain and Yadav (1989a) [4] evaluated 20 varieties against *H. coriandari* in the field and they did not find any varieties resistance, 9 were categorized as moderately susceptible, and 11 were highly susceptible, aphid incidence are generally greater on late flowering than early flowering varieties. Singh *et al.* (1996) [10] also reported resistance to protomyces gall and *Hydaphis coriandari* in the field in northern Madhya Pradesh.

Conclusion

It is clear that out of 50 germplasm none of them were reported as resistance because there is no germplasm which show zero attack of aphid, 4 germplasms showed least susceptible with a population of 1.0-5.0 aphid/umbel/plant, 18 germplasm were recorded as moderately susceptible with 6.0-15.0 aphid/umbel/plant, 16 were germplasm were susceptible with 16.0- 25.0 aphid/umbel/plant and 12 germplasm were found highly susceptible having above 25.01aphid/umbel/plant. It is concluded that the coriander germplasms produced high degree of variability for coriander aphid. In this way, 4 least susceptible lines and 18 other moderately susceptible lines may be utilized as a good source for developing resistant varieties against coriander aphid and they may be recommended to the breeder's programme for the further development of resistance in varieties.

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