

Screening of Some Recently Developed Coriander Varieties against Stem Gall Disease Caused by *Protomyces macrosporus*

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Abstract

Twenty-seven varieties of coriander were evaluated for their resistance against stem gall disease caused by *Protomyces macrosporus*. Out of 27 varieties screened only four varieties viz., UD-125, UD-317, UD-749 and Rlr-480 having less than 10% stem gall intensity were graded as resistant. The mean yield of healthy seeds was found between 1.33 to 1.97 g/plant and of diseased seeds was between 0.13 to 0.68 g/plant. Average seed yield loss (%) ranged between 6.04 to 27.87%. Minimum yield loss was recorded in UD-125 and maximum in American green.

Keywords: Screening; Coriander; Stem gall; *Protomyces macrosporus*

Introduction

Coriander (*Coriandrum sativum* L.), a member of family Apiaceae, is one of the major spice crop in India [1]. It is one of the miraculous herb, used both as a spice as well as herbal medicine. All parts of this herb are used as flavoring agent and/or as traditional remedies for the treatment of various diseases and disorders in the folk medicine systems of different civilizations [2]. India is the largest producer of coriander in the world, accounting for about 80 per cent of the global production. The crop yield is reduced by a number of fungal diseases [3] of which stem gall disease caused by *P. macrosporus* Unger, is the most destructive and versatile disease. The disease is prevalent in all coriander-growing areas of India and is considered as a limiting factor for successful cultivation of the crop. The symptoms of the disease first appear as gall like appearances on the lower part of stem, which gradually extends upwards to flower and seeds. The diseased seeds are hypertrophied depending upon the stage of infection, ultimately lowering the crop yield and quality. Soil and infected seed material served as a source of primary inoculum and the disease appears continuously every year in the field causing heavy loss to the crop. Continuous efforts were made from time to time to screen and select resistant varieties of coriander against the stem gall disease in greenhouse [4,5] and in field experiments [6-9] on a limited scale. Since host plant, resistance is an effective, economic and environmentally safe component in an integrated approach to keep plant diseases below the threshold level. Therefore, an attempt has been made to test some recently developed and popular varieties of coriander against *P. macrosporus*.

Materials and Methods

In the present study 27 varieties of coriander were screened against stem gall disease of coriander caused by *P. macrosporus*. The experiment was conducted during the Rabi season in the net house of the Department of Botany, Aligarh Muslim University, Aligarh. Aligarh is situated at 27°52' N latitude, 78°51'E longitude and 187.45 m altitude above sea level. It has semi-arid and subtropical climate, with severest hot dry summers and intense cold winters. The winter extends from the middle of October to the end of March. The mean temperature for December and January, the coldest months, is about 15°C and 13°C, respectively. The soil at Aligarh is sandy loam type having a pH value of 6.90 and electrical conductivity of 0.46 dsm⁻¹. The available nitrogen was recorded as 84.82 mg/kg soil, available phosphorus as 9.63 mg/kg soil and available potassium as 144.08 mg/kg soil.

Healthy uninoculated seeds of coriander were sown in 12-inch earthen pots containing 4 kg autoclaved soil. For creating artificially epiphytotic condition, 5 g inoculum (crushed powder of stem gall infected plant parts and seeds) containing approximately 6.09×10²

chlamydospores were mixed in each pot before sowing. Five plants were maintained/pot after germination. Each treatment including control was replicated three times. Observations on plant height, seed yield/plant, and yield losses were recorded on three randomly selected plants of each replication. At crop maturity, the data on disease intensity was calculated on a 100-point scale as developed by Lakra [10], where a healthy plant scores 0, while a fully diseased plant scores 100 points divided into four parts: stem (30 points), leaves (20 points), pedicel (20 points) and fruits (30 points). The scoring on the stem depended on the extent and density of galls, for pedicels on the length diseased and for fruits on the approximate number of diseased fruits in relation to total number of fruits formed. The data were analyzed according to Panse and Sukhatme [11]. Loss in yield was estimated by the equation proposed by Lakra [10] as given below:

$$\text{Loss (\%)} = \frac{X - Y \times 100}{X}$$

Where, X=Total yield (healthy+diseased) and
Y=Yield of healthy seed.

Results

In the present study, different varieties of coriander showed variable degree of resistance to stem gall disease. In highly susceptible varieties, the symptoms appeared in the form of small to large tumor like swellings on leaf veins, stalks, pedicels, and stem as well as on fruits. The galls were present on all the above ground plant parts measuring about 3-15 mm on susceptible varieties. The stem gall disease affected all the parameters negatively i.e., as the disease intensity increased, the seed yield and plant height decreased significantly. Out of 27 varieties screened, none of the variety was found free from stem gall infection (Table 1), but four varieties viz., UD-125, UD-317, UD-749 and Rlr-480 had less than 10% disease intensity and were thus graded as resistant (1-10% disease intensity). Ten varieties viz., UD-176, UD-53, UD-344, UD-259, UD-407, UD-421, UD-663, UD-200, Rlr-475 and Rlr-728

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S. No	Varieties	Plant height (cm.)	Yield of healthy seeds (g)	Yield of diseased seeds (g)	Yield loss (%)	Disease Intensity	Response of varieties
1.	American Green Control Inoculated	78.67 47.50	1.84 1.33	0.00 0.51	0.00 27.87	0.00 59.00	S
2.	Evergreen Control Inoculated	79.87 60.40	2.27 1.65	0.00 0.62	0.00 27.33	0.00 47.33	S
3.	Green Wonder Control Inoculated	71.87 49.92	2.25 1.66	0.00 0.59	0.00 26.22	0.00 56.67	S
4.	Harita Control Inoculated	76.67 54.57	2.49 1.89	0.00 0.68	0.00 27.30	0.00 53.67	S
5.	Kranti Control Inoculated	75.97 51.80	2.38 1.86	0.00 0.65	0.00 27.31	0.00 57.33	S
6.	Muskan Control Inoculated	75.62 55.50	2.10 1.57	0.00 0.53	0.00 25.13	0.00 50.00	S
7.	Panipat Control Inoculated	68.57 54.57	1.94 1.39	0.00 0.55	0.00 27.83	0.00 55.00	S
8.	UD-13 Control Inoculated	77.67 59.60	2.05 1.48	0.00 0.57	0.00 27.80	0.00 45.17	S
9.	UD-40 Control Inoculated	74.47 56.90	2.53 1.86	0.00 0.67	0.00 26.34	0.00 46.00	S
10.	UD-90 Control Inoculated	73.97 57.40	2.50 1.84	0.00 0.66	0.00 26.26	0.00 39.00	S
11.	UD-92 Control Inoculated	79.86 65.13	2.52 1.87	0.00 0.65	0.00 25.85	0.00 34.67	S
12.	UD-100 Control Inoculated	43.97 34.23	2.24 1.67	0.00 0.57	0.00 25.44	0.00 38.00	S
13.	UD-156 Control Inoculated	41.25 33.28	2.10 1.57	0.00 0.53	0.00 25.23	0.00 30.67	S
14.	UD-176 Control Inoculated	42.65 35.47	2.44 1.94	0.00 0.50	0.00 15.65	0.00 21.33	MS
15.	UD-53 Control Inoculated	43.37 38.53	2.38 1.95	0.00 0.43	0.00 18.06	0.00 11.33	MS
16.	UD-125 Control Inoculated	55.73 55.53	2.06 1.93	0.00 0.13	0.00 6.04	0.00 9.00	R
17.	UD-317 Control Inoculated	50.87 50.57	2.15 1.97	0.00 0.18	0.00 8.37	0.00 7.67	R
18.	UD-344 Control Inoculated	49.65 45.47	2.26 1.94	0.00 0.32	0.00 13.55	0.00 24.00	MS
19.	UD-259 Control Inoculated	48.93 43.50	2.14 1.87	0.00 0.27	0.00 14.17	0.00 12.00	MS
20.	UD-407 Control Inoculated	56.87 49.50	2.22 1.86	0.00 0.36	0.00 15.31	0.00 21.33	MS
21.	UD-421 Control Inoculated	47.95 44.20	2.30 1.92	0.00 0.38	0.00 16.10	0.00 15.67	MS
22.	UD-663 Control Inoculated	43.67 37.77	1.99 1.85	0.00 0.14	0.00 18.00	0.00 12.67	MS

23.	UD-749 Control Inoculated	55.97 55.53	1.82 1.64	0.00 0.18	0.00 9.62	0.00 9.00	R
24.	UD-200 Control Inoculated	40.15 32.57	2.13 1.80	0.00 0.33	0.00 15.49	0.00 21.00	MS
25.	Rlr-475 Control Inoculated	45.53 39.80	2.15 1.85	0.00 0.30	0.00 11.32	0.00 19.33	MS
26.	Rlr-480 Control Inoculated	57.97 57.77	1.95 1.79	0.00 0.16	0.00 8.20	0.00 7.00	R
27.	Rlr-728 Control Inoculated	62.13 56.53	2.19 1.91	0.00 0.28	0.00 15.17	0.00 11.67	MS
	SE	2.59	0.05	0.04	4.97	1.91	
	LSD 0.05%	5.13	0.11	0.09	9.90	3.80	

S=Susceptible (range=26-60% disease intensity); MS=moderately susceptible (range=11-25% disease intensity); R=Resistant (range=1-10% disease intensity).

Table 1: Screening of different coriander varieties against *Protomyces macrosporus*.

were found as moderately susceptible (11-25% disease intensity), while thirteen varieties viz., Harita, Kranti, Green wonder, American green, Panipat, Muskan, Evergreen, UD-13, UD-40, UD-90, UD-92, UD-100 and UD156, were graded as susceptible (26-60% disease intensity). The mean yield of healthy seeds ranged between 1.33 to 1.97 g/plant, the maximum in UD-317 (1.97 g/plant) and minimum in American green (1.33 g/plant). Range of yield of diseased seeds was between 0.13 to 0.68 g/plant, maximum being in Harita and minimum in UD-125. Average yield loss (%) ranged between 6.04 to 27.87%. Minimum loss was recorded in UD-125 and maximum yield loss was recorded in American green.

Discussion

In order to keep plant diseases below the threshold level, use of resistant varieties is perhaps the most economical, easily adaptable and environmentally safe component of plant disease control. In the present investigation, different varieties of coriander tested showed variable degree of resistance to *P. macrosporus*. Disease symptoms in the form of small to large tumor like swellings appeared on all the above ground plant parts. Out of 27 varieties screened, none of the variety was found free from stem gall infection, but only four varieties viz., UD-125, UD-317, UD-749 and Rlr-480 had less than 10% disease intensity and were thus graded as resistant (1-10% disease intensity). To the best of my knowledge, the literature available revealed that the above mentioned varieties had not been tested so far against *P. macrosporus*. However, some workers have screened several other varieties of coriander against the same pathogen. Tripathi et al. [5] reported seven varieties viz., UD-1, CS-362, CS-4 Comp-1, Comp-2, Gwalior and Morecon as susceptible, having 25-50% disease intensity, while five varieties viz., JD-1, G-5365-91, Pant Haritima, UD-20 and Rcr-41 out of 20 varieties as resistant having less than 10% disease intensity. Naqvi [8] also screened 20 varieties of coriander against stem gall disease and only four were reported to be moderately resistant. Kalra et al. [7] have reported only two varieties (C-1 and Pant-1) out of sixteen selected to be highly resistant against the disease. Singh et al. [9] reported eight varieties viz., PH-7, Pant Haritima, COR-17, Dania-8, DH-13, DH-M-4, DH-19-M-11-2 and COR-2 as highly resistant and five viz., COR-11, COR-14, COR-18 and R-swati as highly susceptible out of seventy varieties. Average seed yield loss (%) ranged between 6.04 to 27.87%. Minimum loss was recorded in UD-125 and maximum yield loss was recorded in American green. The yield losses ranged from 0.9 to 26.00% were also reported by Gupta and Sinha [4], Naqvi [8] and Tripathi et al. [5].

Conclusion

Host plant resistance is an effective, economic and environmentally safe component in an integrated approach to keep stem gall disease below the threshold level. The present study was also an attempt to select the resistant varieties of coriander against *P. macrosporus* and to estimate yield loss. Out of 27 varieties only four varieties were found to be resistant. The overall yield loss was found to be 27.87%. Further, in this study yield loss was found to be directly related to stem gall intensity. To avoid such a great yield loss susceptible varieties of coriander should be replaced with resistant varieties.

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