Khan and Parveen, J Plant Pathol Microbiol 2016, 7:8
DOI: 10.4172/2157-7471.1000375

Journal of
Plant Pathology & Microbiology
ISSN: 2157-7471

Research Article Open Access

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

Manzoor Raiees Khan* and Ghazala Parveen

Section of Plant Pathology, Department of Botany, Aligarh Muslim University, Aligarh-202002, UP, India

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 distructive 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 6.09×10^2 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:

$$\text{Loss (\%)} = \frac{X-Y\times100}{X}$$

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

***Corresponding author:** Manzoor Raiees Khan, Section of Plant Pathology, Department of Botany, Aligarh Muslim University, Aligarh-202002, UP, India, Tel: 912225764618; E-mail: khan111manzoor@gmail.com

Received August 08, 2016; **Accepted** August 22, 2016; **Published** August 24, 2016

Citation: Khan MR, Parveen G (2016) Screening of Some Recently Developed Coriander Varieties against Stem Gall Disease Caused by *Protomyces macrosporus*. doi: 10.4172/2157-7471.1000373

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	78.67	1.84	0.00	0.00	0.00	
	Inoculated	47.50	1.33	0.51	27.87	59.00	S
2.	**Evergreen**						
	Control	79.87	2.27	0.00	0.00	0.00	
	Inoculated	60.40	1.65	0.62	27.33	47.33	S
3.	**Green Wonder**						
	Control	71.87	2.25	0.00	0.00	0.00	
	Inoculated	49.92	1.66	0.59	26.22	56.67	S
4.	**Harita**						
	Control	76.67	2.49	0.00	0.00	0.00	
	Inoculated	54.57	1.89	0.68	27.30	53.67	S
5.	**Kranti**						
	Control	75.97	2.38	0.00	0.00	0.00	
	Inoculated	51.80	1.86	0.65	27.31	57.33	S
6.	**Muskan**						
	Control	75.62	2.10	0.00	0.00	0.00	
	Inoculated	55.50	1.57	0.53	25.13	50.00	S
7.	**Panipat**						
	Control	68.57	1.94	0.00	0.00	0.00	
	Inoculated	54.57	1.39	0.55	27.83	55.00	S
8.	**UD-13**						
	Control	77.67	2.05	0.00	0.00	0.00	
	Inoculated	59.60	1.48	0.57	27.80	45.17	S
9.	**UD-40**						
	Control	74.47	2.53	0.00	0.00	0.00	
	Inoculated	56.90	1.86	0.67	26.34	46.00	S
10.	**UD-90**						
	Control	73.97	2.50	0.00	0.00	0.00	
	Inoculated	57.40	1.84	0.66	26.26	39.00	S
11.	**UD-92**						
	Control	79.86	2.52	0.00	0.00	0.00	
	Inoculated	65.13	1.87	0.65	25.85	34.67	S
12.	**UD-100**						
	Control	43.97	2.24	0.00	0.00	0.00	
	Inoculated	34.23	1.67	0.57	25.44	38.00	S
13.	**UD-156**						
	Control	41.25	2.10	0.00	0.00	0.00	
	Inoculated	33.28	1.57	0.53	25.23	30.67	S
14.	**UD-176**						
	Control	42.65	2.44	0.00	0.00	0.00	
	Inoculated	35.47	1.94	0.50	15.65	21.33	MS
15.	**UD-53**						
	Control	43.37	2.38	0.00	0.00	0.00	
	Inoculated	38.53	1.95	0.43	18.06	11.33	MS
16.	**UD-125**						
	Control	55.73	2.06	0.00	0.00	0.00	
	Inoculated	55.53	1.93	0.13	6.04	9.00	R
17.	**UD-317**						
	Control	50.87	2.15	0.00	0.00	0.00	
	Inoculated	50.57	1.97	0.18	8.37	7.67	R
18.	**UD-344**						
	Control	49.65	2.26	0.00	0.00	0.00	
	Inoculated	45.47	1.94	0.32	13.55	24.00	MS
19.	**UD-259**						
	Control	48.93	2.14	0.00	0.00	0.00	
	Inoculated	43.50	1.87	0.27	14.17	12.00	MS
20.	**UD-407**						
	Control	56.87	2.22	0.00	0.00	0.00	
	Inoculated	49.50	1.86	0.36	15.31	21.33	MS
21.	**UD-421**						
	Control	47.95	2.30	0.00	0.00	0.00	
	Inoculated	44.20	1.92	0.38	16.10	15.67	MS
22.	**UD-663**						
	Control	43.67	1.99	0.00	0.00	0.00	
	Inoculated	37.77	1.85	0.14	18.00	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 Moreccon as susceptible, having 25-50% disease intensity, while five varieties viz., JD-1, G-5365-91, Pant Haritma, 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.

References:

1. Raghavan S (2000) Hand book of spices; Seasoning and flavouring. Ambica Book Agency Jaipur, India p: 457.
2. Sahib NG, Anwar F, Gilani AH, Hamid AA, Saari A, et al. (2012) Coriander (*Coriandrum sativum* L.): A potential source of high-value components for functional foods and nutraceuticals- A Review. J Phytother Res 27: 25-33.
3. Bilgrimi KS, Rizvi MA (1991) Fungi of India-Lists and references. Today and Tomorrow's Printers and Publishers, New Delhi p: 798.
4. Gupta RN, Sinha S (1973) Varietal field trials in the control of stem gall disease of coriander. Indian Phytopathology 26: 337-340.
5. Tripathi AK, Chauhan RKS, Bartria AM, Chauhan S (2002) Reaction of coriander cultivars to *Protomyces macrosporous*. Annals of Plant Protec Sci 10: 134-138.
6. Gupta JS, Sinha S (1964) Variation in pathogenicity of *Protomyces macrosporus* Unger. Proc Nat Acad Sci 34: 241-244.
7. Kalra A, Patra NK, Singh HP, Singh HB, Mengi N, et al. (1999) Evaluation of coriander (*Coriandrum sativum*) collection for essential oil. Indian J Agri Sci 69: 657-659.
8. Naqvi SAMH (1986) Varietal screening of coriander against stem gall in relation to disease intensity and crop loss. IJMPP 16: 270-276.
9. Singh HB, Singh A, Tripathi A, Rai SK, Katiyar RS, et al. (2003) Evaluation of Indian coriander accessions for resistance against stem gall disease. Gen Res and Crop Evol 50: 339-343.
10. Lakra BS (1999) Assessment of losses due to stem gall of coriander. Plant dis Res 14: 85-87.
11. Panse VG, Sukhatme PV (1961) Statistical methods for agricultural workers. ICAR Publication.

Citation: Khan MR, Parveen G (2016) Screening of Some Recently Developed Coriander Varieties against Stem Gall Disease Caused by *Protomyces macrosporus*. doi: 10.4172/2157-7471.1000373