



Research Article

WILT OF CORIANDER MANAGEMENT THROUGH PLANT EXTRACTS AND SOURCE OF RESISTANCE

JAT M.K.¹, AHIR R.R.¹ AND JITARWAL O.*²

¹Department of Plant Pathology, College of Agriculture, Sri Karan Narendra Agriculture University, Jobner, 303329, Rajasthan, India

²Department of Horticulture, Chaudhary Charan Singh Haryana Agricultural University, Hisar, 125004, Haryana, India

*Corresponding Author: Email - mksepat@gmail.com, omprakashjitarwal@gmail.com

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Abstract: *Azadirachta indica* leaf extract was found most effective followed by *Allium sativum* cloves extract in both conditions and *Ocimum tenuiflorum* were found least effective. Among these plant extracts, *Azadirachta indica* leaf extract recorded in vitro inhibition the mycelial growth (56.33%), and in vivo 18.27 per cent disease incidence with 64.81 per cent disease control and 788.35 kg/ha seed yield by increasing 135.79 per cent seed yield. were categorized, nineteen genotypes/varieties viz. RCr-475, RCr-480, RCr-728, UD-796, RD-366, UD-426, UD-483, CO-3, UD-743, UD-744, DH-246, NS-2, UD-728, UD-775, UD-630, UD-707, DH-208, RD-120 and RD-154 as moderately resistant, four genotypes/ varieties viz., NS-1, J. Co-387.

Keywords: Coriander, *Fusarium oxysporum*, Plant extracts, Host resistance

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Introduction

Coriander (*Coriandrum sativum* L.) popularly known as 'dhanai' is one of the oldest seed spice used by the mankind that belong to family 'Apiaceae' synonym to 'Umbelliferae'. The fresh green stems, leaves and fruits of coriander have a pleasant aromatic odour. The pleasant aroma in the plant is due to an essential oil called 'coriandrol' which ranges from 0.1 to 1.3 per cent in dry seeds. The oil of coriander seeds is a valuable ingredient in perfumes, cosmetic products, soup, candy, cocoa, chocolate, meat products, soft drinks and alcoholic beverages. The seed yield losses caused by *Fusarium* wilt ranges from 5 to 60 per cent in Rajasthan and 15 to 25 per cent in Gujarat [1]. Coriander occupied prime place amongst the seed spices grown in northern India particularly in Rajasthan. In India, it occupies 447 thousand hectares area with annual production 314 thousand tonnes.

The average productivity of coriander seed is 702 kg/ha. Disease can also be a serious problem in coriander crop. The important diseases are wilt caused by *Fusarium oxysporum* [2,3]. The wilt disease causes up to 60 per cent yield loss in coriander [4]. The seed yield losses caused by *Fusarium* wilt ranges from 5 to 60 per cent in Rajasthan and 15 to 25 per cent in Gujarat. Whereas, Mathur and Prasad (1964) [5] reported an average seed yield loss of 20 per cent in Rajasthan due to *Fusarium* wilt with disease incidence of 70 to 80 per cent.

Material and methods

Preparation of the plant extracts

Hundred grams from each was collected and washed 2-3 times with water and allowed to dry at room temperature (25±1°C) for six hours. Before extraction leaves of each plant (100g) were crushed separately with 100 ml sterilized distilled water. The extract was filtered through muslin cloth and centrifuged at 5000 rpm for 15 min. The extract were then sterilized by passing them through a Millipore filter using a swimming filter adapter. The supernatant obtained was collected and stored at 5°C for further use. Seeds were separately soaked in leaf/cloves extract for 24 h at 25±1°C [6-9].

Plant extracts and their Concentration

SN	Common name	Trade Name	Part used	Concentration(%)	
				In vitro	In vivo
1	Neem	<i>Azadirachta indica</i>	Leaves	5, 10, 15	15
2	Garlic	<i>Allium sativum</i>	Cloves	5, 10, 15	15
3	Datura,	<i>Datura stramonium</i>	Leaves	5, 10, 15	15
4	Tulsi	<i>Ocimum tenuiflorum</i>	Leaves	5, 10, 15	15

In vitro effect of plant extracts against *Fusarium oxysporum* f.sp. coriandrii

Petri plates containing PDA supplemented with different phyto-extracts, each with three concentrations and replicated four times were inoculated with 7-day old culture (5 mm dia disc). A suitable check was also maintained. Fungal colony was measured after 7 days of incubation at 25±1°C. The linear growth of test fungus was recorded and per cent growth inhibition was calculated.

In the experimental plots, field trials were conducted during winter season of 2013-14 and 2014-15 at Agronomy farm, SKN College of Agriculture, Jobner in randomized block design (RBD). Untreated seeds sown under similar conditions served as control. Usual agronomical practices were followed in preparation of the field. In both the years, the experiments were sown in the third week of November. Observations on disease incidence were recorded periodically up to 90 days after sowing and after harvest grain yield was also recorded [10-13].

Through source of resistance

Thirty germplasm/variety of coriander viz. RCr-20, RCr-41, RCr-435, RCr-436, RCr-446, RCr-475, RCr-480, RCr-684, RCr-728, UD-796, RD-366, UD-426, UD-483, CO-3, UD-743, UD-744, DH-246, NS-2, UD-728, UD-775, UD-630, UD-707, DH-208, RD-120, RD-154, NS-1, J.Co-387, Co-2, UD-529 and DH-205 were collected from AICRP on seed spices, SKN College of Agriculture, Jobner were evaluated against wilt under wilt sick plot condition during rabi 2013-14 and 2014-15. Inoculum multiplied on sand maize meal medium was placed in furrows at 8-10 cm depth @ 200 g/2 m row length to increase the disease pressure. The experiment was replicated twice. Observations were recorded after 30 days of sowing. On the basis of disease incidence the were categorized as per criterion followed by Iqbal et al., (2005) [14].

Table-1 *In vitro* efficacy of plant extracts against *Fusarium oxysporum* f.sp. *corianderii*

Plant extracts	Per cent inhibition of mycelial growth* at different Concentration (per cent)			Mean
	5 %	10 %	15 %	
<i>Azadirachta indica</i>	35.64(36.65)	46.90(43.22)	58.15(49.69)	56.33
<i>Allium sativum</i>	30.17(33.32)	40.21(39.35)	50.24(45.14)	48.18
<i>Datura stramonium</i>	25.40(30.26)	33.51(35.37)	41.61(40.17)	42.22
<i>Ocimum tenuiflorum</i>	21.54(27.65)	25.90(30.59)	30.25(33.37)	35.16
Control	0.00(0.00)	0.00(0.00)	0.00(0.00)	
SEm±	0.59	0.56	0.66	
CD (p=0.05)	1.83	1.73	2.04	

Table-2 Effect of seed treatment with Plant extracts on wilt disease incidence and seed yield of coriander under field condition

Plant extracts	Concentration (per cent)	Per cent disease incidence*			Decrease in PDI over control (per cent)	Yield (kg/ha)*			Increase in yield over control (per cent)
		2013-14	2014-15	Pooled		2013-14	2014-15	Pooled	
<i>Azadirachta indica</i>	15	19.30(26.06)	17.23(24.53)	18.27(25.30)	64.81	764.40	812.30	788.35	135.79
<i>Allium sativum</i>	15	25.67(30.44)	22.41(28.25)	24.04(29.36)	53.69	698.50	759.20	728.85	117.99
<i>Datura stramonium</i>	15	27.31(31.51)	24.50(29.67)	25.91(30.60)	50.10	595.10	607.90	601.50	79.90
<i>Ocimum tenuiflorum</i>	15	30.13(33.29)	28.70(32.39)	29.42(32.84)	43.33	536.60	548.80	542.70	62.31
Control	-	54.49(47.58)	49.33(44.62)	51.91(46.09)		317.50	351.20	334.35	
SEm±		0.93	1.03	1.05		18.41	18.40	18.36	
CD (p=0.05)		2.87	3.19	3.23		56.72	56.67	56.58	
CV (%)		5.52	6.49	6.39		6.32	5.97	6.13	

Rating scale	Disease incidence (%)	Category
1	0-10	Highly resistant (HR)
3	Nov-20	Resistant (R)
5	21-30	Moderately resistant (MR)
7	31-50	Susceptible (S)
9	>50	Highly susceptible (HS)

Results and discussion

In vitro effect of Plant extract against *Fusarium oxysporum* f.sp. *corianderii*

Effect of plant extracts was tested at 5, 10, and 15 per cent concentration against inhibition of mycelial growth of *Fusarium oxysporum* f.sp. *corianderii* by poison food technique.

The *Azadirachta indica* leaf extract was found significantly superior in inhibition the mycelial growth (56.33%), followed by *Allium sativum* clove extract (48.18%) and *Datura stramonium* (42.22%). *Ocimum tenuiflorum* leaf extract was found least effective (35.16%) against inhibition of mycelial growth of the fungus.

In vivo effect of Plant extract against *Fusarium oxysporum* f.sp. *corianderii*

Effect of different plant extracts at 15 per cent concentration was tested against wilt of coriander under field conditions. Results of pooled analysis showed that minimum disease incidence was recorded in *Azadirachta indica* leaf extract (18.27). Two-year pooled analysis of seed yield data indicated that highest seed yield was recorded with *Azadirachta indica* leaf extract (788.35 kg/ha) and *Ocimum tenuiflorum* leaf extract was found lowest (542.70 kg/ha) [Table-2]. Among the *Azadirachta indica*, leaf extract was found most effective to inhibit (56.33%) followed by *Allium sativum* (48.18%) mycelia growth of fungus *in vitro* and *Azadirachta indica*, leaf extract (64.81%) per cent disease control under field condition and maximum 788.35kg/ha seed yield, followed by *Allium sativum* (53.69%) disease control under field condition and 728.85 kg/ha seed yield. These results were also confirmation by Dwivedi and Shukla (2000) [15] that the leaf extract of *Azadirachta indica* at 100% concentration was completely inhibit the spore germination of *Fusarium* spp. while *Allium sativum* leaf extract partially inhibited spore germination *F. equiseti*. Ramaiah and Garampalli (2015) tested fifteen plant extracts *in vitro* against *Fusarium oxysporum* f. sp. *Lycopersici*. Out of fifteen plant extracts, three plant extracts proved to be potential in inhibiting the growth of the pathogen viz., *Solanum indicum* (78.33%), *Azadirachta indica* (75.00%), *Oxalis latifolia* (70.33%).

Screening of coriander genotypes / varieties

Thirty coriander genotypes / varieties were screened against *Fusarium oxysporum* f.sp. *corianderii* under sick plot conditions in field. The disease incidence was recorded using 1 to 9 rating scale. Based on disease reaction recorded, coriander genotypes / varieties were grouped into different categories i.e. Highly resistant (HR), Resistant (R), Moderately resistant (MR), Susceptible (S) and Highly susceptible (HS). Disease reaction was recorded by using standard rating scale. Four of the genotypes were resistant (R) viz, RCr-446, RCr-684, RCr-20 and RCr-41 While, nineteen genotypes viz., RCr-475, RCr-480, RCr-728, UD-796, RD-366,

UD-426, CO-3, UD-530, UD-743, UD-744, DH-246, NS-2, UD-728, UD-775, UD-630, UD-707, DH-208, RD-120 and RD-154 were categorized as moderately resistant (MR). Screenings of coriander genotypes/varieties against wilt disease were also done by Prakasam *et al.*, (1987) [16]. Arora and Kant (2004) [17] screened twenty-five cumini cultivars for their resistance to blight and wilt diseases in natural conditions. Maximum resistance to wilt was shown by cultivars UC-220, EC-232684 and UC-63 and susceptibility was shown by cultivars RZ-19, UC-90, UC-231, JC-2000-72, CMB-134 and Jobner local.

Champawat and Singh (2008) [18] identify resistant sources against *Fusarium oxysporum* f. sp. *cumini* and then to use them in resistance breeding programme. Though a few high yielding strains of cumini viz; S404, MC43, GC1, GC3 and RZ19 have been released in recent past but so far wilt resistant strains are not available because of limited variability in germplasm of cumini.

Table-3 Screening of coriander the genotypes/ varieties against wilt incited by *Fusarium oxysporum* f.sp. *corianderii*

Genotypes/ varieties	Disease incidence (%)			Disease Reaction
	2013-14	2014-15	Mean	
RCr-446	12.50	10.30	11.40	R
RCr-684	13.30	11.75	12.52	R
RCr-20	12.95	13.20	13.07	R
RCr-41	17.77	15.30	16.53	R
RCr-475	22.90	24.33	23.61	MR
RCr-480	23.80	25.15	24.47	MR
RCr-728	26.20	25.00	25.60	MR
NS-2	24.15	26.40	25.27	MR
DH-208	27.30	26.15	26.72	MR
UD-426	26.10	28.45	27.27	MR
UD-483	22.65	22.00	22.32	MR
CO-3	21.22	21.55	21.38	MR
UD-630	28.33	27.21	27.77	MR
UD-707	29.42	27.11	28.26	MR
UD-728	20.11	24.70	22.40	MR
UD-743	26.15	29.84	27.99	MR
UD-744	27.34	24.16	25.75	MR
UD-775	21.55	25.80	23.67	MR
UD-796	24.90	27.33	26.11	MR
RD-120	29.75	29.00	29.37	MR
RD-154	24.35	26.49	25.42	MR
RD-366	26.20	25.15	25.67	MR
DH-246	26.90	28.30	27.60	MR
UD-529	37.50	33.24	35.57	S
NS-1	35.65	39.80	37.72	S
J.Co-387	44.15	41.20	42.67	S
Co-2	49.15	45.25	47.20	S
RCr-435	55.90	51.40	53.65	HS
RCr-436	56.40	54.30	55.10	HS
DH-205	51.33	50.10	50.71	HS

Application of research: Study of wilt of coriander management through plant extracts

Research Category: Plant extracts

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****Research Guide or Chairperson of research: Dr R.R. Ahir**

University: Sri Karan Narendra Agriculture University, Jobner, 303329, India

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Study area / Sample Collection: Department of Plant Pathology, Sri Karan Narendra Agriculture University, Jobner, 303329, Rajasthan, India

Cultivar / Variety / Breed name: Coriander (*Coriandrum sativum*)

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