Int.J.Curr.Microbiol.App.Sci (2017) *6*(9): 896-900

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 6 Number 9 (2017) pp. 896-900**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2017.609.108

Management of Coriander Wilt (*Fusarium oxysporium*) through Cultural Practices as Organic Amendments and Date of Sowing

Mukesh Kumar Jat*, R.R. Ahir, Sanju Choudhary and G.L. Kakaraliya

Department of plant pathology, SKN College of Agriculture, SKN Agriculture University, Jobner, Jaipur (Raj.) 303329, India
**Corresponding author*

Keywords

Coriander, *Fusarium oxysporum*, Plant extracts, Host resistance.

Article Info

Accepted:
14 July 2017
Available Online:
10 September 2017

A B S T R A C T

The trials were conducted with various organic amendments *i.e.* Neem oil cake, Groundnut cake, Castor cake, Mustard cake & Poultry manure and four dates of sowing i.e. 30th October, 10th, 20th and 30th November. Analysis of pooled data showed that crop planted on 30th November showed minimum disease incidence and crop sown on 30th October showed maximum disease incidence and minimum seed yield. Data indicated that crop planted on 30th November gave highest yield 639.25 kg/ha. Studies on the relative efficacy of organic cakes in under field conditions showed Neem oil cake was found most effective followed by Mustard oil cake. Poultry manure was found least effective among these organic amendments. Neem oil cake recorded 21.45 per cent disease incidence with 52.25 per cent disease control and 790.50 kg/ha seed yield by increasing 119.02 per cent seed yield.

Introduction

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 (Anonymous, 2014-15). Disease can also be a serious problem in coriander crop. The important diseases are wilt caused by *Fusarium oxysporum* (Narula and Joshi, 1963; Srivastava, 1972), the wilt disease causes up to 60 per cent yield loss in coriander (Manoranjitham *et al.*, 2003). 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 (Prasad and Patel, 1963). Whereas, Mathur and Prasad (1964) 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.

Materials and Methods

Effect of organic amendments under field conditions

Field experiments were conducted during winter season of 2013-14 and 2014-15 at Agronomy farm, SKN College of Agriculture, Jobner in Randomized Block Design (RBD)

with six treatments including control with four replications in 2x2 m^2 plot size. Usual agronomical practices were followed in preparation of the field. In both the years, the experiments were sown in the third week of November.

Soil was amended with five organic amendments were made 2 week prior to sowing @ 200 g/plot (2×2 M^2). A light irrigation was applied after amendment. Plots without amendment served as check. Highly susceptible coriander variety RCr-435 was sown. The organic amendments used are mentioned below:

Per cent disease incidence was calculated by using formula given below. At harvesting, seed yield per plot was also recorded and calculated in kg/ha.

$$\text{Per cent Disease incidence} = \frac{\text{Number of infected plants}}{\text{Total number of plants observed}} \times 100$$

Effect of date of sowing

Incidence of wilt disease was observed on coriander plants sown at four different dates. Sowing was done from 30th October to 30th November at an interval of ten days at the experimental farm of S.K.N. College of Agriculture, Jobner during both seasons 2013-14 & 2014-15. Wilt is known to occur in severe form under natural field conditions in this area. The experiment was laid out in RBD with four replications. In each replication, standard plant populations were maintained in plot of 2 x 2 m^2. The sowing dates were as follows:

30 October
10 November
20 November
30 November

The crop was observed regularly for wilt incidence. Disease incidence was recorded at 45 DAS by examining the plants randomly selected in each plot starting from the initiation of the disease. At harvesting, seed yield per plot was also recorded and calculated in kg/ha.

Results and Discussion

In vivo effect of organic amendment against *Fusarium oxysporum* f. sp. *corianderii*

It is evident from the data that all the organic amendment tested reduced wilt incidence of coriander significantly over check. Neem oil cake was found significantly superior over all other treatments result a maximum disease control (58.95%) followed by Groundnut cake (54.05%), Castor cake (50.86%) and Mustard cake (44.15%). Poultry manure was least effective in reducing wilt incidence (41.15%) (Table 1). Two year pooled data of seed yield indicated that highest 790.50 kg/ha seed yield was recorded in Neem cake with increasing 119.02 per cent seed yield followed by Groundnut cake (712.15 kg/ha) seed yield with increasing 97.32 per cent over control.

In vivo condition all the amendment, cakes namely Neem cake, Groundnut cake, Castor cake, Mustard cake and Poultry manure were tested against *Fusarium oxysporum* f.sp. *corianderii*.

Among the oil cakes, Neem cake was found most effective to control the disease up to 58.95 per cent under field condition with maximum 790.50kg/ha seed yield, followed by Groundnut cake (54.05%) under field condition with 712.15 kg/ha seed yield. Poultry manure control the disease up to 41.15 per cent under field condition with 398.89 kg/ha seed yield were least effective in reducing wilt incidence.

Table.1 Effect of soil treatment with various organic amendment on wilt disease incidence and Yield of coriander under field condition

Organic amendment	Dose (q ha^{-1})	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	
Groundnut cake	5	24.40 (29.60)	23.62 (29.08)	24.01 (29.34)	54.05	694.00	730.30	712.15	97.32
Neem cake	5	22.71 (28.46)	20.19 (26.70)	21.45 (27.59)	58.95	761.30	819.70	790.50	119.02
Castor cake	5	26.90 (31.24)	24.45 (29.63)	25.68 (30.44)	50.86	664.15	692.80	678.48	87.98
Mustard cake	5	29.83 (33.10)	28.54 (32.29)	29.19 (32.70)	44.14	590.51	630.30	610.41	69.12
Poultry manure	25	32.40 (34.70)	29.10 (32.65)	30.75 (33.68)	41.15	509.28	537.50	523.39	45.02
Control	-	53.15 (46.81)	51.35 (45.77)	52.25 (46.29)		343.64	378.20	360.92	
SEm±		0.91	1.04	1.00		21.17	23.42	19.57	
CD (p=0.05)		2.75	3.12	3.01		63.80	70.57	58.99	
CV (%)		5.77	7.01	6.53		7.13	7.42	6.39	

* Average of four replications

Figures in parenthesis are angular transformed values

Table.2 Effect of dates of sowing on wilt disease incidence and seed yield of coriander

Date of Sowing		Per cent disease incidence*			Yield (kg/ha)*		
		2013-14	2014-15	Pooled	2013-14	2014-15	Pooled
30	Oct.	42.18 (40.50)	39.22 (38.77)	40.70 (39.64)	395.30	454.60	424.95
10	Nov.	36.71 (37.29)	34.60 (36.03)	35.66 (36.66)	490.20	517.30	503.75
20	Nov.	26.30 (30.85)	24.15 (29.43)	25.23 (30.15)	537.25	581.00	559.13
30	Nov.	21.64 (27.72)	19.51 (26.21)	20.58 (26.97)	617.10	661.40	639.25
SEm±		0.94	0.87	0.75	16.02	16.90	14.82
CD (p=0.05)		3.02	2.77	2.41	51.24	54.07	47.41
CV (%)		5.54	5.30	4.52	6.28	6.11	5.57

* Average of four replications

Figures in parenthesis are angular transformed value

Effect of organic amendments under field conditions

S. No.	Organic amendment	Dose (q ha^{-1})
1	Groundnut cake	5
2	Neem cake	5
3	Castor cake	5
4	Mustard cake	5
5	Poultry manure	25

Our observations are in conformity to Kimaru, *et al.,* (2004), who conducted both in the laboratory and greenhouse conditions to investigate the effects of Neem Kernel cake powder (NKCP) on growth, sporulation and pathogenicity of tomato wilt caused by *Fusarium oxysporum* f. sp. *lycopersici* and in both the condition Neem cake was found significantly effective. Yelmame *et al.,* (2010), were tested the extracts of different organics of Neem cake, Mustard cake, FYM, Groundnut cake, Poultry manure, Press mud, Castor cake and coconut cake against *Fusarium solani* caused wilt of chilli in *in vitro*. Minimum growth of pathogen was recorded in the extracts of Neem cake showing excellent inhibitory effect (59.8%) followed by Mustard cake (52.61%). Nikam *et al.,* (2007) tested various oilseed cakes viz., Groundnut cake, Cotton seed cake, Neem cake and Castor seed cake. Amongst four oil cakes tested Groundnut cake is proved to be effective against *F. oxysporum* f. sp. *ciceri* followed by Neem cake and Castor cake in checking per cent wilt incidence by 61.91, 52.39 and 47.67 per cent, respectively as against control.

Effect of sowing dates

A trial was conducted with four dates of sowing *i.e.* 30th October, 10th, 20th and 30th November. The pooled data presented in Table 2 indicated that disease incidence showed a decreasing trend with the delayed sowing, where disease incidence was maximum 40.70 per cent on 30th October sown crop closely followed by 35.66 per cent on 10th November sown crop and 25.53 per cent in 20th November sown crop. Minimum 20.58 per cent disease incidence was observed in 30th November sown crop (Table 2). The pooled analysis of seed yield data indicated that seed yield was lowest (424.95 kg/ha) in case of 30th October sown crop followed by 10th November sown crop (503.75 kg/ha) However, in spite 30th November sown crop recorded maximum (639.25 kg/ha) seed yield. Our results indicated that crop planted on 30thOctober had highest disease incidence (40.70%) and lower seed yield. Crop planted on 30th November had minimum disease incidence (20.58%). Maximum 661.40 kg/ha seed yield was recorded in 30th November sown crop with 20.58 per cent disease incidence. It was suggested that planting date of 30th November better in this agro climatic zone. Our findings are in contradiction with finding of Deepak *et al.,* (2008) as observed incidence of wilt disease of cumin was more on 30th October sown cumin crop was more in comparison to late sown crop. The reason is that in early sown crop (10th October), the incidence of disease was more as in January pathogen have more congenial climatic condition.

Gangwar *et al.,* (2009), observed that incidence of wilt disease of chickpea were six sowing dates started from 4th October to 8th November at weekly intervals showed that disease incidence gradually decreased and crop yield gradually increased with postponing the sowing date.

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How to cite this article:

Mukesh Kumar Jat, R.R. Ahir, Sanju Choudhary and G.L. Kakaraliya. 2017. Management of Coriander Wilt (*Fusarium oxysporium*) through Cultural Practices as Organic Amendments and Date of Sowing. *Int.J.Curr.Microbiol.App.Sci.* 6(9): 896-900.
doi: https://doi.org/10.20546/ijcmas.2017.609.108