Plant Archives **Vol. 25, Special Issue (ICTPAIRS-JAU, Junagadh) Jan. 2025 pp. 256-260**
e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives
Journal homepage: http://www.plantarchives.org
DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2025.SP.ICTPAIRS-039

MANAGEMENT OF CORIANDER WILT [*FUSARIUM PALLIDOROSEUM* (COOKE) SACC.] UNDER SOUTH SAURASHTRA CONDITION

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ABSTRACT

A field experiment was conducted at the Research Farm of the Department of Plant Pathology, Junagadh Agricultural University, Junagadh to study the efficacy of fungicides, phytoextracts and bioagents in managing the coriander wilt incited by *Fusarium pallidoroseum* (Cooke) Sacc. under field condition during *Rabi*: 2023-24. The results indicated that, drenching in the coriander crop @ 1000 litre/ha at seven days after germination and thereafter thirty days of crop with prochloraz 5.7 + tebuconazole 1.4 ES @ 0.05% showed minimum disease incidence (11.53%) with maximum disease reduction over control of 72.55 per cent. But it was remained statistically at par with copper oxychloride 50 WP @ 0.10% (15.38%) and flusilazole 40 EC @ 0.05% (16.47%) with per cent disease reduction over control of 63.73 and 60.78, respectively. Similarly, the maximum seed yield (1394 kg/ha) of coriander was observed in drenching the crop @ 1000 litre/ha at seven days after germination and at thirty days of crop with prochloraz 5.7 + tebuconazole 1.4 ES at 0.05% with per cent seed yield increase over control of 67.95. But it was remained statistically at par with copper oxychloride 50 WP @ 0.10% (1333 kg/ha) and flusilazole 40 EC @ 0.05% (1305 kg/ha) with per cent seed yield increase over control of 60.60 and 57.23, respectively. Whereas, control treatment recorded maximum wilt disease incidence of 42.52 per cent with minimum coriander seed yield of 830 kg/ha.

Key words : Coriander, Disease incidence, *Fusarium pallidoroseum*, Management, Wilt.

Introduction

Coriander (*Coriandrum sativum* L.) is an important annual herbaceous plant belonging to the family '*Apiaceae*' or '*Umbelliferae*'. It is also known as Cilantro, Arab parsley or Chinese parsley and is cultivated for its seeds and green foliage in India (Burdock and Carabin, 2009). It is a tropical crop and can be grown in loamy or black soil during winter (Singh *et al.*, 2015). It can be grown throughout the year for green leaf purpose. Cloudy weather and high atmospheric humidity during flowering and fruiting stage encourages pest and disease incidence (Vijay and Malhotra, 2001). Hot weather and high wind velocity during seed setting phase impairs seed setting and thereby affect seed yield (Sharma *et al.*, 2001). India is 'The Land of Spices' and the glory of Indian spices is known throughout the world and is the major producer, consumer and exporter of seed spices in the world (Anonymous, 2021). In India, coriander is cultivated in an area of 710.6 thousand hectare yielding a production of 974 thousand metric tonnes with the productivity of 1370 kg/ha in 2022-23 (Anonymous, 2023$_a$). In India, Gujarat occupies 217 thousand hectares of area with annual production of 312.7 thousand metric tonnes and average productivity of 1440 kg/ha in 2022-23 (Anonymous, 2023b).

Coriander is known to affect by many fungal, bacterial and viral diseases. Coriander wilt incited by *Fusarium pallidoroseum* (Cooke) Sacc. marks the first reported instance in the Saurashtra region of Gujarat state (Pithiya and Kanzaria, 2024), with no existing literature documenting the occurrence up to the present date. Previously, *Fusarium pallidoroseum* (Cooke) Sacc. has been reported in citrus causing fruit rot disease in Gujarat (Baria *et al.*, 2015) and in chilli causing wilt disease in

Kashmir (Wani, 2007). The disease is known to occur at any crop growth stage. During seedling stage, the affected plant exhibits drooping of petiole and leaves followed by collapse of seedlings and lodging over the soil surface. Whereas at flowering stage, initially affected plant showed yellowing and drooping of lower leaves which extending upward followed by withering and outright mortality of plant. Longitudinal split open infected root showed brown discoloration of xylem vessels. Considering the occurrence of wilt in coriander and economic importance of the crop, the present investigation aimed with management of coriander wilt *in vivo* by using different fungicides, phytoextracts and biocontrol agents under south Saurashtra condition.

Materials and Methods

An experiment was carried out at the Research Farm of the Department of Plant Pathology, Junagadh Agricultural University, Junagadh during *Rabi* season 2023-24 to study the efficacy of different fungicides, phytoextracts and bioagents for the management of coriander wilt (Table 1). The trial was arranged in Randomized Block Design with four replications. Certified seeds of coriander variety 'GC-2' was sown at the rate of 20 kg seeds per hectare at 30 × 10 cm distance in each of the gross plot size of 5.00 m × 2.40 m and net plot size of 4.00 m × 1.80 m in manually fertilized (20:10:00 NPK kg/ha) soil. All agronomical practices were followed as and when required except fungicidal treatments.

Preparation of phytoextract

Fresh leaves of respective plant species were thoroughly washed with running tap water followed by sterilized distilled water. Later on, the sample was homogenized in sterilized distilled water at the rate of 1 ml/g of tissues (1:1 V/W) with a pestle and mortar and filtered through fine muslin cloth. The filtrate thus obtained was centrifuged at 5000 rpm for 10 minutes and the supernatant was filtered with the sterilized funnel having the pore size of 1-2 µ, which was consider standard plant extract solution (100%) and was stored in refrigerator at 4ºC for further use.

Soil inoculation

The inoculum load of ten days old culture of *F. pallidoroseum* prepared on half cooked sorghum grains were artificially inoculated in the soil in open furrows at the rate of 100 g per 100 m square area of soil at the time of sowing followed by planking.

Application of treatment

The fungicides, phytoextracts and bioagents were drenched seven days after germination of coriander crop and thereafter thirty days of crop by dissolving at their effective concentration at the rate of 1000 litre solution per hectare. Required quantity of respective fungicides and phytoextracts were added to measured quantity of water in order to set desired concentration. Whereas, the fungal and bacterial bioagents were drenched by dissolving 1 kg/litre of bioagent in 1000 litre of water per hectare. Control was also maintained without drenching of any fungicide, phytoextract and biocontrol agents.

Table 1 : Fungicides, phytoextracts and biocontrol agents used in management of coriander wilt *in vivo*.

S. no.	Treatments	Concentration (%)
1.	Azoxystrobin 18.2+Difenoconazole 11.4 SC	0.10
2.	Copper oxychloride 50 WP	0.10
3.	Leaf extract of *Lantana camera* L.	10.00
4.	Flusilazole 40 EC	0.05
5.	*Trichoderma koningii* (2×10^6 cfu/g Min.)	1.00
6.	Leaf extract of *Adhatoda vasica* Ness.	10.00
7.	Prochloraz 5.7 + Tebuconazole 1.4 ES	0.05
8.	*Bacillus cereus* (1×10^8 cfu/ml Min.)	1.00
9.	Thiophanate methyl 70 WP	0.05
10.	Control	-

Observations recorded

Per cent disease incidence at seven days before harvesting of crop were calculated using following formula.

$$\text{Per cent disease incidence (PDI)} = \frac{\text{Number of infected plants}}{\text{Total number of plants observed}} \times 100$$

The per cent disease reduction over control was calculated with the help of following formula (Mathur *et al*., 1971).

$$\text{Disease control (\%)} = \frac{\text{PDI in control plot} - \text{PDI in treated plot}}{\text{PDI in control plot}} \times 100$$

$$\text{Yield increase over control (\%)} = \frac{\text{Yield in treatment} - \text{Yield in control}}{\text{Yield in control}} \times 100$$

Results and Discussion

The observations on per cent disease incidence and seed yield (kg/ha) as influenced by different treatments of fungicides, phytoextracts and bioagents were recorded and analysed. The results so obtained are communicated hereunder.

Efficacy of Fungicides, Phytoextracts and Bioagents against Coriander Wilt *in vivo*

The sowing of coriander variety 'GC-2' was carried out on 21st November, 2023 and total ten treatments along with control were applied under field condition. Drenching of fungicides, phytoextracts and bioagents were carried out on 7th December, 2023 and thereafter on 30th December, 2023. The harvesting of crop was carried out on 23rd February, 2024. Observations on per cent disease incidence (PDI) was recorded at seven days before harvesting of the crop and seed yield (kg/ha) was also recorded after threshing.

Perusal of data presented in Table 2 and Fig. 1 and 2 revealed that all the treatments were effective in reducing the disease incidence with corresponding increase in seed yield as compared to control under field condition. Among the different treatments tried, drenching the coriander crop @ 1000 l/ha at seven days after germination and thereafter thirty days of crop with prochloraz 5.7 + tebuconazole 1.4 ES @ 0.05% showed minimum disease incidence (11.53%) with maximum disease reduction over control (72.55%), but it was remained statistically at par with copper oxychloride 50 WP @ 0.10% (15.38%) and flusilazole 40 EC @ 0.05% (16.47%) with per cent disease reduction over control of 63.73 and 60.78, respectively.

The next effective treatment was thiophanate methyl 70 WP @ 0.05% (21.48%), but it was remained statistically at par with azoxystrobin 18.2 + difenoconazole 11.4 SC @ 0.10% (22.89%) with per cent disease reduction over control of 49.02 and 46.08, respectively. The treatment with moderately effective action was observed in *Bacillus cereus* @ 1.00% (28.71%) with 32.35 per cent disease reduction over control, but it was remained statistically at par with *Trichoderma koningii* @ 1.00% (32.47%) with per cent disease reduction over control of 23.53. Whereas, control treatment showed maximum per cent disease incidence of 42.52 with high disease pressure and was remained statistically at par with leaf extract of *Adhatoda vasica* (39.16%) and leaf extract of *Lantana camera* (36.12%) each at 10 per cent concentration with per cent disease reduction over control of 7.84 and 14.71, respectively. The results indicated ineffectiveness of phytoextracts in reducing the wilt disease incidence of coriander under field condition.

Table 2 : Per cent disease incidence and seed yield of coriander as influenced by different fungicides, phytoextracts and bioagents.

Treatments	Concentration (%)	Per cent disease incidence	Per cent disease reduction over control	Seed yield (kg/ha)	Seed yield increased over control (%)
Azoxystrobin 18.2 + Difenoconazole 11.4 SC	0.10	28.58(22.89)	46.08	1186	42.89
Copper oxychloride 50 WP	0.10	23.09(15.38)	63.73	1333	60.60
Leaf extract of *Lantana camera* L.	10.00	36.94(36.12)	14.71	946	13.98
Flusilazole 40 EC	0.05	23.95(16.47)	60.78	1305	57.23
Trichoderma koningii 2×10^6 cfu/g Minimum	1.00	34.74(32.47)	23.53	1014	22.17
Leaf extract of *Adhatoda vasica* Ness.	10.00	38.74(39.16)	7.84	890	7.23
Prochloraz 5.7 + Tebuconazole 1.4 ES	0.05	19.85(11.53)	72.55	1394	67.95
Bacillus cereus 1×10^8 cfu/ml Minimum	1.00	32.40(28.71)	32.35	1089	31.20
Thiophanate methyl 70 WP	0.05	27.61(21.48)	49.02	1210	45.78
Control	-	40.70(42.52)	-	830	-
S. Em. ±		1.55		56.51	
C. D. at 5%		4.50		164	
C.V.%		10.11		10.09	

* Data outside the parentheses are arcsine transformed, whereas inside are retransformed values.

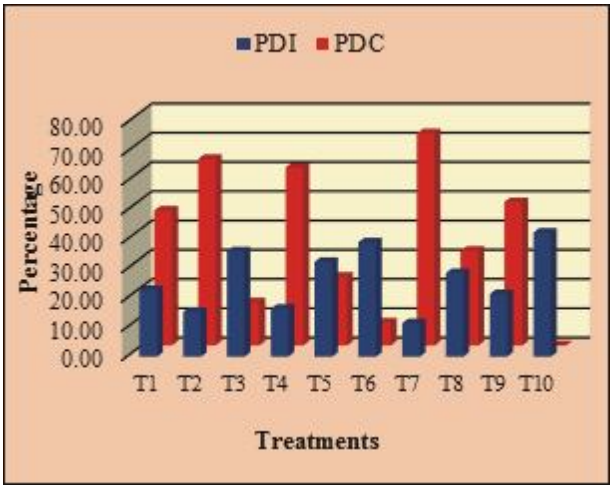

Fig. 1 : Per cent disease incidence and per cent disease reduction over control of coriander as influenced by different treatments *in vivo*.

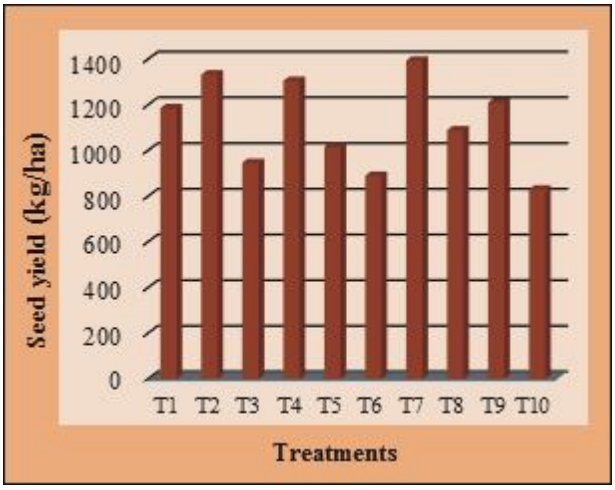

Fig. 2 : Seed yield of coriander as influenced by different treatments *in vivo*.

Looking to the seed yield, drenching the coriander crop @ 1000 l/ha at seven days after germination and at thirty days of crop with prochloraz 5.7 + tebuconazole 1.4 ES @ 0.05% exhibited maximum seed yield (1394 kg/ha) with per cent seed yield increase over control of 67.95. But, it was remained statistically at par with copper oxychloride 50 WP @ 0.10% (1333 kg/ha) and flusilazole 40 EC @ 0.05% (1305 kg/ha) with per cent seed yield increase over control of 60.60 and 57.23, respectively. The next effective treatment in order of merit was thiophanate methyl 70 WP @ 0.05% (1210 kg/ha), but it was remained statistically at par with azoxystrobin 18.2 + difenoconazole 11.4 SC @ 0.10% (1186 kg/ha) and *Bacillus cereus* @ 1.00% (1089 kg/ha) with seed yield increase over control of 45.78, 42.89 and 31.20 per cent, respectively. The treatment *Trichoderma koningii* @ 1.00% (1014 kg/ha) observed moderately effective with seed yield increase over control of 22.17 per cent, but it was remained statistically at par with leaf extract of *Lantana camera* @ 10% (946 kg/ha) and leaf extract of *Adhatoda vasica* @ 10% (890 kg/ha) with seed yield increase over control of 13.98 and 7.23 per cent, respectively.

The control treatment exhibited minimum seed yield of 830 kg/ha. But, it was remained statistically at par with leaf extract of *Adhatoda vasica* (890 kg/ha) and leaf extract of *Lantana camera* (946 kg/ha) each at 10% concentration with seed yield increase over control of 7.23 and 13.98 per cent, respectively. The results indicated ineffectiveness of phytoextracts in increasing the seed yield of coriander under field condition.

The present results corroborate the finding of Khalequzzaman *et al.* (2016) and Jangir *et al.* (2022). They reported minimum disease incidence of 30.53 and 20.39 per cent in the treatment of thiophanate methyl 70 WP when cumin wilt incited by *F. oxysporum f.* sp. *cumini*. Kumar *et al.* (2016) also reported the effectiveness of *Trichoderma pseudokoningii* as seed treatment (6 g/kg seed) and soil application (10 kg/ha) in reducing per cent disease incidence of cumin wilt causing pathogen under field condition.

Conclusion

Based on current study, it can be concluded that drenching the coriander crop @ 1000 l/ha at seven days after germination and thereafter thirty days of crop with prochloraz 5.7 + tebuconazole 1.4 ES @ 0.05% or copper oxychloride 50 WP @ 0.10% or flusilazole 40 EC @ 0.05% gave similar effect in managing the wilt disease incidence of coriander (*Coriandrum sativum* L.) caused by *Fusarium pallidoroseum* (Cooke) Sacc. with corresponding increase in seed yield as compared to other treatments under field evaluation.

Acknowledgement

The authors are highly thankful to the Director of Research and Dean, Faculty of P. G. Studies, Junagadh Agricultural University, Junagadh for providing the necessary facilities to conduct the research work.

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