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Evaluation of antifungal activity of cow urine based phytoextracts against *Erysiphe polygoni* DC causing powdery mildew in coriander

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Abstract

Coriander (*Coriandrum sativum* L.) is one of the essential seed spices which is cultivated in arid and semi-arid region of India. Powdery mildew caused by *Erysiphe polygoni* is an important disease of coriander, which diminish the quality and yield of seeds under field condition. The present study was carried out at the Department of Plant Pathology, College of Agriculture, Junagadh Agricultural University, Junagadh. Efficacy of nine different phytoextracts with cow urine as solvent at 5, 7.5 and 10 per cent were tested against *E. polygoni* using Poisoned Food Technique *in vitro*. Among all nine phytoextracts, maximum mean inhibition of spore germination (76.73%) was observed in the treatment of neem leaf extract which remained superior over other treatments followed by *Ocimum sanctum* L. and *Allium sativum* L. with 71.73 and 70.61 per cent mean spore germination inhibition. The least per cent mean spore germination inhibition of 41.41 per cent was recorded in lantana.

Keywords: Coriander, *E. polygoni*, phytoextracts, cow urine

Introduction

Coriander is a seed spice belonging to the family *Apiaceae* (*Umbelliferae*). The coriander crop is grown for its aromatic and fragrant leaves and fruits. Coriander production in India accounts for more than 80 per cent of total production. In India, annual coriander seed production was 6,39,000 MT in 2021-22 grown on 8,24,000 ha with a productivity of 0.77 MT ha⁻¹ (Anon., 2022) ^[1]. Madhya Pradesh, Rajasthan and Gujarat are the leading coriander producing states in India. The coriander crop suffers from different diseases which is one of the limiting factors in its production. Some common fungal diseases are stem gall (*Protomyces macrosporus*), powdery mildew (*Erysiphe polygoni* DC), wilt (*Fusarium oxysporum* f. sp. *coriandrii*), stem rot (*Rhizoctonia* spp.) and blight (*Alternaria* spp.). Out of these, powdery mildew is a very destructive disease and cause losses by deteriorating the quality of the seed and reducing the yield. It results in losses of up to 15–40%, in addition to significant reduction in coriander seed quality. In the case of favourable conditions losses could reach 50% if appropriate control measures are not implemented (Kumawat *et al.*, 2021) ^[10]. Indiscriminate use of conventional fungicides which are recommended for the control of the disease cause environmental pollution, leave residues and may also lead to development of resistance in pathogens. In order to overcome these problems, phytoextracts were tested for their efficacy in the management of the disease under *in vitro* condition. Plants synthesize various aromatic secondary metabolites, such as phenols, phenolic acids, quinones, flavones, flavonoids, flavonols, tannins and coumarins which have antimicrobial properties and act as defence systems for plants against harmful pathogenic microbes (Gurjar *et al.*, 2012) ^[7]. Cow urine also has antimicrobial and germicidal properties due to presence of urea, creatinine, swarn kshar (aurum hydroxide), carbolic acid, phenols, calcium and manganese (Ghosh and Biswas, 2018) ^[6]. Thus, extracts from plants and cow urine together can be used as a means to control harmful pathogens.

Materials and Methods

Preparation of cow urine based phytoextracts

Fresh leaves, cloves or rhizomes of respective plant species were first washed with tap water and then with sterilized water to remove soil and unwanted particles. For the preparation of

cow urine based phytoextract, the plant materials were crushed in pestle and mortar in required quantity of solvent *i.e.*, cow urine (1:1 w/v). The pulp of the plant tissue along with the extraction solvent were stored and left for 15 days. Later, the contents were filtered through muslin cloth followed by Whatman no. 1 (Rakesh *et al.*, 2013) [12]. The solution thus obtained served as stock solution (100%). Required concentrations of respective phytoextracts were prepared accordingly (Ansari, 1995) [2]. The clarified extracts were stored in refrigerator at 4°C till used. To prevent bacterial contamination, a pinch of streptomycin was added to each dilution.

Spore germination inhibition activities of nine phytoextracts were tested against *Erysiphe polygoni* at concentration of 5, 7.5 and 10 per cent by Poisoned Food Technique using Potato Dextrose Agar (PDA) as the germinating medium (Bagchi and Das, 1968) [3]. With micro pipette appropriate quantity of each phytoextracts based on required concentration were incorporated into PDA medium before solidification. The medium containing phytoextracts was sterilized at 1.038 kg/cm² (15 psi) at 121.6°C for 20 minutes in autoclave. The sterilized medium was poured into sterilized Petri dishes in equal quantity (5 ml per Petri dish) to form a thin layer. Conidia of *E. polygoni* from young colonies, by using a soft camel hair brush were collected and dusted under aseptic conditions over the solidified PDA medium and then Petri dishes were incubated at room temperature (23±1°C) for 24 hours (Meena *et al.*, 2019) [11]. Inoculated Petri dishes containing PDA without phytoextract served as control.

Effect of toxicity on spore and their germination were observed with the help of compound microscope. The conidium having germ tube length of more than its width was considered as germinated conidium. Per cent inhibition of spore germination in each treatment were calculated using following formula (Vincent, 1947) [13].

$$I = \frac{C - T}{C} \times 100$$

Where,

I = Per cent inhibition

C= Number of germinated spores in control

T= Number of germinated spores in treatment

Results and Discussion

It is evident from the Table 1 and Fig. 1 that all the phytoextracts were capable in the inhibition of spore germination at different concentration as compared to control. Among all nine phytoextracts, maximum mean spore germination inhibition (76.73%) was observed in the treatment of *Azadirachta indica* L which remained superior over other treatments. Next effective treatment was *Ocimum sanctum* L. with 71.73 per cent mean spore germination inhibition which was statistically at par with *Allium sativum* L. with 70.61 per cent mean spore germination inhibition. The treatment *Allium cepa* L. exhibited 65.90 per cent mean spore germination inhibition, but it was remained statistically at par with *Curcuma longa* L. (63.39%). The lowest per cent mean spore germination inhibition of 41.41 per cent was recorded in lantana leaf extract treatment after 24 hrs.

There was positive relation in between concentration of phytoextract and spore germination inhibition. Among all three concentrations, 10 per cent concentration was found significantly superior over rest of the concentrations with 64.69 per cent mean spore germination inhibition. The interaction effect between phytoextracts and concentrations revealed that *Azadirachta indica* L at 10 per cent concentration was found significantly superior over the rest of the treatments with 82.59 per cent spore germination inhibition. The next effective treatment was *Ocimum sanctum* L which was followed by *Allium sativum* L at 10 per cent concentration with and 75.05 per cent spore germination inhibition, respectively and were found statistically at par with each other. Treatment *Lantana camara* L at 5 per cent concentration was found least effective with 36.38 per cent spore germination inhibition. Jadav and Kadvani (2019) [8] noted the highest spore germination inhibition (82.23%) against *Erysiphe cichoracearum* causing powdery mildew in okra at 10 per cent concentration. These results are also in agreement with findings of Khunt *et al.* (2017) [9] who recorded maximum spore germination inhibition in the treatment of neem leaf extract 10 per cent with of 82.18 per cent spore germination inhibition after 24 hours. Garlic was also found effective in the present study which is in agreement with the findings of Chovatiya and Dhruj (2010) [5] and Bhosale *et al.* (2024) [4].

Table 1: Evaluation of cow urine based phytoextracts on spore germination inhibition of *E. polygoni* *in vitro*

Tr. No.	Phytoextract	Mean spore germination inhibition (%)			
		5%	7.5%	10%	Mean
T ₁	<i>Jatropha curcas</i> L. (Jatropha)	39.73 (40.85)	42.14 (45.02)	44.54 (49.21)	42.14 (45.03)
T ₂	<i>Allium cepa</i> L. (Onion)	50.79 (60.04)	54.78 (66.73)	57.37 (70.93)	54.31 (65.90)
T ₃	<i>Zingiber officinale</i> Rosc. (Ginger)	43.59 (47.54)	45.98 (51.71)	47.90 (55.06)	45.82 (51.44)
T ₄	<i>Azadirachta indica</i> L. (Neem)	58.94 (73.39)	59.49 (74.22)	65.34 (82.59)	61.26 (76.73)
T ₅	<i>Ocimum sanctum</i> L. (Tulsi)	52.77 (63.39)	58.96 (73.41)	62.30 (78.39)	58.01 (71.73)
T ₆	<i>Allium sativum</i> L. (Garlic)	54.77 (66.72)	56.83 (70.07)	60.03 (75.05)	57.21 (70.61)
T ₇	<i>Curcuma longa</i> L. (Turmeric)	51.78 (61.73)	52.76 (63.38)	53.76 (65.06)	52.77 (63.39)
T ₈	<i>Lantana camara</i> L. (Indradhanu)	37.28 (36.68)	41.18(43.36)	41.66 (44.19)	40.04 (41.41)
T ₉	<i>Adhatoda vasica</i> Ness. (Ardusi)	45.50 (50.87)	49.83 (58.39)	51.80 (61.76)	49.04 (57.01)
	Mean	48.35 (55.69)	51.33 (60.70)	53.86 (64.69)	-
	Fungicide (F)		Concentration (C)		F×C
	S.Em. ±	0.59	0.32		1.02
	C. D. at 5%	1.67	0.91		2.90
	C. V.%			3.86	

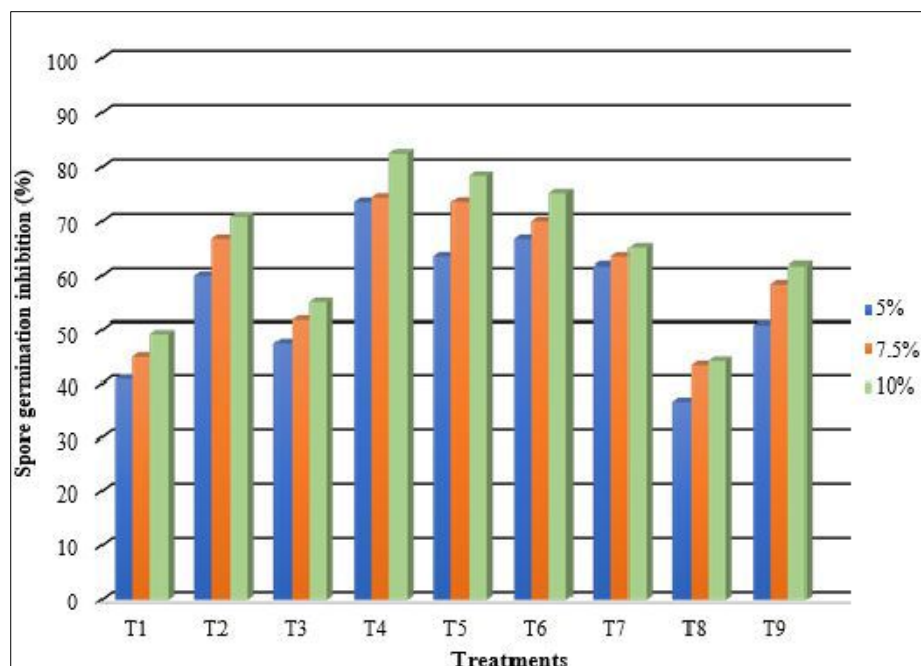


Fig 1: Per cent spore germination inhibition of *E. polygoni* by different phytoextracts

Conclusion

Poisoned Food Technique was employed for testing the efficacy of nine phytoextracts at different concentration of 5, 7.5 and 10 per cent. Instead of water, cow urine was used as solvent for the phytoextracts. Among all nine phytoextracts, maximum mean inhibition of spore germination (76.73%) was observed in the treatment of neem. Next effective treatments were tulsi followed by garlic with 71.73 and 70.61 per cent mean spore germination inhibition. All the phytoextracts showed considerable reduction in spore germination with increasing concentration (5%, 7.5%, 10%). Thus, it can be concluded that natural phytoextracts have scope in the disease management.

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