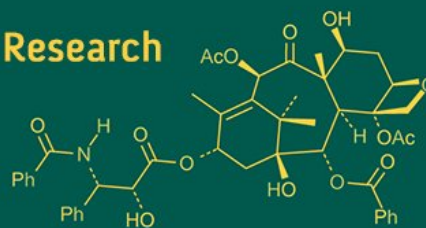


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Prajakta C. Kokani
M.Sc. Scholar, Department of
Plant Pathology, College of
Agriculture, Dr. Balasaheb
Sawant Konkan Krishi
Vidyapeeth, Dapoli, Ratnagiri,
Maharashtra, India

Dr. Rajesh R. Rathod
Assistant Professor,
Department of Plant
Pathology, College of
Horticulture, Mulde, Dr.
Balasaheb Sawant Konkan
Krishi Vidyapeeth, Dapoli,
Ratnagiri, Maharashtra, India

Dr. Ranapratap A. Raut
Assistant Professor,
Department of Plant
Pathology, College of
Agriculture, Dr. Balasaheb
Sawant Konkan Krishi
Vidyapeeth, Dapoli, Ratnagiri,
Maharashtra, India

Dr. Vijaykumar S. Desai
Professor (CAS), Department
of Agricultural Entomology,
College of Agriculture, Dr.
Balasaheb Sawant Konkan
Krishi Vidyapeeth, Dapoli,
Ratnagiri, Maharashtra, India

Dr. Nitish V. Dalvi
Professor (CAS), Department
of Floriculture and
Landscaping, College of
Horticulture, Dapoli, Dr.
Balasaheb Sawant Konkan
Krishi Vidyapeeth, Dapoli,
Ratnagiri, Maharashtra, India

Arathy S. Jayan
Ph.D. Scholar, Department of
Plant Pathology, College of
Agriculture, Dr. Balasaheb
Sawant Konkan Krishi
Vidyapeeth, Dapoli, Ratnagiri,
Maharashtra, India

Corresponding Author:
Prajakta C. Kokani
M.Sc. Scholar, Department of
Plant Pathology, College of
Agriculture, Dr. Balasaheb
Sawant Konkan Krishi
Vidyapeeth, Dapoli, Ratnagiri,
Maharashtra, India

In-vitro evaluation of plant extracts and cow urine against *Colletotrichum capsici* f. sp. *cyamopsicola* causing anthracnose of cluster bean

**Prajakta C Kokani, Rajesh R Rathod, Ranapratap A Raut, Vijaykumar
S Desai, Nitish V Dalvi and Arathy S Jayan**

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Abstract

Anthrachnose caused by *Colletotrichum capsici* f. sp. *cyamopsicola* is an important disease constraint of cluster bean. The present investigation was undertaken to evaluate selected plant extracts and cow urine concentrations for their inhibitory effect against the pathogen under *in-vitro* conditions. Five plant extracts, viz., Ghaneri (*Lantana camara*), Nilgiri (*Eucalyptus globulus*), Dhatura (*Datura stramonium*), Karanj (*Pongamia pinnata*) and Soapnut (*Sapindus trifoliat*), were evaluated at 10 per cent concentration using the poisoned food technique. Cow urine obtained from Konkan Kapila and Jersey breeds was tested at 10, 20, 30, 40 and 50 per cent concentrations. The experiments were conducted under a Completely Randomized Design and mycelial growth was recorded after seven days of incubation. All plant extracts inhibited mycelial growth compared with the untreated control. Soapnut extract was the most effective, recording a mean colony diameter of 43.00 mm and 52.22 per cent inhibition, followed by Nilgiri with 51.62 mm colony diameter and 42.63 per cent inhibition. Cow urine also inhibited pathogen growth, and higher concentrations generally showed greater inhibition. Konkan Kapila cow urine at 50 per cent recorded the lowest colony diameter of 25.25 mm and the highest inhibition of 71.94 per cent, followed by Jersey cow urine at 50 per cent with 32.25 mm colony diameter and 64.16 per cent inhibition. The results indicated that Soapnut extract and higher concentrations of cow urine, particularly Konkan Kapila cow urine at 50 per cent, possess promising antifungal activity against *C. capsici* f. sp. *cyamopsicola* under laboratory conditions.

Keywords: Anthracnose, cluster bean, *Colletotrichum capsici*, cow urine, plant extracts, eco-friendly management

Introduction

Cluster bean (*Cyamopsis tetragonoloba* (L.) Taub.), commonly known as guar, is an important leguminous crop valued for its tender pods, fodder and seed and is also an important source of guar gum. The crop is cultivated under diverse agro-climatic conditions and has considerable agricultural and industrial importance. However, its production is affected by several diseases, among which anthracnose is an important constraint.

Colletotrichum species are important plant pathogenic fungi responsible for anthracnose diseases in numerous crops. In cluster bean, anthracnose is associated with *Colletotrichum capsici* f. sp. *cyamopsicola*. The disease affects different plant parts and may result in necrotic lesions, premature drying and deterioration of crop quality. Warm and humid environmental conditions favour the development and spread of anthracnose, making effective disease management particularly important. Management of fungal diseases has traditionally depended largely on chemical fungicides. However, their repeated and indiscriminate use may lead to concerns related to fungicide residues, environmental contamination and adverse effects on non-target organisms. Therefore, increasing attention is being given to plant-derived products and locally available organic inputs as potential components of eco-friendly disease management programmes. Plant extracts contain several biologically active compounds possessing potential antifungal properties. Earlier investigations have demonstrated the inhibitory activity of different botanical extracts against *Colletotrichum* species. Gurav *et al.* (2013) [3] reported considerable inhibition of *C. gloeosporioides* by soapnut and eucalyptus extracts. Jagtap *et al.* (2014) [4] also reported

inhibitory activity of different aqueous botanical extracts against *C. truncatum*. Bhardwaj *et al.* (2015) ^[5] observed strong antifungal activity of *Sapindus mukorossi* extracts against *C. lindemuthianum*. Similarly, cow urine has been reported to possess antifungal activity against plant pathogenic fungi. Kambar *et al.* (2013) ^[7] studied the inhibitory effect of cow urine against *C. capsici* isolated from chilli anthracnose and reported variation in inhibition with concentration. Kekuda *et al.* (2014) ^[8] also evaluated cow urine extracts against *C. capsici* and reported their antifungal potential. Despite these reports, comparatively limited information is available on the efficacy of locally available plant extracts and cow urine against *C. capsici* f. sp. *cyamopsicola* associated with anthracnose of cluster bean. Therefore, the present investigation was undertaken to evaluate selected plant extracts and different concentrations of cow urine against the pathogen under *in-vitro* conditions.

2. Materials and Methods

2.1 Experimental site and pathogen

The investigation was conducted during 2025–2026 at the Department of Plant Pathology, College of Agriculture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, District Ratnagiri, Maharashtra.

Anthracnose infected cluster bean samples were collected and the pathogen was isolated on Potato Dextrose Agar (PDA). The pathogen was purified and maintained on PDA. Pathogenicity was confirmed on healthy cluster bean plants, and the pathogen was identified as *Colletotrichum capsici* f. sp. *cyamopsicola* based on its cultural and morphological characteristics.

2.2 In-vitro evaluation of plant extracts

Five plant extracts, viz., Ghaneri (*Lantana camara*), Nilgiri (*Eucalyptus globulus*), Dhatura (*Datura stramonium*), Karanj (*Pongamia pinnata*) and Soapnut (*Sapindus trifolius*), were evaluated at 10 per cent concentration. The poisoned food technique described by Nene and Thapliyal (1993) ^[9] was followed for evaluating the antifungal activity of the plant extracts. The experiment was conducted under Completely Randomized Design (CRD). The required quantity of each plant extract was incorporated into molten PDA to obtain the desired concentration. The amended medium was poured into sterilized Petri plates. A mycelial disc obtained from the actively growing margin of the pathogen culture was placed at the centre of each plate. Plates containing unamended PDA served as the untreated control. The inoculated plates were incubated at 27 ±2°C. Mycelial growth was recorded after seven days of incubation.

2.3 In-vitro evaluation of cow urine

Cow urine obtained from Konkan Kapila and Jersey breeds was evaluated at 10, 20, 30, 40 and 50 per cent concentrations against *C. capsici* f. sp. *cyamopsicola*.

The poisoned food technique was followed. The required quantity of cow urine was incorporated into molten PDA to

obtain the respective concentrations. The amended medium was poured into sterilized Petri plates and inoculated with a mycelial disc of the pathogen. Unamended PDA served as the control. The plates were incubated at 27 ±2°C and colony growth was recorded after seven days.

2.4 Assessment of mycelial growth inhibition

The mean colony diameter was recorded for each treatment. The percentage inhibition of mycelial growth over the untreated control was calculated using the formula proposed by Vincent (1947) ^[10]:

$$\text{Per cent Growth Inhibition (I)} = \frac{C - T}{C}$$

Where:

I = Per cent inhibition of mycelial growth

C = Colony diameter in untreated control

T = Colony diameter in treatment

3. Results and Discussion

3.1 In-vitro efficacy of plant extracts against

The results revealed that all the plant extracts tested inhibited the mycelial growth of *C. capsici* f. sp. *cyamopsicola* compared with the untreated control.

The untreated control recorded a mean colony diameter of 90.00 mm. Among the plant extracts, Soapnut (*Sapindus trifolius*) was the most effective treatment, recording the lowest colony diameter of 43.00 mm and the highest mycelial growth inhibition of 52.22 per cent. It was followed by Nilgiri (*Eucalyptus globulus*), which recorded a colony diameter of 51.62 mm with 42.63 per cent inhibition. Dhatura (*Datura stramonium*) recorded 52.50 mm colony diameter and 41.66 per cent inhibition. Karanj (*Pongamia pinnata*) recorded 62.25 mm colony diameter and 30.83 per cent inhibition, whereas Ghaneri (*Lantana camara*) recorded 67.62 mm colony diameter and 24.86 per cent inhibition. The superior performance of Soapnut observed in the present investigation is supported by earlier studies. Gurav *et al.* (2013) ^[3] reported considerable inhibition of *C. gloeosporioides* by soapnut extract at 10 per cent concentration. Similarly, Bhardwaj *et al.* (2015) ^[5] reported strong antifungal activity of *Sapindus mukorossi* fruit extract against *C. lindemuthianum*. Vibhute *et al.* (2024) ^[11] also reported soapnut rind extract as the most effective among the organic plant extracts evaluated against *C. gloeosporioides*. These findings support the potential of *Sapindus* extracts against different *Colletotrichum* species. Jagtap *et al.* (2014) ^[4] reported inhibitory effects of aqueous botanical extracts, including eucalyptus, against *C. truncatum*. The differences in efficacy among the botanicals may be associated with variations in their active constituents, extraction procedures, concentration and susceptibility of the pathogen.

Table 1: *In-vitro* efficacy of plant extracts against *C. capsici* f. sp. *Cyamopsicola*

Tr. No.	Treatment		Mean colony diameter (mm)*	Per cent inhibition
	Common name	Botanical name		
T ₁	Ghaneri	<i>Lantana camera</i>	67.62	24.86
T ₂	Nilgiri	<i>Eucalyptus globus</i>	51.62	42.63
T ₃	Dhatura	<i>Datura stramonium</i>	52.50	41.66
T ₄	Karanj	<i>Pongamia pinnata</i>	62.25	30.83
T ₅	Soapnut	<i>Sapindus trifoliatus</i>	43.00	52.22
T ₆	Control		90.00	-
SE(m)±			2.41	
C.D. at 1%			8.72	

*Mean of four replication

**Plate I:** *In-vitro* efficacy of plant extracts against *C. capsici* f. sp. *cyamopsicola*

3.2 *In-vitro* efficacy of cow urine concentrations

The results showed that cow urine obtained from both Konkani Kapila and Jersey breeds inhibited the mycelial growth of *C. capsici* f. sp. *cyamopsicola*.

In Konkani Kapila cow urine, the mean colony diameter decreased from 78.00 mm at 10 per cent concentration to 25.25 mm at 50 per cent concentration. Correspondingly, inhibition increased from 13.33 per cent to 71.94 per cent. In Jersey cow urine, the colony diameter decreased from 78.37 mm at 10 per cent to 32.25 mm at 50 per cent concentration, while inhibition increased from 12.91 per cent to 64.16 per cent. Thus, the 50 per cent concentration

was the most effective for both breeds. At 50 per cent concentration, Konkani Kapila cow urine showed greater inhibition than Jersey cow urine.

The present findings are in agreement with earlier reports on the antifungal activity of cow urine. Kambar et al. (2013)^[7] reported inhibitory activity of cow urine against *C. capsici* isolated from chilli anthracnose and observed differences in inhibition at different concentrations. Kekuda et al. (2014)^[8] also reported antifungal activity of cow urine extracts against *C. capsici*. Similarly, studies cited in the thesis have demonstrated the potential of cow urine as an organic antifungal input.

Table 2: *In-vitro* efficacy of Konkani Kapila and Jersey cow urine concentrations against *Colletotrichum capsici* f. sp. *Cyamopsicola*

Tr. No.	Treatments	Mean colony diameter (mm)*		Per cent inhibition	
	Cow urine conc.(%)	Konkan kapila	Jersey	Konkan kapila	Jersey
T ₁	10	78.00	78.37	13.33	12.91
T ₂	20	63.12	72.50	29.86	19.44
T ₃	30	53.00	49.87	41.11	44.58
T ₄	40	30.62	36.75	65.97	59.16
T ₅	50	25.25	32.25	71.94	64.16
T ₆	Control	90.00	90.00	-	-
SE (m) ±		0.87	0.54		
C. D. @ 1%		3.54	2.21		

*Mean of four replication

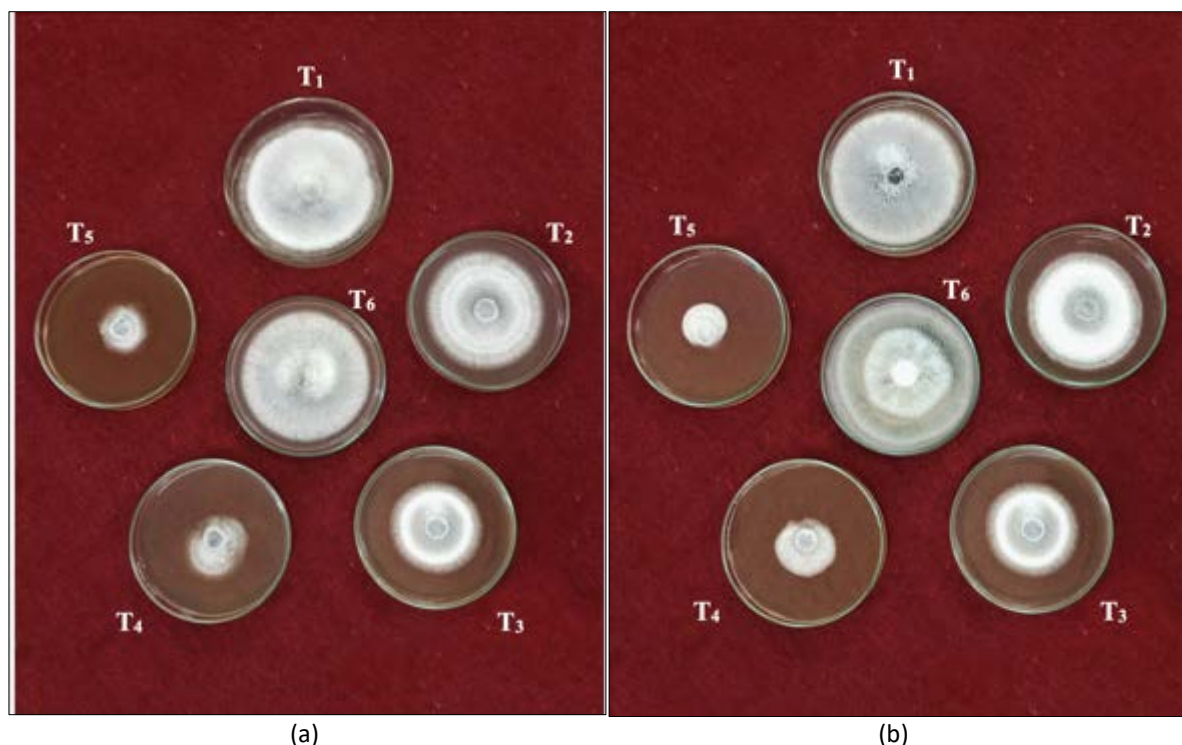


Plate II: In-vitro efficacy of (a) Konkan Kapila and (b) Jersey cow urine concentrations against *C. capsici* f. sp. *cyamopsicola*

4. Conclusion

The obtained result indicated that among the plant extracts evaluated at 10 per cent concentration, Soapnut (*Sapindus trifolius*) was the most effective, recording 52.22 per cent inhibition, followed by Nilgiri (*Eucalyptus globulus*) with 42.63 per cent inhibition. Among the cow urine treatments, Konkan Kapila cow urine at 50 per cent concentration recorded the highest inhibition of 71.94 per cent, followed by Jersey cow urine at 50 per cent concentration, which recorded 64.16 per cent inhibition.

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