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Management of *Colletotrichum gloeosporioides* (Penz.) Causing Cashew Anthracnose through Botanicals

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A B S T R A C T

Cashew is infected by more than 20 diseases worldwide. Among the diseases, anthracnose caused by *Colletotrichum gloeosporioides* (Penz.), perfect stage *Glomerella cingulata* (Ston.) Spauld. & Schrenk is a serious menace in cultivation of cashew causing economic loss in Odisha. The present investigation was carried out with an objective to study the efficacy of easily available different botanicals in *in-vitro* condition. Ten plant extracts such as *Strychnos nuxvomica*, *Rauvolfia serpentine*, *Azadirachta indica*, *Pongamia pinnata*, *Aegle marmelos*, *Ipomoea carnea*, *Tabernaemontana divaricata*, *Lantana camara*, *Begonia grandis* and *Carica papaya* were evaluated against the pathogen at 15% and 20% concentration. Among the plant extracts, *Aegle marmelos* recorded maximum mycelia growth inhibition of 74.85% followed by *Ipomoea carnea* (63.23%) and *Pongamia pinnata* (54.89 %) at 15% concentration. *Tabernaemontana divaricata* recorded the least inhibition of 5.56%. The result at 20% concentration was also obtained at the same trend as 15% concentration. Maximum inhibition as high as 88.78% was recorded from *Aegle marmelos* followed by *Ipomoea carnea* (85%) and *Pongamia pinnata* (70 %). The least inhibition of 7.45% was registered from *Tabernaemontana divaricata*. The effectiveness of *Aegle marmelos* and *Ipomoea carnea* against cashew anthracnose may be attributed to presence of oxazoline derivative named aeglemarmelosine and ergonovine respectively which needs further investigation. Further, the effective plant products may be tested under field condition against cashew anthracnose.

Introduction

Cashew (*Anacardium occidentale* L.) is popularly known as the 'Gold mine' of wasteland. Cashew was originally introduced into India from Brazil in the sixteenth century mainly for checking soil erosion on the coast. Initially, it was considered as a suitable crop for soil conservation, afforestation and also wasteland development but gradually gained commercial importance.

Odisha stands third in Cashew cultivation, production and processing in India, claiming 16% of land under cashew cultivation area at 1.68 Lakh hectares and producing 1,00,000 MT of raw cashew nut (13.6% of India's raw cashew nut production). The major cashew

growing districts in Odisha are Dhenkanal, Koraput, Cuttack, Puri, Ganjam, Sambalpur, Balasore and Sundargarh. As on date, there are more than 350 cashew processing industries processing approximately 125000 MT of raw cashew nuts, thus generating 35,000 employment opportunities every day. Raw cashew nut sector generates annual revenue of Rs 950 crores converting raw cashews into kernels by processing earn an additional value of more than Rs 250 crores. Hence Odisha cashew sector generates approximately Rs 1200 crores every year.

Various factors are responsible for low yield of the crop especially diseases play a vital role. There are more than 12 diseases which are reported to infect cashew tree worldwide. Anthracnose foliar blight, fruit rot, gummosis of twigs and trunk are often considered as the most relevant diseases causing severe damages across cashew growing areas. Among the diseases anthracnose caused by [*Colletotrichum gloeosporioides* (Penz.) Penz. & Sacc.], perfect stage [*Glomerella cingulata* (Ston.) Spauld. & Schrenk] is a common pathogen of cashew causing huge loss in yield.

Chemicals that are used in plant disease management have much adverse environmental effect. So everyone is going for organic management of the diseases and also most of the plants have antimicrobial property. Keeping in view of these facts, the investigation on "Evaluation on antifungal property of some plant extracts against plant pathogens" was undertaken in the Department of Plant Pathology, College of Agriculture, Orissa University of agriculture and technology, Bhubaneswar, Odisha (India).

Materials and Methods

Fresh plant materials were collected and washed first in tap water and then in distilled water. These leaves were allowed to dry under air. Hundred grams of fresh sample was chopped and then crushed in a surface sterilized pestle and mortar by adding 100ml sterile water (1:1 w/v). The extract was centrifuged at 10,000 rpm at 260C for 20 minutes. Finally filtrate thus obtained was used as stock solution.

To study the antifungal mechanism of plant extracts, the poisoned food technique was used in *in-vitro*. Fifteen ml and twenty ml of the stock solution were mixed with 85 and 80 ml of sterilized molten PDA medium respectively so as to get 15 and 20 per cent concentration. The medium was thoroughly shaken for uniform mixing of extract. Twenty ml of medium was poured into sterile petri dishes.

Mycelium of 5 mm size discs from periphery of actively growing culture were cut out by sterile cork borer disc and then placed on the centre of each Petri plate. Controls were also maintained by growing the only pathogen on PDA dishes. Each treatment was replicated thrice and dishes were incubated at 28 ±10C till control dishes reached the maximum radial growth. The per cent inhibition over control was calculated according to formula given by Vincent (1947).

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

I = Per cent inhibition of mycelium
C = Growth of mycelium in control
T = Growth of mycelium in treatment

Results and Discussion

It is seen from table 2 that among the plant extracts, *Aegle marmelos* recorded maximum mycelia growth inhibition of 74.85% followed by *Ipomoea carnea* (63.23%) and *Pongamia pinnata* (54.89 %) at 15% concentration.

Tabernaemontana divaricata recorded the least inhibition of 5.56%. The result at 20% concentration was also obtained at the same trend as 15% concentration. Maximum inhibition as high as 88.78% was recorded from *Aegle marmelos* followed by *Ipomoea carnea* (85.01%) and *Pongamia pinnata* (69.98 %). The least inhibition of 7.45% was registered from *Tabernaemontana divaricata.*

An *in – vitro* experiment was conducted on different plant extracts in inhibiting the mycelial growth of the test fungus. *Aegle marmelos* recorded maximum mycelia growth inhibition of 88.79% followed by *Ipomoea carnea* (85.01%) and *Pongamia pinnata* (69.98 %) at 20% concentration. *Tabernaemontana divaricata* recorded the least inhibition of 7.45%. The efficacy of plant extracts against *C. gloeosporioides* had been reported earlier by Alam (2002). His finding was bark extracts of *Azardirachta indica* at 25% concentration completely inhibited the conidial germination of *C. gloeosporioides* which is in agreement with present findings. Kolase (2014) also reported Neem leaf extract at 5% concentration inhibited the growth of *C. gloeosporioides* in *in-vitro* condition which is also corroborating the present findings. The seed extracts (5%) of *Azardirachta indica* was proved effective to inhibit the growth of *C. gloeosporioides* as reported by Kothikar (2017). Yogarajan (2014) while working on the antifungal activity of crude leaf extracts of *Lantana camara* against *C. gloeosporioides* opined that there was growth inhibition of 80.2% and Prasad (2015) also reported ethanol leaf extracts of *L. camara* gave a significant inhibitory effect on the radial growth of *C. gloeosporioides* in *in-vitro* condition. However, *L. camara* at 20% concentration recorded 31.58% growth inhibition in the present investigation which is in support with earlier findings of Yogarajan and Prasad (Fig. 1; Table 1 and 2).

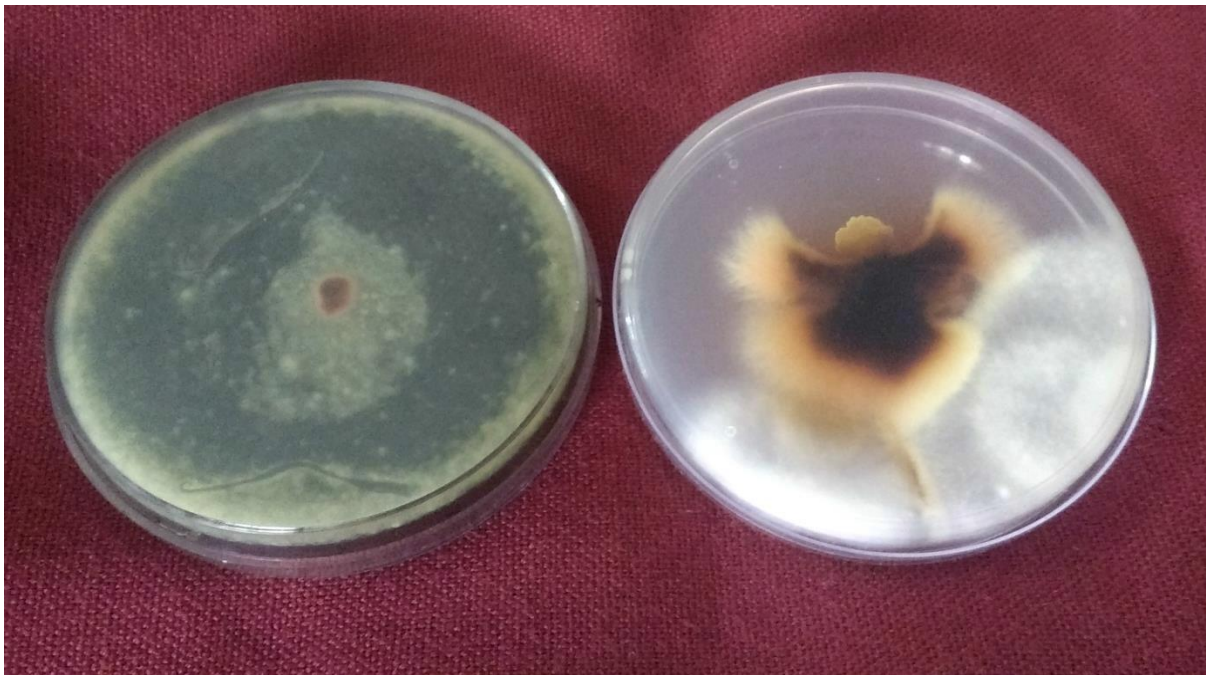
Table.1 Different plant extracts used with their common names, Scientific name and plant parts used

Sl. No	Common name	Scientific name	Plant parts used
1	Kochila	*Strychnos nuxvomica*	Leaf
2	Sarpagandha	*Rauvolfia serpentine*	Leaf
3	Neem	*Azadirachta indica*	Leaf
4	Karanj	*Pongamia pinnata*	Leaf
5	Bael	Aegle marmelos	Leaf
6	Amari	*Ipomoea carnea*	Leaf
7	Tagar	*Tabernaemontana divaricata*	Leaf
8	Lantana	*Lantana camara*	Leaf
9	Begunia	*Begonia grandis*	Leaf
10	Papaya	*Carica papaya*	Leaf

Table.2 *In vitro* bio-assay of plant extracts

Sl. No.	Scientific name of botanicals	Growth inhibition	Growth inhibition
		15% Conc.	**20% Conc.**
1	*Strychnos nuxvomica*	51.56	65.79
2	*Rauvolfia serpentine*	48.98	60.98
3	*Azadirachta indica*	20.13	31.99
4	*Pongamia pinnata*	54.89	69.98
5	*Aegle marmelos*	74.85	88.79
6	*Ipomoea carnea*	63.23	85.01
7	*Tabernaemontana divaricata*	5.56	7.45
8	*Lantana camara*	19.71	31.58
9	*Begonia grandis*	22.5	35.52
10	*Carica papaya*	35.82	40.31
	SE (m)	± 2.901	± 4.323
	CD (0.05)	8.619	12.84

Fig.1 Effect of plant extract on the test pathogen. T5- *Aegle marmelos*



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