

Bioefficiency of Botanicals against *Colletotrichum truncatum*, Causing Pod Blight of Soybean

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Abstract—Soybean (*Glycine max* L. Merrill.) is one of the most important oilseed-cum leguminous crop, which is the largest source of vegetable oil and protein in the world. *Colletotrichum truncatum* has been reported as major constraint in the successfully cultivation of soybean, causing more than 30 per cent yield losses. A total of eleven botanicals viz., Mehandi (*Lawsonia innermis*), Ginger (*Zingiber officinale*), Parthenium (*Parthenium hysterophorus*), Neem (*Azadirachta indica*), Garlic (*Allium sativum*), Turmeric (*Curcuma longa*), Bougainvillea (*Bougainvillea spectabilis*), Onion (*Allium cepa*), Eucalyptus (*Eucalyptus globules*), Datura (*Datura metal*), Beshram (*Ipomea carnea*) were evaluated (@ 10, 15 and 20% each) in vitro against *C. truncatum*, applying poisoned food technique (Nene and Thaplial, 1993).

All the botanicals/plant leaf extracts tested in vitro were found significantly effective in reducing the percentage mycelial growth of *C. truncatum* over untreated control. The mean radial mycelial growth recorded with the plant extracts tested (@ 10, 15 and 20% each) was ranged from 14.68 mm (Garlic) to 54.94 mm (Beshram). Garlic recorded lowest mean colony diameter (14.68 mm) and highest mean mycelial growth inhibition (83.69%) of the test pathogen over untreated control. This was followed by the botanicals, onion (Mean Col. Dia. 32.32 mm and mean inhibition 64.09%), Ginger (Mean Col. Dia. 38.66 mm and mean inhibition 57.05%), Neem (Mean Col. Dia. 43.52 mm and mean inhibition 51.64%), Parthenium (Mean Col. Dia. 45.78 mm and mean inhibition 49.13%), turmeric (Mean Col. Dia. 50.94 mm and mean inhibition 43.39%), Bougainvillea (Mean Col. Dia. 51.98 mm and mean inhibition 42.69%), Eucalyptus (Mean Col. Dia. 52.60 mm and mean inhibition 41.56%) and Mehandi (Mean Col. Dia. 53.29 mm and mean inhibition 40.79%). The least effective found were Datura (Mean Col. Dia. 54.37 mm and mean inhibition 39.59%) and Beshram (Mean Col. Dia. 54.94 mm and mean inhibition 38.95%).

Keywords: *Colletotrichum truncatum*, mean inhibition, fungistatic and botanicals.

1. INTRODUCTION

Soybean is the world's foremost provider of protein and oil. In Maharashtra, the area production and productivity of soybean were 32.13 lakh hectare, 39.95 lakh metric tonnes and 1243 kg/ha, respectively [1]. Soybean growing major states in the country are Madhya Pradesh, Maharashtra, Karnataka, Andhra Pradesh. Soybean plant health is a critical component of

profitable soybean production. *Colletotrichum truncatum*, is the most common species recorded on soybean [9] and the crop soybean is susceptible to *C. truncatum* at all stages of development particularly from bloom to pod fill.

2. MATERIAL AND METHODS

Preparation of plant extracts

Hundred grams of fresh healthy plant parts (leaves/root/bulbs) collected from field were washed with distilled water and air-dried and crushed in 100 ml of distilled water (w/v). The crushed product was filtered through double layer, muslin cloth and further filtrated through Whatman No. 1 filter paper using funnel and volumetric flasks (100 ml cap.). The prepared solution gave 100 per cent concentration, which was further diluted to required concentrations of 10.0, 15.0 and 20.0 per cent. The extracts were tested against *C. truncatum* on the cultural media using poison food technique [11] under in vitro condition.

An appropriate quantity of each plant extract (100%) was separately mixed thoroughly with autoclaved and cooled (40°C) PDA medium in conical flasks (250 ml cap.) to obtain desired concentrations (10, 15 and 20 per cent). The PDA medium amended separately with plant extract was then poured (20 ml/plate) into sterile glass Petri plates (90 mm dia.) and allowed to solidify at room temperature. For each test botanical extract and their respective concentrations, three plates / treatment / replication were maintained. Each plant extract and its respective concentrations were replicated thrice. Upon solidification of PDA, all the treatment and control plates were aseptically inoculated by placing in the centre a 5 mm mycelial disc obtained from a week old actively growing pure culture of *C. truncatum*. Plates containing plain PDA without any botanical extract and inoculated with mycelial disc of the test fungus served as untreated control. All these plates were then incubated at 27 ± 2°C temperature for a week or till the untreated control plates were fully covered with mycelial growth of the test fungus.

Details of the experiment:	
Design :	CRD
Replications :	Two
Treatments :	12

		Local name	Scientific Name
T ₁	:	Mehandi	<i>Lawsonia innermis</i>
T ₂	:	Ginger	<i>Zingiber officinale</i>
T ₃	:	Parthenium	<i>Parthenium hysterophorus</i>
T ₄	:	Neem	<i>Azardirachta indica</i>
T ₅	:	Garlic	<i>Allium sativum</i>
T ₆	:	Turmeric	<i>Curcuma longa</i>
T ₇	:	Bougainvillea	<i>Bougainvillea spectabilis</i>
T ₈	:	Onion	<i>Allium Cepa</i>
T ₉	:	Eucalyptus	<i>Eucalyptus globulus</i>
T ₁₀	:	Datura	<i>Datura metal</i>
T ₁₁	:	Beshram	<i>Ipomea carnea</i>
T ₁₂	:	Control (untreated)	

Observations on radial mycelial growth of the test fungus were recorded at 24 hrs. interval and continued till growth of the test pathogen in untreated control plate was fully covered. Per cent inhibition of the test pathogen was calculated by applying the formula [16]. Observations on sporulation were recorded at 10 days after incubation.

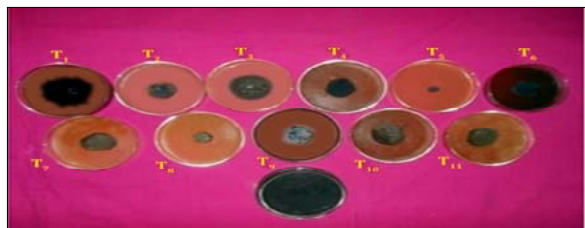
3. RESULTS AND DISCUSSION

The results revealed that (Table No. 1 and plate I) all the botanicals/plant leaf extracts tested *in vitro* were found significantly effective in reducing the percentage mycelial growth of *C. truncatum* over untreated control. The mean radial mycelial growth recorded with the plant extracts tested (@ 10, 15 and 20% each) was ranged from 14.68 mm (Garlic) to 54.94 mm (Beshram). Garlic recorded lowest mean colony diameter (14.68 mm) and highest mean mycelial growth inhibition (83.69%) of the test pathogen over untreated control. This was followed by the botanicals, onion (Mean Col. Dia. 32.32 mm and mean inhibition 64.09%), Ginger (Mean Col. Dia. 38.66 mm and mean inhibition 57.05%), Neem (Mean Col. Dia. 43.52 mm and mean inhibition 51.64%), Parthenium (Mean Col. Dia. 45.78 mm and mean inhibition 49.13%), turmeric (Mean Col. Dia. 50.94 mm and mean inhibition 43.39%), Bougainvillea (Mean Col. Dia. 51.98 mm and mean inhibition 42.69%), Eucalyptus (Mean Col. Dia. 52.60 mm and mean inhibition 41.56%) and Mehandi (Mean Col. Dia. 53.29 mm and mean inhibition 40.79%). The least effective found were Datura (Mean Col. Dia. 54.37 mm and mean inhibition 39.59%) and Beshram (Mean Col. Dia. 54.94 mm and mean inhibition 38.95%). Botanicals garlic, onion, ginger, neem, mehandi, parthnium, bougainvillea were also reported fungistatic against several *Colletotrichum* species causing anthracnose, blights, leaf spot in many crop by several workers [6,10, 4, 2, 15, 3, 12, 13, 5, 8, 14 and 7].

Table 1 : Bioefficacy of botanicals against <i>C. truncatum</i>								
Treatments	Col. dia.*(mm) at Conc.			Av. (m)	% Inhibition			Av. (%)
	10 %	15 %	20 %		10 %	15 %	20 %	
<i>Lawsonia innermis</i> (Mehandi)	56.2 7	53.5 0	50.1 0	53.2 9	37.48 (22.0 0)	40.55 (23.9 1)	44.33 (26.3 1)	40.79 (24.0 7)
<i>Zingiber officinale</i> (Ginger)	42.1 7	38.6 0	35.2 0	38.6 6	53.15 (32.0 9)	57.11 (34.8 0)	60.89 (37.5 1)	57.05 (34.8 0)
<i>Parthenium hysterophorus</i> (Parthenium)	51.3 3	44.2 0	41.8 0	45.7 8	42.96 (25.4 3)	50.89 (30.5 6)	53.55 (32.3 7)	49.13 (29.4 5)
<i>Azardirachta indica</i> (Neem)	46.6 7	43.6 0	40.3 0	43.5 2	48.16 (28.7 6)	51.55 (31.0 1)	55.22 (33.5 8)	51.64 (31.1 2)
<i>Allium sativum</i> (Garlic)	18.3 3	14.5 0	11.2 0	14.6 8	79.63 (52.7 7)	83.88 (57.0 1)	87.55 (61.1 0)	83.69 (56.9 6)
<i>Curcuma longa</i> (Turmeric)	55.2 3	50.3 0	47.3 0	50.9 4	38.63 (22.7 1)	44.11 (20.1 5)	47.44 (28.3 2)	43.39 (23.7 3)
<i>Bougainvillea spectabilis</i> (Bougainvillea)	55.2 7	51.7 7	47.7 0	51.5 8	38.59 (22.6 9)	42.47 (25.1 2)	47.00 (28.0 2)	42.69 (25.2 8)
<i>Allium cepa</i> (Onion)	35.1 7	32.1 0	29.7 0	32.3 2	60.93 (37.5 3)	64.33 (40.0 0)	67.00 (42.0 6)	64.09 (39.8 6)
<i>Eucalyptus globules</i> (Eucalyptus)	56.0 0	52.1 0	49.7 0	52.6 0	37.78 (22.1 8)	42.11 (24.8 8)	44.78 (26.6 0)	41.56 (24.5 5)
<i>Datura metal</i> (Datura)	57.1 0	54.6 0	51.4 0	54.3 7	36.55 (21.4 3)	39.33 (23.1 3)	42.89 (25.3 8)	39.59 (23.3 1)
<i>Ipomea carnea</i> (Beshram)	57.3 3	54.8 0	52.7 0	54.9 4	36.30 (21.2 8)	39.11 (23.0 1)	41.44 (24.4 9)	38.95 (22.9 3)
Untreated (Control)	90.0 0	90.0 0	90.0 0	90.0 0	--	--	--	--
S.E. ±	0.05	0.03	0.06		0.63	0.63	0.66	
C.D. (P=0.05)	0.15	0.10	0.18		1.87	1.84	1.93	

* :- Average of four replication, Av. :- Average, % :- per cent, dia.:- Diameter

PLATE I



10 % (A)



15 % (B)



20 % (C)

In vitro effect of botanicals at (A) 10 %, (B) 15 % and (C) 20 % on growth and inhibition of *C. truncatum*

T ₁ : <i>Lawsonia innermis</i>	T ₇ : <i>Bougainvillea spectabilis</i>
T ₂ : <i>Zingiber officinale</i>	T ₈ : <i>Allium cepa</i>
T ₃ : <i>Parthenium hysterophorus</i>	T ₉ : <i>Eucalyptus globulus</i>
T ₄ : <i>Azadirachta indica</i>	T ₁₀ : <i>Datura metal</i>
T ₅ : <i>Allium sativum</i>	T ₁₁ : <i>Ipomea carnea</i>
T ₆ : <i>Curcuma longa</i>	T ₁₂ : Untreated control

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