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IN VITRO EVALUATION OF OIL CAKES AND PLANT EXTRACTS AGAINST *PHOMOPSIS VEXANS*, THE CAUSAL AGENT OF FRUIT ROT OF BRINJAL

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ABSTRACT

Brinjal or eggplant (*Solanum melongena* L.) is an important *solanaceous* crop of sub- tropics and tropics. Brinjal is described as the "King of vegetables" due to its versatility in use in Indian food. An investigation was carried out to test the efficacy of fungicides and plant extracts *in vitro*. Here is a concise and polished version. Four oil cakes coconut, neem, gingelly, and groundnut were evaluated for their effect on radial growth suppression of *Phomopsis vexans*. Among them, groundnut oil cake showed the highest growth inhibition (60.46%) and was significantly superior to the other oil cakes. A 20% concentration of groundnut oil cake (56.18%) was as effective as a 30% concentration of the other oil cakes, except groundnut oil cake. Among four plant extracts tested, *Ocimum sanctum* showed the highest inhibition of *Phomopsis vexans* mycelial growth (41.89%) and was significantly superior to *Clerodendron oderatum* (32.61%). Although *Azadirachta indica* (40.70%) and *Lantana camara* (36.65%) showed slightly lower inhibition than *O. sanctum*, the differences were not statistically significant.

Keywords **:** King of vegetables, *Azadirachta indica, Phomopsis vexans, Clerodendron oderatum.*

Introduction

Brinjal or eggplant (*Solanum melongena* L.) is an important solanaceous crop of sub- tropics and tropics. The name brinjal is popular in Indian subcontinents and is derived from Arabic and Sanskrit whereas the name eggplant has been derived from the shape of the fruit of some varieties which are white and resemble in shape to chicken eggs. It is also called aubergine (French word) in Europe. Eggplant is a semitropical/tropical plant originating in Asia and India. Before it gained in culinary popularity eggplant was also termed "mala insana," which translates to "mad apple" owing to the belief that eating eggplant would lead to madness (Kemble *et al.*, 1998). Brinjal is known to have ayurvedic medicinal properties and is good for diabetic patients. It has also been recommended as an excellent remedy for those suffering from liver complaints (Shukla and Naik, 1993).

Brinjal is of much importance in the warm areas of Far East being grown extensively in India, Bangladesh, Pakistan, China and Philippines. Bitterness in eggplant due to the presence of glycoalkaloids in the Indian commercial cultivars varies from 0.37 mg/100 g fresh weight to 4.83 mg (Bajaj *et al.*, 1981).

Phomopsis vexans is a pycnidial fungus with an apparent sexual form in the genus *Diaporthe*, easily seedborne and producing large numbers of conidia. It causes disease in Solanum melongena, its only significant host, ranging from poor seed germination and damping off of seedlings to leaf and stem lesions and to fruit rot, both in the field and after harvest (Chalkley, 2010). Fruit lesions are sunken, discolored and soft with a surrounding margin of black fruit bodies. If conditions become dry, infected fruit become shrivelled, dry and form black mummies (Schwartz and Gent, 2007).

Materials and Methods

In-vitro screening of oil cakes against *Phomopsis vexans*

Four oil cakes were tested against *Phomopsis vexans* following poisoned food technique (Nene and Thapliyal, 1982). Each oil cake was used at 20 and 30 per cent concentration.

Table 1: The oil cakes tested were as follows

S. No.	Oil cake	Scientific Name of plants from which oil cake was obtained
1.	Coconut oil cake	*Cocos nucifera* (Linn.)
2.	Neem oil cake	*Azadirachta indica* (A. Juss)
3.	Gingelly oil cake	*Sesamum indicum* (Linn.)
4.	Groundnut oil cake	*Arachis hypogea* (Linn.)

Oilcakes were dried at room temperature (30^0C) for three days broken into small pieces and powdered thoroughly with pestle and mortar, sieved through a sieve (2 mm porosity) and soaked in sterilized distilled water in the ratio 1: 2 (w/v). After 24 h oil cake extract was obtained by squeezing the cake in water through four folds of muslin cloth. The extract was centrifuged (5000 rpm for 10 min) and supernatant was decanted into 100 ml flask. From this 20 and 30 ml was added to 80 and 70 ml prepared and sterilized Double strength PDA medium independently to the media to get the required concentrations. The media along with respective oil cake extract was melted, cooled and poured to petri dishes. After plating the media, a five mm dia. disc of actively growing seven-day old culture of *Phomopsis vexans* was inoculated at the center of the petri plate. Control plates were kept without adding oil cake extracts. Three replications were maintained for each treatment. The plates were then incubated at room temperature. When mycelial growth completely covered the surface of the media in control plates, observations on the inhibition of mycelial growth due to the use of oil cakes were recorded. Percentage inhibition of mycelial growth.

In vitro screening of plant extracts against *Phomopsis vexans*

Four plant extracts *viz., Lantana camara, Ocimum sanctum, Azadirachta indica,* and *Clerodendron odoratum* at two concentrations (20 and 30 %) were tested for their antimycotic behavior against *Phomopsis vexans* following poisoned food technique (Nene and Thapliyal, 1982). Procedure followed for the preparation of plant extracts are detailed below.

Hundred-gram fresh leaves from each plant were collected from field, washed well and ground with 100 ml distilled water. The macerate was filtered through four layered cheese cloth, again filtered through Whatman No. 42 filter paper and centrifuged at 5000 rpm for 10 min. The supernatant collected was filtered through Millipore membrane filter. Double strength PDA medium was supplemented aseptically with the different concentrations of each leaf extract. Fifteen ml sterilized medium was poured into each petri plate and inoculated with a five mm disc taken from the periphery of seven-day old culture of *Phomopsis vexans by* placing it in the center of the plate. The plates were incubated at room temperature (28 ± 2^0C). All the treatments were replicated three times. A control was also maintained where no leaf extract was added to PDA. When complete mycelial growth was observed in control plates observation was taken from the treatment plates. Percentage inhibition of mycelial growth.

Table 2 : Plants used for preparation of leaf extracts.

S. No.	Plant (Common name)	Scientific Name
1.	Lantana (Poochedi)	*Lantana camara* (Linn.)
2.	Holy basil (Tulsi)	*Ocimum sanctum* (Linn.)
3.	Neem (Vep)	*Azadirachta indica* (A. Juss)
4.	Peruvalam	*Clerodendron odoratum* (Linn.)

Result and Discussion

In vitro screening of plant extracts against *Phomopsis vexans*

Four plant extracts *viz., Ocimum sanctum, Azadirachta indica, Lantana camara* and *Clerodendron oderatum* at two different concentrations (20 and 30 %) were evaluated in the laboratory for their efficacy against *Phomopsis vexans* through poisoned food technique.

Plant extracts might be a substantial alternative of chemical pesticides in controlling plant diseases. Four plant extracts *viz., Ocimum sanctum, Azadirachta indica, Lantana camara* and *Clerodendron oderatum* at two different concentrations (20 and 30 %) were evaluated in the laboratory for their efficacy against *Phomopsis vexans* through poisoned food technique. *Ocimum sanctum* at 30 per cent concentration was found to be superior in inhibiting the mycelial growth (44.75 %) of *Phomopsis vexans* and was significantly superior to all other plant extracts tested. It was also observed that *Ocimum sanctum* at 20 per cent (39.04 %) was on par with 30 per cent concentration of *Azadirachta indica* (43.80 %) and *Lantana camara* (32.37 %). Similar observations were reported by Jadeja (2003), Panda *et al*. (1996). Dhakate *et al*. (2008) conducted *in vitro* and *in vivo* studies with some plant extracts against *Phomopsis* blight caused by *Phomopsis vexans* in brinjal. The results with datura at

five per cent concentration, the inhibition was 80.65 per cent, in eucalyptus it was 53.60 per cent, in tulsi 53.27 per cent and in neem 51.15 per cent. Jadeja (2003) reported that leaf extracts (10 %) of neem and lantana were effective in inhibiting more than 50 per cent growth of *Phomopsis vexans*

Table 3 : Effect of various plant extracts on the growth of *Phomopsis vexans* (*in vitro*)

S. No	Plant Extracts	Growth of the Pathogen (cm) * at 20% consent ration	% inhibition over control	Growth of the Pathogen (cm) * at 30% concentration	% inhibition over control	Mean	
						Growth of the Pathogen (cm)	% inhibition over control
1.	*Lantana camara*	4.73	32.37	4.13	40.94	4.43	36.65
			(34.62)		(39.76)		(37.19)
2.	*Azadirachta indica*	4.36	37.61	3.93	43.80	4.14	40.70
			(32.48		(36.92)		(34.70)
3.	*Ocimum sanctum*	4.26	39.04	3.86	44.75	4.06	41.89
			(38.65)		(41.96)		(40.30)
4.	*Clerodendron oderatum*	5.13	29.04	4.46	36.18	4.79	32.61
			(37.81)		(41.41)		(39.61)
5.	Control	7.0		7.0			
CD at 0.05 % between concentrations						0.22	2.05
CD at 0.05 % between extracts						0.31	2.90

(Figures given in parenthesis are transformed values)
*Mean of three replications

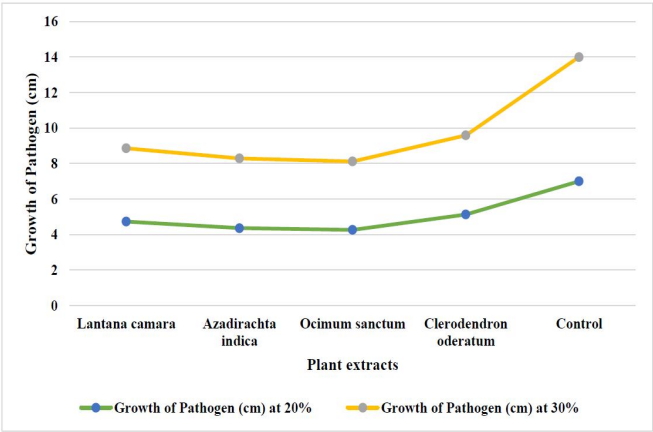

Fig. 1 : Effect of various plant extracts on the growth of pathogen (cm)

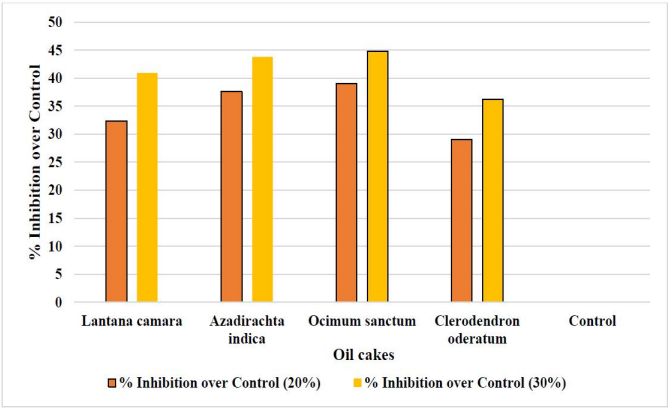

Fig. 2 : Effect of various plant extracts on per cent inhibition over control

The higher concentrations of all the leaf extracts had shown significant superior effect than their lower concentrations in inhibiting the growth of *Phomopsis vexans.*

In vitro* screening of oil cakes against *Phomopsis vexans

Four oil cakes *viz.*, coconut oil cake, neem oil cake, gingelly oil cake and groundnut oil cake were tested to check the suppression of radial growth of *Phomopsis vexans* following poisoned food technique. Each oil cake was used at 20 and 30 per cent concentration.

Table 4 : Effect of various oil cakes on the growth of *Phomopsis vexans (in vitro)*

S. No	Oil cakes	Growth of the Pathogen (cm) * at 20% consent ration	% inhibition over control	Growth of the Pathogen (cm) * at 30% concentration	% inhibition over control	Mean	
						Growth of the Pathogen (cm)	% inhibition over control
1.	Coconut oil cake	3.60	48.57 (44.16)	3.26	56.66 (47.16)	3.43	52.61 (45.66)
2.	Gingelly oil cake	3.70	47.14 (43.34)	3.16	54.76 (47.72)	3.43	50.95 (45.53)
3.	Groundnut cake	3.10	56.18 (48.54)	2.46	64.75 (53.56)	2.78	60.46 (51.05)
4.	Neem cake	4.30	38.09 (38.00)	3.03	53.80 (48.83)	3.66	45.94 (43.41)
5.	Control	7.0		7.0			
	CD at 0.05 % between concentrations					0.32	
	CD at 0.05 % between extracts					0.45	

(Figures given in parenthesis are transformed values)
*Mean of three replications.

Four oil cakes *viz.*, coconut oil cake, neem oil cake, gingelly oil cake and groundnut oil cakes were tested to check the suppression of radial growth of *Phomopsis vexans*. Among the different oil cakes tested, groundnut oil cake gave the highest the highest percentage growth inhibition of 60.46 and was significantly superior to all the other oil cakes tested. Twenty per cent concentration of groundnut oil cake (56.18 %) had equal effect in inhibiting *Phomopsis vexans* compared to 30 per cent concentration of all other oil cakes except groundnut oil cake.

Bhadrasree (2007) reported that gingelly oil cake and coconut oil cakes were effective in managing the collar rot and web blight of cowpea caused by *R. solani.* Amendment of soil with individual applications of mustard oil cake, urea, triple super phosphate, muriate of potash, $ZnSO_4$ and $CaSO_4$ and their mixed application reduced the level of infection of anthracnose (caused by *Phomopsis* and *Macrophomina*) on immature guava fruits compared with applications of manures (Hossain *et al.*, 1996).

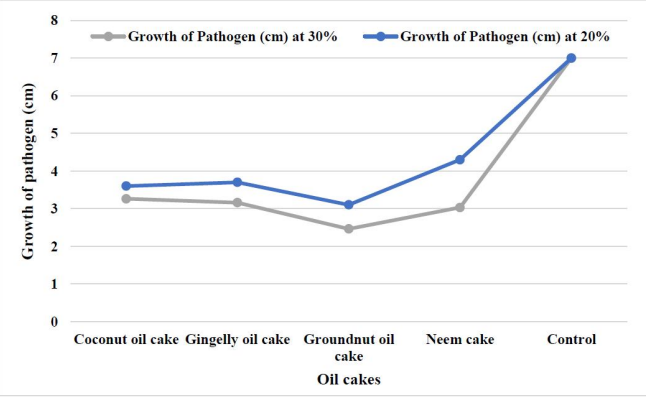

Fig. 3 : Effect of various oil cakes on the growth of pathogen (cm)

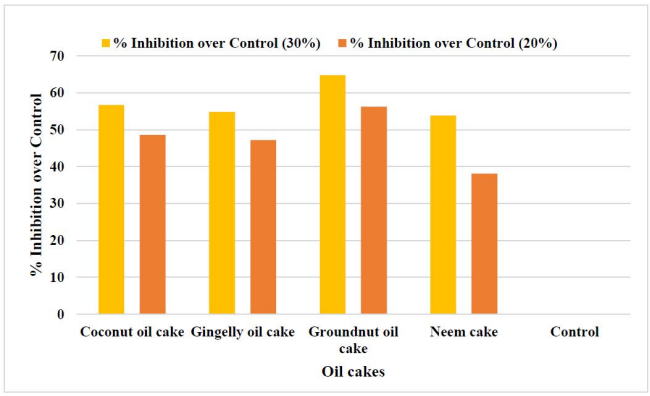

Fig. 4 : Effect of various oil cakes on per cent inhibition over control

Conclusion

From among the different leaf extracts *viz.*, *Ocimum sanctum*, *Azadirachta indica*, *Lantana camara* and *Clerodendron oderatum* tried at two concentrations (20 and 30 %) for the inhibition study of the pathogen under in vitro conditions it was found that *Ocimum sanctum* was found to be the best (41.89 %).

Among various oil cakes viz., coconut oil cake, neem oil cake, gingelly oil cake and groundnut oil cake tested under in vitro conditions against the pathogen, highest inhibition was obtained in groundnut oil cake at 20 per cent concentration.

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