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A SushreeDepartment of Plant Pathology,
CA, OUAT, Bhubaneswar,
Odisha, India**SK Beura**Department of Plant Pathology,
CA, OUAT, Bhubaneswar,
Odisha, India**A Dhal**Department of Plant Pathology,
CA, OUAT, Bhubaneswar,
Odisha, India

In vitro effect of phytoextracts against *Phomopsis vexans* causing Phomopsis blight of brinjal

A Sushree, SK Beura and A Dhal

Abstract

Brinjal is one of the most important vegetable that is grown and cultivated all around the globe. Its infected with a plethora of pathogens one of which is the deadly fungi *Phomopsis vexans* that is the incitant of Phomopsis blight and fruit rot disease of brinjal. The present study was carried out to evaluate the antagonistic properties of various easily available phytoextracts against the pathogen. The effect of nineteen different phytoextracts was tested *in vitro* by poisoned food technique, among which Allamanda registered maximum inhibition per cent of 89.13% and 91.43% at 15% and 20% respectively followed by garlic with an inhibition per cent of 84.22% and 88.81% which were significantly different from each other. The least inhibition was observed in Lantana with an inhibition per cent of 64.16% and 72.27% at 15% and 20% respectively. All the other treatments were significantly at par.

Keywords: Aubergine, eggplant, *Phomopsis vexans*, phytoextracts, poisoned food technique

Introduction

Brinjal is cultivated and consumed all around the world. According to popular belief the major domestication of the crop took place in the Indian subcontinent as it has been cultivated here for the last 4000 years. India ranks second to China, contributing 24.5% towards the global brinjal production (wikipedia, FAOSTAT, 2018) ^[1]. Egypt, Iran, Sri Lanka, Pakistan and Turkey are also the major contributors to the brinjal production Worldwide. In India, brinjal is cultivated in an area of 730 thousand ha with a total production of 12801 thousand MT alongwith a productivity of 17.07MT/ha (NHB Database 2017-18) ^[2]. Its known as eggplant in USA, Australia, New Zealand and Canada, as aubergine in UK, Ireland and France and brinjal in Indian subcontinent. Tending to the gustatory perception of humankind all across the globe brinjal has carved a niche for itself. With an enormous impact on the eating habits of the world the significance of the crop has also risen. Numerous biotic and abiotic factors have seen to act as a barrier to the potential yield of the crop. One of the major diseases of brinjal is the phomopsis blight and fruit rot of brinjal. This disease attacks the plant at all stages of growth and in all parts of the plant. The disease cause a considerable amount of loss to the marketable yield of the crop. Jain et al. (1980) ^[3] reported that the disease decreases nearly 20-30% of the marketable value of the fruit. Phomopsis blight and fruit rot is caused by *Phomopsis vexans*. To control the menace of pest and diseases in brinjal a plethora of chemicals are used which are detrimental to the environment and produces fruits filled with residual chemicals that might cause several health issues on human consumption. Keeping in view the importance of an optimum crop yield and the harmful effect of chemicals on environment a study was conducted to investigate the antagonistic effect of various phytoextracts against the pathogen.

Materials and Methods

The effect of plant extracts of nineteen different plant species such as *Nyctanthes arbotris-tris*, *Ocimum sanctum*, *Azadirachta indica*, *Melia azadirach*, *Justicia adhatoda*, *Allamanda cathartica*, *tagetes sp.*, *Cyanodon dactylon*, *Allium sativum*, *Moringa oleifera*, *Nux-vomica*, *Aloe vera*, *Psidium guajava*, *Polyalthia longifolia*, *Cucurma longa*, *Ipomea sp.*, *Periwinkle*, *Lantana camara*, *Tridax Procumbens* were tested *in vitro* by poisoned food technique to assess their inhibitory effect on the growth of *Phomopsis vexans* in the laboratory of Department of Plant pathology OUAT. First of all, the fresh plant parts were collected from field and washed with tap water. This was followed by washing with distilled water. The plant parts were dried for few minutes. 100g of each plant part was weighed and ground using grinder with addition of equal volume of sterilized distilled water.

Corresponding Author:**A Sushree**Department of Plant Pathology,
CA, OUAT, Bhubaneswar,
Odisha, India

These extracts were then filtered through double layer muslin cloth and taken as stock solution. All the extracts were centrifuged at 12000 rpm for 7minutes and supernatant were taken as 100 per cent and adjusted to different concentration as per need. The extracts were indivisually added in melted, cooled and sterilized PDA at desired concentrations. Twenty mililitre (ml) of poisoned medium was poured into sterilized petridishes. Mycelial disc of five mm from actively growing zone of ten days old culture were inoculated in each plate and placed at the centre of petriplate. Control was maintained without adding any fungicide. Each treatment replicated thrice. The plates were incubated at 27+1^oC temperature and radial growth of fungal mycelium was measured from both direction and radial growth was calculated. The per cent inhibition over control was calculated according to the formula given by Vincent (1927) ^[4].

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

Where

I = Per cent inhibition of mycelium

C = Growth of mycelium in control

T = Growth of mycelium in treatment

Results and Discussions

The extracts obtained from a various easily available plants were evaluated *in-vitro* for their antagonistic and inhibitory effect on the radial growth of the mycelium of the *P. vexans*. All the plant extracts were found to significantly suppress the mycelial growth of the fungus over the control. The results indicated that, the maximum inhibition of the fungal growth was found in petridishes poisoned with Allamanda extract followed by garlic at both the concentrations. Allamanda registered maximum inhibition per cent of 89.13% and 91.43% at 15% and 20%, respectively followed by garlic with an inhibition per cent of 84.22% and 88.81% which were significantly different from each other. The least inhibition was observed in Lantana with an inhibition per cent of 64.16% and 72.27% at 15% and 20%, respectively. All the other treatments were significantly at par at 0.05%.

It can be concluded from the above experiment that the allamanda leaf extract was found to have best control over the growth of the fungus which was followed by garlic and by neem. The worst performing plant extract was *Lantana camara* followed by *Tridax procumbens* and by *Justicia adhatoda*. these have been tested to explore the fungitoxic nature of the plant extracts against *P. vexans in vitro*.

Table 1: Mycelial growth and inhibition percent indicating the level of antagonism of phytoextracts against *Phomopsis vexans*

Sl.no.	Name of the plant	15%		20%	
		Mean (mm)	Inhibition per cent	Mean (mm)	Inhibition Per cent
1	<i>Nyctanthes arbotris-tris</i>	25.03	71.22	20.03	76.97
2	<i>Ocimum sanctum</i>	26.68	69.32	21.67	75.08
3	<i>Azadirachta indica</i>	14.46	83.36	11.46	86.81
4	<i>Melia azedarach</i>	24.45	71.88	19.45	77.63
5	<i>Justicia adhatoda</i>	29.16	66.47	23.16	73.36
6	<i>Allamanda cathartica</i>	9.45	89.13	7.45	91.43
7	<i>Tagetes sp.</i>	25.02	71.23	21.02	75.82
8	<i>Cyanodon dactylon</i>	16.45	81.08	13.45	84.53
9	<i>Allium sativum</i>	13.72	84.22	9.72	88.81
10	<i>Moringa oleifera</i>	17.17	80.25	12.17	86.00
11	<i>Nux-vomica</i>	26.66	69.34	21.66	75.09
12	<i>Aloe vera</i>	23.89	72.52	18.89	78.27
13	<i>Psidium guajava</i>	25.62	70.54	20.62	76.29
14	<i>Polyalthia longifolia</i>	24.80	71.49	22.8	73.29
15	<i>Cucurma longa</i>	20.51	76.41	15.51	82.16
16	<i>Ipomea sp.</i>	19.10	78.04	17.10	80.34
17	<i>Periwinkle</i>	18.39	78.85	13.39	84.59
18	<i>Lantana camara</i>	31.17	64.16	24.11	72.27
19	<i>Tridax procumbens</i>	29.11	66.52	26.17	69.90
20	Control	86.99	0.00	86.99	0.00
	SE(m)+	2.19		1.95	
	CD(0.05)	6.29		5.62	

The study can be corroborated with the findings of Mohanty *et al.* (1995) ^[5] fungal growth was inhibited to a maximum by leaf extracts of *Allamonda cathertica* (93.75%) similar results were obtained by Panda *et al.* (1996) ^[6], Khan (1999) ^[7] and Ekka *et al.*, (2018) ^[8] Meah (2003) ^[9] reported that garlic bulbs extract (1:1) and allamanda leaves extract efficiently controlled *P. vexans*. Jakatimath *et al.*, (2017) ^[10] elucidated that the plant extracts like, the garlic extract, kokum extract and onion extract (5 and 10%, w/v) inhibited the mycelia growth of *P. vexans*. Moreover, they stated that allicin present in garlic was assumed to be the main component responsible for the inhibition of fungal growth. Mone *et al.* (2014) ^[11] concluded that plumieride obtained from *Allamanda*

cathartica acted as an inhibitory compound against various plant pathogenic fungi among which *Phomopsis vexans* was one.

Conclusion

The use of phytoextracts obtained from allamanda and garlic have shown promising results towards controlling the *Phomopsis* blight and fruit rot disease. They can be used as green alternatives for harmful chemicals. This will help in decreasing the environmental degradation caused by the pesticides. Moreover, the residual effects of the pesticides in the fruits will also be eliminated posing no threat to humanity.

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