

Original Research Article

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Exploitation of Botanicals for Eco-Friendly Management of Grape (*Vitis vinifera* L.) Anthracnose caused by *Elsinoe ampelina*

Nithin B. Patil^{1*}, Sunil Zacharia¹ and Gopu Ajay²

¹Department of Plant Pathology, Sam Higginbottom University of Agriculture
Technology and Sciences, Allahabad – 211007, India

²Assam Agriculture University, Jorhat, Assam, India

*Corresponding author

ABSTRACT

Grape (*Vitis vinifera* L.) is a fruit, botanically a berry, is among the oldest plants on earth and is one among the most consumed fruit crop worldwide. India is ranked at 9th position in grape production (Shikamany, 2001; Gade *et al.*, 2014). It is affected by numerous pest and disease. Anthracnose is a major disease following powdery mildew and downy mildew for which excessive chemicals are used for their management causing potential threat. In order to reduce the damage to the environment and humans, an attempt was made to study the antagonistic property of seven botanicals viz., *Azadirachta indica*, *Allium sativum* L., *Allium cepa* L., *Eucalyptus teretecornis*, *Parthenium hysterophorus*, *Pongamia pinnata* and *Ocimum basilicum* for the management of anthracnose of grape popularly known as “Bird’s eye spot” caused by *E. ampelina*. All the above mentioned seven botanicals were tested by poison food technique against *E. ampelina*. Among the botanicals tested the maximum per cent mycelial inhibition was recorded in treatments involving *Onion extract* (78.00 %) and *Garlic extract* (72.23 %) at 10 per cent concentrations which was found to be significantly superior over rest of the treatments.

Keywords

Anthracnose,
Botanicals, *Elsinoe
ampelina*

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Introduction

Grape (*Vitis vinifera* L.) is a fruit, botanically a berry, is among the oldest plants on earth. India being the major producer of grapes, production suffers from biotic and abiotic stresses. Biotic stress such as anthracnose is a fungal disease caused by *Elsinoe ampelina* is also referred as “Bird’s eye spot” is a major disease following powdery mildew and downy mildew.

The disease was first referred by Pliny in Italy on the 1st century of Christian era and later

reported by Burrill during 1886 from Illinois, U.S.A. It was observed that the disease was present in Europe for centuries and was introduced into the United States through cuttings / young vines from European grapes. In India, the disease was first recorded in 1903 near Pune (Butler, 1905). The disease is widely prevalent in Maharashtra, Karnataka, Punjab, Haryana and Andhra Pradesh.

The disease affects all the aerial parts in the green stage, mostly on the new shoots and fruits. On leaves small circular to irregular, 1- 5 mm dia. in size, dark brown spot appear

which later turn gray in the center and dark brown at the margins. The central necrotic tissue often falls off leaving a shot-hole appearance. In severe cases the complete driving of leaves is also noticed. On shoots and tendrils, small isolated brown spots develop which elongate to form elliptical, slightly sunken lesions. Later, the central area of the lesion develops into ashy-gray colour bordered by darker rim. The affected shoots may be restricted in growth as well as shedding of inflorescence / flower buds takes place due to infection. On berries, typical bird's eye spot symptoms appear having violet to gray center and dark brown margins.

In the recent years, there has been major thrust on residue free, organic grape production. In view of this, different botanicals, bio-agent and bio-rational need to be explored for their effectiveness and to fit in with the management schedule of the disease suitably.

Materials and Methods

Collection, isolation and maintenance of the pathogen

Grape leaves and shoots which had symptoms of anthracnose were collected from the grape vineyard and other grape growing areas during the survey and were used for isolation of the fungus *in vitro*. The diseased samples were washed thoroughly under the tap water and allowed to dry in shade under laboratory conditions. The infected portion along with some healthy part was cut into small pieces, and surface sterilized and then transferred aseptically to Petri plates containing Potato Dextrose Agar (PDA) media. The inoculated Petri plates were then incubated at $28 \pm 1^\circ \text{C}$ and growth of fungus and were observed periodically. The pure colonies that developed from these infected leaf/stem bits was transferred onto the PDA slants aseptically. The fungus was sub cultured on PDA slants

and allowed to grow at $28 \pm 1^\circ \text{C}$ for one week and such slants were preserved in refrigerator at 4°C and were renewed once in two months. The preserved culture was used for further studies.

Preparation of cold aqueous and organic extracts

Fresh plant materials were collected and washed in fresh tap water and then in distilled water. Hundred grams of fresh sample was chopped and crushed in a surface sterilized pestle and mortar by adding 100 ml sterile water (1:1 w/v). The extract was filtered through two layers of muslin cloth. Finally such obtained extract was used as stock solution. To study the antifungal mechanism of plant extracts, the poisoned food technique was used (Nene and Thapliyal, 1973). Five and ten ml of stock solution was mixed with 95 and 90 ml sterilized molten PDA medium, respectively so as to get 5 and 10 per cent concentration. The medium was thoroughly shaken for uniform mixing of extract. Twenty ml of medium was poured into sterile petri plate, mycelium disc of five mm size from periphery of actively growing culture was cut out by sterile cork borer and one such disc was placed at the center of each plate without containing any extract. Controls were maintained by growing the pathogen on PDA plates. Then such plates were incubated at $28 \pm 1^\circ \text{C}$ and radial growth was taken when maximum growth was observed in control plate. The efficacy of plant products or botanicals was expressed as per cent inhibition of radial growth over the control which was calculated by using Vincent (1947) formula.

Results and Discussion

As plant extracts are cost effective means of management, an effort was made to know the efficacy of different plant extracts against *E. ampelina*. Seven botanicals were evaluated

against *E. ampelina* (Table 1). This was carried out by adopting the ‘poisoned food technique’ as described in “Material and Methods”. Results revealing the effects of plant extracts on per cent inhibition of *E. ampelina* are presented in the table 2. Among the Seven botanicals tested at two concentrations (5% and 10%) the maximum per cent mycelial inhibition was recorded in treatments involving *Allium cepa L.* (78.00 %)

and *Allium sativum L.* (72.23%) at 10 per cent concentrations which was found to be significantly superior over rest of the treatments and it was followed by *Ocimum basilicum* (51.92 %) at 10 per cent.

The least inhibition of mycelial growth was observed in *Eucalyptus teretecornes* (14.19 %) and *Pongamia pinnata* (14.53 %) at 5 per cent concentration.

Table.1 List of plant extracts

Sl. No.	Botanical name	Common name	Part used
1	<i>Azadirachta indica</i>	Neem	Leaf
2	<i>Allium sativum L.</i>	Garlic	Bulb
3	<i>Allium cepa L.</i>	Onion	Bulb
4	<i>Eucalyptus teretecornes</i>	Eucalyptus	Leaf
5	<i>Parthenium hysterophorus</i>	Parthenium	Leaf
6	<i>Pongamia pinnata</i>	Honge	Leaf
7	<i>Ocimum basilicum</i>	Basil	Leaf

Table.2 *In vitro* evaluation of botanicals against *E. ampelina*

Botanicals	Per cent inhibition of mycelial growth		Mean
	Concentration (%)		
	5	10	
<i>Azadirachta indica</i>	38.97 (38.61)	51.62 (45.61)	45.30 (42.11)
<i>Eucalyptus teretecornes</i>	14.19 (21.74)	25.81 (31.95)	20.00 (26.84)
<i>Allium sativum L.</i>	43.02 (40.98)	72.23 (58.22)	57.63 (49.60)
<i>Ocimum basilicum</i>	28.03 (32.32)	51.92 (45.91)	39.97 (39.11)
<i>Allium cepa L.</i>	45.07 (42.17)	78.00 (62.03)	61.54 (52.10)
<i>Parthenium hysterophorus</i>	37.44 (37.71)	45.81 (42.58)	41.62 (40.14)
<i>Pongamia pinnata</i>	14.53 (22.81)	22.56 (29.16)	18.55 (25.98)
	S.Em.±		CD at 1%
Botanicals (B)	0.54		2.15
Concentration (C)	0.28		1.15
B X C	0.77		3.05

Irrespective of concentration of plant extracts evaluated, the treatment involving *Allium cepa L.* was recorded maximum mean per cent mycelial inhibition (61.54 %) followed by *Allium sativum L* (57.63 %) and minimum mean mycelial inhibition was recorded in *Pongamia pinnata* (18.55%).

In the present investigation, seven plant extracts were tested under *in vitro* condition against *E. ampelina* to know the fungitoxis mechanism of botanicals. *Allium cepa L.* (78.00 %) and *Allium sativum L* (72.23%) at 10 per cent concentrations were found to maximize the inhibition of mycelial growth. Similar results were reported by Jamadar and Lingaraju (2011) stating that Onion extract 10% (78.0% inhibition) was significantly superior and was at par with garlic extract 10% (72.2% inhibition) against *E. ampelina* and leaf extract of eucalyptus and garlic bulbs at 10 per cent concentration gave higher level of inhibition of anthracnose disease of pomegranate caused by *Colletotrichum gloeosporioides* (Prashanth *et al.*, 2008). In another study conducted by Kolase *et al.*, (2014) stated that under *in vitro* condition neem leaves extract at 5 per cent concentration was found to inhibit the growth of *Colletotrichum gloeosporioides*.

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