



E-ISSN: 2278-4136  
P-ISSN: 2349-8234  
JPP 2019; 8(6): 514-515  
Received: 26-09-2019  
Accepted: 28-10-2019

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## Management of *Alternaria macrospora* causing alternaria leaf spot of cotton by plant extracts

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### Abstract

Among the seven plant extracts evaluated *in vitro*, *Allium sativum* (bulb extract) was most effective in inhibiting the mycelial growth (60.30 per cent) of *Alternaria macrospora*. The next best plant extracts were onion bulb extract, Ashoka leaf extract and sorghum leaf extract with mean mycelial inhibition of 57.54, 30.29 and 29.76 per cent, respectively. The least inhibition was shown by *Eucalyptus* leaf extract) which recorded mean mycelial inhibition of 15.06 per cent.

**Keywords:** *Alternaria macrospora*, plant extracts, *Bt* cotton

### Introduction

Cotton, the 'king of fibres' is one of the important commercial and industrial crop of India and is the principal raw material for a flourishing textile industry. Currently, cotton is the leading fibre crop worldwide and is grown commercially in the temperate and tropical regions of more than 50 countries of world. The low productivity of cotton is attributed due to many biotic and abiotic factors. A large number of fungal, bacterial and viral and nematode diseases have been reported on cotton crop right from early stage to till maturity of crop (Anonymous., 2012) [1]. Among them, economically important diseases are bacterial blight, *Alternaria* leaf spot, *Cercospora* leaf spot, grey mildew, rust and vascular wilts. Continuous use of chemical fungicides in the management of diseases leads to new problems in addition to solving the existing problem. The chemical pesticides are causing serious problems and more alarming among them are the pollution of air, water and soil, residual toxicity and development of resistance in fungal pathogens against chemical there by need to apply them frequently with their escalating prices and harmful effects on non-target organisms. Botanicals are an ideal source of low cost, ecofriendly, safe and are indigenously available and hence are suitable in plant protection practices in the integrated disease management. Hence, keeping this in view, an attempt has been done on screening of plant products for its effective antifungal activity against the pathogen so as to minimize the use of fungicides.

### Material and Methods

Fresh plant materials were collected and washed first in tap water and then in distilled water. Hundred grams of fresh sample was chopped and then 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 filtrate thus obtained was used as stock solution. To study the antifungal mechanism of plant extracts, the poisoned food technique was used (Nene and Thapliyal, 1982) [5]. Five and ten ml of stock solution was mixed with 95 and 90 ml of sterilized molten potato dextrose agar (PDA) medium respectively so as to get 5, 10 and 15 per cent concentration. The medium was thoroughly shaken for uniform mixing of extract. Twenty ml of poisoned medium was poured into Petri plate and 5mm diameter of culture disc from actively growing *A. macrospora* was kept at centre of each Petri plate. Three replications were maintained for each treatment and plates were incubated at 27± 1oC. Totally seven plant extracts were evaluated. Controls were also maintained by growing the pathogen on PDA plates The radial growth of the colony was recorded when fungus reached maximum growth in control and per cent inhibition was calculated by the following formula (Vincent, 1947) [2].

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

**Where**

I = Per cent inhibition

C = Radial growth in control

T = Radial growth in treatment

**Table 1:** Plant extracts used for *in vitro* evaluation

Sl. No	Botanical name	Common name	Plant part used
1	<i>Saraca asoca</i>	Ashoka	Leaf
2	<i>Eucalyptus camaldulensis</i>	Eucalyptus	Leaf
3	<i>Allium sativum</i>	Garlic	Clove
4	<i>Azadirachta indica</i>	Neem tree	Leaf
5	<i>Allium cepa</i>	Onion	Bulb
6	<i>Parthenium hysterophorus</i>	Parthenium	Leaf
7	<i>Sorghum bicolor</i>	Sorghum	Leaf

**Results and Discussion**

It is evident from the data (Table-2) that among seven plant extracts evaluated against *A. macrospora* under *in vitro* garlic bulb extract was found most effective which recorded significantly highest mean mycelial inhibition of 60.30 per cent. The next best plant extracts were onion bulb extract, ashoka leaf extract and sorghum leaf extract with mean mycelial inhibition of 57.54, 30.29 and 29.76 per cent, respectively. The least mycelia inhibition was noticed in

Eucalyptus leaf extract (15.06%). There was a significant difference among different plant extracts, concentrations and their interactions. Garlic bulb extract at 15 per cent concentration showed significantly higher inhibition (64.00%) followed by onion bulb extract at with 60.60 per cent inhibition of mycelial growth. Eucalyptus leaf extract showed least inhibition of mycelial growth (18.83%) at the same concentration.

The antifungal effects of the botanicals tested against the test fungus may be attributed to the presence of antifungal compounds like phenols, tannins, alkaloids and non-volatile substances. At higher concentration most of the plant extracts tested, showed higher antifungal activity. At all the concentrations tested, garlic bulb extract followed by onion bulb extract showed more than 50 per cent inhibition of mycelial growth. The present results are in agreement with Shekawat and Prasad (1971) <sup>[6]</sup>, who has established the fungicidal property of *Allium sativum* and *Ocimum sanctum* against *Alternaria tenuis*. Prasad and Naik (2003) <sup>[4]</sup> also reported higher fungicidal activity of garlic bulb extract on *A. solani*. Vijayalaxmi *et al.* (1996) <sup>[3]</sup> reported that, effectiveness of garlic as a pesticide is due to an acrid volatile oil which contains diallyl disulphide, diallyl trisulphide and sulphoxides derived from allicin.

**Table 2:** Efficacy of plant extracts on mycelial growth of *A. macrospora* under *in vitro*

Sl. No.	Plant extracts	Per cent inhibition of mycelial growth			
		Concentration (%)			
		5	10	15	Mean
1	Ashoka	13.22* (21.32) **	31.50 (34.15)	46.17 (42.81)	30.29 (33.40)
2	Eucalyptus	11.52 (19.85)	14.83 (22.66)	18.83 (25.73)	15.06 (22.84)
3	Garlic	57.24 (49.17)	59.67 (50.58)	64.00 (53.13)	60.30 (50.95)
4	Neem	14.19 (22.13)	20.17 (26.69)	24.50 (29.67)	19.62 (26.30)
5	Onion	54.10(47.36)	57.94 (49.57)	60.60 (51.12)	57.54 (49.34)
6	Parthenium	14.27 (22.20)	23.35 (28.90)	33.43 (35.33)	23.68 (29.12)
7	Sorghum	15.68 (23.33)	31.43 (34.11)	42.19 (40.51)	29.76 (33.07)
	Mean	25.74 (30.49)	34.12 (35.75)	41.38 (40.04)	33.75 (35.52)
				S.Em. ±	C.D. at 1%
Botanicals (B)				0.29	0.83
Concentration (C)				0.12	0.55
B × C				0.51	1.52

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