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Efficacy of phytoextracts against *Alternaria alternata* (Fr.) Keissler causing leaf spot of Jatropha

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Abstract
The effect of nine leaf extracts and rhizome powder of turmeric on the mycelial growth of *Alternaria alternata* was tested. Out of ten plant species, leaf extract of *Polyalthia longifolia* (Ashoka) was significantly superior over other treatments which inhibited the mycelial growth upto 71.34 per cent over control after 8 days of incubation. All the plant extracts inhibited the growth of *A. alternata* over control at 10 days of incubation. The maximum inhibition was observed by *Polyalthia longifolia* (Ashoka) followed by *Lawsonia inermis* (Mehandi) and *Curcuma longa* (Turmeric).

Keywords: Leaf spot, *Alternaria alternata*, phytoextracts, Jatropha

Introduction
Jatropha (*Jatropha curcas*) belongs to the family Euphorbiaceae and is thus closely related to other important cultivated plants like rubber, castor, etc. Today Jatropha is found in almost all the tropical and subtropical regions of the world. As Jatropha oil is a potential substitute for diesel, having medicinal properties, saponification value etc. in India, it's cultivation is found in almost all the states. In general, the Jatropha is considered to be free from different diseases and pests. However, some diseases like root rot, fungal leaf spots, rust, bacterial leaf spot, damping-off and mosaic have been reported by many scientists (Duke, 1983; Singh, 1983; Das and Chattopadhyay, 1990; Padilla and Monterroso, 1999; Heller, 1996; Rangaswamy *et al*., 2005; Watve, 2006) [1, 11, 8, 2, 9, 12].

With the use of phytoextracts many scientists have proven it's efficacy to control Alternaria leaf spot disease on various plants. Kumar *et al*. (1979) [13] tested aqueous extracts of different parts of many plants, *in-vitro* against *Alternaria alternata*. Spore germination was completely inhibited by onion, garlic, kalanchoe, *Parthenium histopum*, cotton and *Phaseolus atropureus* extracts. Navrekar (1981) [7] studied the antifungal properties of 15 plant extracts against *Alternaria* sp. The plant extract of *Ocimum sanctum*, *Rosa* sp., *Nerium* sp. and *Allium sativum* (Garlic) were most effective than others. The inhibitory action was tested by spore germination method. The percentage of inhibition of spore germination by crude and acetone extract of *Allium sativum* was 100 per cent and inhibition of mycelial growth on solid medium of the same was 91.95 per cent. Kazim *et al.* (1993) [4] evaluated hexane extracts of *Azadirachta Indica* seed, turmeric and *Valeriana officinalis* rhizomes and seed oil of mustard and found that they were inhibitory to growth of *A. alternata*, *A. fumigatus* and *A. wentii.* Meena and Mariappan (1993) [6] reported that the leaf extracts of *Azadirachta indica* inhibited mycelial growth and spore germination of the seed borne microflora of sorghum including *A. alternata*. Shrivastava and Biharilal (1997) [10] tested fungicidal properties in aqueous leaf extracts of *Calotropis procera*, *Azadirachta indica*, *Lantana camera* and *Ocimum basilicum* against *A. alternata* isolate B, isolated from fruits of pomegranate. Karade and Sawant (1999) [3] tested crude leaf extract of 8 medicinal plants, clove extracts of *Allium sativum* (Garlic) and Rhizome extracts of *Curcuma aromatica* for inhibition of spore germination of an onion isolate of *A. alternata* and found that 10 per cent extract of *Allium sativum* (garlic) completely inhibited spore germination of the pathogen and similarly crude extracts of *C. aromatica* and *Pithecellobium* also inhibited spore germination. With taking into consideration of importance of phytoextracts present investigation were undertaken.

Materials and Methods

Fungistatic activity of different plant extracts was studied against *Alternaria alternata in-vitro* condition. Each plant extract was mixed with sterilized double strength PDA in 1:1 proportion and poisoned medium was poured in petri dishes. For preparing plant extracts plant parts (20g) were ground in miser cum grinder for 2 to 3 minutes. This extract (20ml) was mixed in 80 ml of water and homogenised in blender for 2 to 3 minutes. This 100 ml of plant extract was mixed in 100 ml of double strength PDA before sterilization. Thus, the final strength of plant extract with PDA was 10 per cent. A mycelial disc of fungus 5 mm in diameter was cut from periphery of 7 to 10 days old culture of fungus and aseptically inoculated into the medium. Each set was replicated three times. The control was run side by side by using only sterilized single strength PDA. The petri plates were incubated at 26+1 °C temperature in a BOD, incubator and observations on mycelial growth were recorded at 4, 5, 8 and 10 days of incubation. Plant species were used in the investigation are mentioned in Table 1.

Table 1: Common name, botanical name and plant part used in the experiment

S. No.	Plant	Botanical name	Plant part used
1.	Ashoka	*Polyalthia longifolia*	Leaf
2.	Babhul	*Acacia arabica*	Leaf
3.	Bael	*Aegle marmelos*	Leaf
4.	Ber	*Ziziphus jujuba*	Leaf
5.	Beshram	*Ipomoea carnea*	Leaf
6.	Mehandi	*Lawsonia inermis*	Leaf
7.	Neem	*Azadiracta indica*	Leaf
8.	Parthenium	*Parthenium hysterophorus*	Leaf
9.	Tulasi	*Ocimum sanctum*	Leaf
10.	Turmeric	*Curcuma longa*	Rhizome powder

Results

Leaf extracts of nine plant species and rhizome powder of turmeric were tested against growth of *Alternaria alternata.* The mycelial growth was observed on 4, 6, 8 and 10 days after inoculation. The effect of these plant extracts on the mycelial growth is presented in Table 2.

Amongst the ten plant species, leaf extract of *Polyalthia longifolia* was found to be significantly superior over all other treatments which inhibited the growth up to 71.34% over control after 8 days of incubation. Similar trend was observed at 4, 6 and 10 days after incubation.

The results of 4 days of incubation showed significant reduction in growth of *Alternaria alternata* over control due to plant extracts treatments except *Parthenium hysterophorus* and *Aegle marmelos*. Maximum reduction in mycelial growth was observed in T_1 (*Polyalthia longifolia*) (56.30%). It was statistically superior over rest of the plant extract. It was followed by T_{10} (*Curcuma longa*), T_6 (*Lawsonia inermis*) and T_2 (*Acacia arebica*) with which it was at par.

At 6 days of incubation all the treatments exhibited reduction in the mycelial growth over control except T_4 (*Ziziphus jujuba*). Maximum reduction was observed in T_1, (*Polyalthia longifolia*) (64.60%) which was followed by T_9 (*Ocimum sanctum*) and T_{10} (*Curcuma longa*) which were at par with each other.

At 8 days of incubation all the plant extracts significantly reduced the mycelial growth of *Alternaria alternata* over control. The maximum inhibition was observed in T_1 (*Polyalthia longifolia*), followed by T_6 (*Lawsonia inermis*) and T_{10} (*Curcuma longa*).

At 10 days of incubation all the plant extracts significantly inhibited the growth of *Alternaria alternata* over control. The maximum inhibition was observed in T_1 (*Polyalthia longifolia*), followed by T_6 (*Lawsonia inermis*) and T_{10} (*Curcuma longa*). Among the plant extract, T_8 (*Parthanium hysterophorus*) showed it's minimum and significant effect of reduction in the mycelial growth.

Among the ten plant species, leaf extracts of *Polyalthia longifolia* (Ashoka) proved to be most effective followed by *Lawsonia inermis* (Mehandi) and rhizome extract of *Curcuma longa* (Turmeric) in inhibition of mycelial growth over rest of leaf extracts.

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