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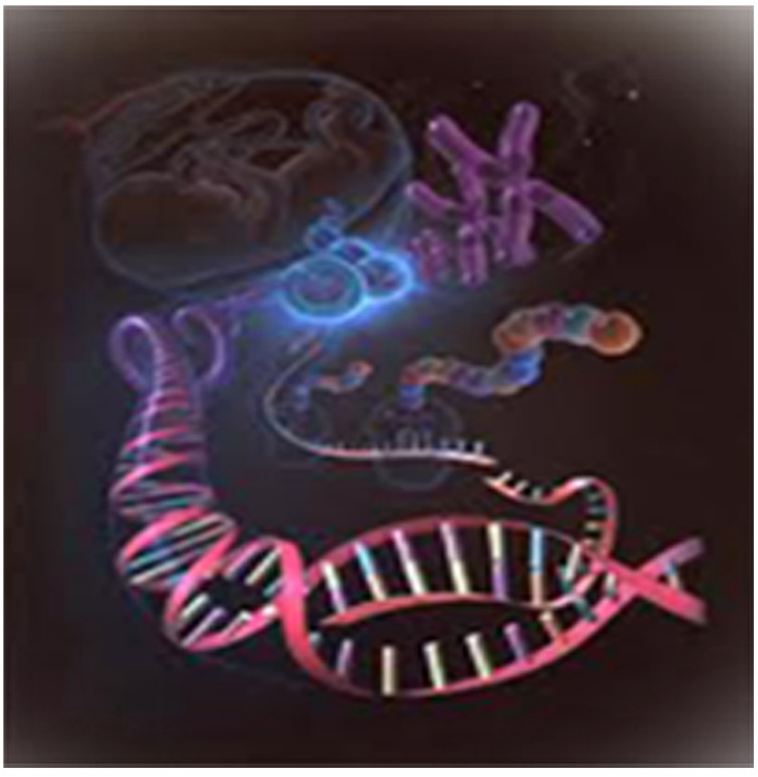

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Research Paper

SYMPTOMATOLOGY, HOST RANGE STUDY AND MANAGEMENT BY BOTANICALS AGAINST *ALTERNARIA ALTERNATA* OF *CANNA INDICA* (FR.) KEISSLER

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Severe blight disease incidence was observed on canna at the Hi-tech Farm, College of Agriculture, Dapoli during March in 2011. While *In vitro* screening of the Host range studies was conducted on different ornamentals, *viz*., Gerbera, Marigold, Hibiscus, Spider lily, Heliconia, Dracena, Mussaenda, Croton, Acalypha and Aglonema. Among these, pathogen could infect gerbera (*Gerbera jamesonii*), marigold (*Tagetes erecta*), heliconia (*Heliconia psittacorum*) and mussaenda (*Mussaenda erythrophylla*). *In vitro* screening of the plant extracts revealed that the nut extract of soapnut (*Sapindus laurifolius* L.) was most effective in inhibiting the growth of the test fungus followed by neem.

Keywords: Symptomatology, Host range, Botanicals, *Alternaria alternata*, Canna

INTRODUCTION

Canna, an important bulbous crop, the only flowering genus of family Cannaceae, is valued for its flowers as well as foliage. It has gained much importance and attraction of gardeners and floriculturists for use in garden decoration throughout the year (Bihari *et al*., 2009). The canna rhizome is rich in starch and it has many uses in agriculture. All aerial canna plant parts have commercial value, rhizomes for starch (consumption by human beings and livestock), stems and foliage for animal fodder and young shoots are used for vegetable purpose by many people. The seeds are used as beads in jewelry. In more remote regions of India, cannas are fermented to produce alcohol. The plant yields a fiber from the stem which is used as a jute substitute. The fiber obtained from the leaves is used for making paper. A purple dye is obtained from the seed. Smoke from the burning leaves is said to have insecticidal property. Cannas are used to extract many undesirable pollutants in a wetland environment as they have high tolerance to contaminants. The severe incidence of leaf blight disease on *Canna indica* L. was noticed in the nursery of the Department of Horticulture, Dr.

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Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli. Symptoms of blight were observed as small spots, which gradually increased, ultimately giving a completely charred and burnt appearance to the plant. The disease gradually caused drying and withering of the blighted leaves. The severity of *Alternaria* blight disease in the experimental plot of Canna was found to be quite high. So far, no research has been carried out on Canna leaf blight in Konkan.

MATERIALS AND METHODS

The fresh leaf samples of canna showing typical symptoms of leaf blight disease were collected from Hi-Tech Farm and made into small bits of affected portion along with healthy portion were cut from margins of the spots. These bits were then surface sterilized with 0.1% aqueous solution of mercuric chloride ($HgCl_2$) for 1 min and then washed with three successive changes of sterilized water to remove the traces of mercuric chloride. Each bit was blot dried and aseptically transferred equidistantly in Petri plates containing solidified Potato Dextrose Agar (PDA). These plates were incubated at room temperature (27 ± 1°C) for seven days. The young leaves of the test plant were surface sterilized with 0.1% mercuric chloride solution with the help of cotton swab and were washed with sterile water to remove traces of mercuric chloride. Very light injuries were made on the surface of the leaves by gently pressing the sand paper (No. 40) so as to allow easy penetration the test fungus. The spore suspension of 15 days old culture on PDA was prepared by pouring 10 ml of sterilized water on the colony surface in each Petri plate and gently scrapping with the help of sterilized needle. The suspension from ten Petri plates was strained through sterilized muslin cloth and collected in 250 mL sterilized Erlenmeyer conical flask for inoculating the test plant. The homogeneous spore suspension (>200 conidia per microscopic field at low power) prepared in sterile water was sprayed by sterilized atomizer on the surface of leaves. After inoculation, plants were covered with clean polyethene sheets of appropriate size for maintaining humid conditions. Control plants sprayed only with sterilized distilled water were also kept under similar conditions. The observations on the development of symptoms were recorded daily for a period of 15 days after inoculation.

HOST RANGE

This study was undertaken to determine the ability of the test fungus to infect different types of ornamental plants. The technique of inoculation was same as described earlier. Adequate control plants were simultaneously maintained for each host plant tested. The observations for disease development were recorded after a period of 10 days of inoculation. The following different types of ornamental plants were used. Gerbera, Marigold, Hibiscus, Spider lily, Heliconia, Dracena, Mussaenda, Croton, Acalypha, Aglonema.

Processing of Plant Materials to Test their Antifungal Properties

Crude Extraction

One hundred grams (100 g) of the fresh plant material was weighed and thoroughly washed with clean water to remove dirt. The plant material was then blended in a food processor by adding 100 mL of sterilized distilled water. The macerate was then filtered through double layered muslin cloth and was centrifuged at 4000 rpm for 5 min. After centrifuging, the supernatant was taken out whereas pellet was discarded. This supernatant

was then filtered through Whatman's filter paper No 1. The filtered extract was then passed through Sintered glass filter to avoid bacterial contamination. Thus, the standard plant extract solution (100%) was obtained.

Effect of Plant Extract on Mycelial Growth of the Test Fungus

All the glassware used in the study were sterilized before their use. The effect of plant extracts on mycelial growth was studied by 'poisoned food technique'. All the plant extracts were tested at 10% concentration against *Alternaria alternata* using PDA medium as a basal medium. To obtain 10% plant extract medium, 90 mL PDA was poured in 100 mL sterilized conical flask and 10 mL of plant extract was poured in each flask separately with the help of sterilized pipette. Then 20 mL of such medium was poured in each sterilized Petri plate and allowed to solidify. Mycelial discs of 5 mm diameter were cut from seven days old culture of the fungus with the help of sterilized cork borer and transferred aseptically to the centre of Petri plate already poured with poisoned medium. Medium devoid of plant extract served as control. Petri plates were incubated at room temperature (27 ± 1°C) for growth. Three replications per treatment were maintained. The observations on colony diameter of the fungus and sporulation were recorded when Petri plate in control treatment was fully covered with mycelial growth. The percent inhibition of growth was calculated by using the formula (Horsfall, 1956).

$$X = \frac{Y - Z}{Y} \times 100$$

where,

X = Percent inhibition

Y = Growth of fungus in control (cm)

Z = Growth of fungus in treatment (cm)

RESULTS AND DISCUSSION

Symptomatology

The disease appeared initially as small brownish spots on the upper surface of leaf lamina and later, dark brown colored lesions were produced on upper surface of the leaves. These lesions gradually increased and formed larger patches. Leaf blight and complete drying of the affected plants were notable symptoms in advanced stage of the disease.

Host Range Study

Among the different ornamental plants tested for their reaction to *Alternaria alternata* (Table 1), marigold (*Tagetes erecta*), heliconia (*Heliconia psittacorum*), mussaenda (*Mussaenda erythrophylla*) showed characteristic leaf blight symptoms within 9-12 days after inoculation, but in gerbera, the symptoms developed after 7 days of inoculation. Other hosts, *viz.,* spider lily (*Hymenocallis littorals*), hibiscus (*Hibiscus canabinus*), dracena (*Cordyline fruticosa*), croton (*Croton variegatum*), acalypha (*Acalypha californica*), aglonema (*Aglonema commutatum*) failed to express any kind of symptom (Table 1). These results indicated that the pathogen is not very host specific and infects other species of plants also signifying that these hosts play an important role in active survival of the pathogen in the nursery. Karlatti and Hiremath (1989) recorded that Ageratum, Aster, Chrysanthemum, Cosmos and Sunflower were the hosts of *Alternaria alternata.* Ingawale (1996) reported that the fungus *A. alternata* was not host specific and

Table 1: Host range of *Alternaria alternata* (canna isolate)

S. No.	Common Name	Botanical Name	Reaction
1.	Gerbera	*Gerbera jamesonii*	+
2.	Marigold	*Tagetes erecta*	+
3.	Hibiscus	*Hibiscus canabinus*	_
4.	Spider lily	*Hymenocallis littorals*	_
5.	Heliconia	*Heliconia psittacorum*	+
6.	Dracena	*Cordyline fruticosa*	_
7.	Mussaenda	*Mussaenda erythrophylla*	+
8.	Croton	*Croton variegatum*	_
9.	Acalypha	*Acalypha californica*	_
10.	Aglonema	*Aglonema commutatum*	_

it infected 15 different host plants which included cereals, vegetables and ornamental crops.

Effectiveness of Plant Extracts Against the Test Fungus in In Vitro

The water extracts of nine plant species were tested against *Alternaria alternata* to exploit their antifungal properties (Table 2). All the plant extracts were tested at 10% concentration by poisoned food technique. All of the plant extracts under study, showed antifungal activity against *Alternaria alternata*. the nut extract of soapnut (*Sapindus laurifolius* L.) recorded maximum inhibition (38.55%) of mycelial growth and was significantly superior to rest of the treatments.

Table 2: Effectiveness of Different Plant Extracts on Growth of Alternaria alternata (Fr.) Keissler

S. No.	Common Name	Conc.(%)	Mean Colony Diameter (cm)*	Per cent Inhibition
1.	Castor	10	8.35	7.22
2.	Neem	10	6.10	32.22
3.	Heena	10	8.03	10.77
4.	Ghaneri	10	7.70	14.44
5.	Sarpagandha	10	8.35	7.22
6.	Tulsi	10	7.2	20.00
7.	Garlic	10	7.23	19.66
8.	Soapnut	10	5.53	38.55
9.	Onion	10	7.87	12.55
10.	Control		9	

Note: S.E.m ±: 0.033; C.D.at 1% :0.133 * Mean of three replications.

This was followed by neem (*Azadirachta indica*) recording 32.22% inhibition over control. The leaf extract of tulsi (*Ocimum sanctum* Linn), garlic (*Allium sativum* Linn) and ghaneri (*Lantana camera* L.) recorded 20%, 19.66% and 14.44% inhibition of mycelial growth, respectively over control. Castor (*Ricinus communis* L.) and sarpagandha (*Rauvolfia serpentine* (L.) Benth.) proved to be least effective in inhibiting the growth of the test fungus (7.22% inhibition) (Table 2). These findings are almost similar to those of Jadhav (2003) also reported that bulb extract of *Allium sativum* was most effective against *Alternaria alternata.* Similarly, Effectiveness of tulsi (*Ocimum sanctum*) was demonstrated by Mamata and Yashoda (2006) against *Alternaria alternata* causing leaf blight of turmeric. Among the various plant extracts (10% concentration) tested against *Alternaria alternata* for their antifungal effect, soapnut extract was found to be most effective in inhibiting the mycelial growth of *Alternaria alternata* followed by neem and tulsi extracts.

CONCLUSION

The disease appeared initially as small brownish spots on the upper surface of leaf lamina, which increased gradually in size. Several spots coalesced producing blight symptoms, resulting in drying of the plant. The host range study indicated that the pathogen could infect gerbera (*Gerbera jamesonii*), marigold (*Tagetes erecta*), heliconia (*Heliconia psittacorum*) and mussaenda (*Mussaenda erythrophylla*). Among the various plant extracts (10% concentration) tested against *Alternaria alternata* for their antifungal effect, soapnut extract was found to be most effective in inhibiting the mycelial growth of *Alternaria alternata* followed by neem and tulsi extracts.

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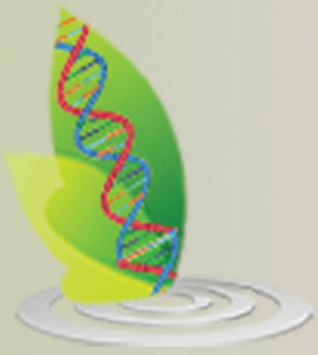

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