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Host range of *Alternaria tenuissima* incitant of Kodo blight

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Metabolites produced by fungi are low molecular weight, organic compounds secreted by diverse group of fungal organisms as results of diverse beneficial, detrimental activities or chemical reactions occurring in every functional cell during its growth and metabolism. The metabolite produced in the nutrient medium by *Alternaria tenuissima*, causal agent of leaf blight of *Paspalum scrobiculatum* L. was isolated from culture filtrate in Czapek's broth medium and tested for its efficacy on infectivity to kodo millet as well as related cereals. The culture filtrate was able to incite disease in finger millet, barnyard millet, foxtail millet and rice besides kodo indicating non host specificity. Host range studies indicated that some of the cereal crops like *P. scrobiculatum, E. frumentacea* and *E. coracana* may be the collateral hosts for the pathogen.

Key words: *Alternaria tenuissima*, fungal metabolites, host range, Kodo blight

INTRODUCTION

Microbes release or excrete various active metabolites during their static growth and proliferation in favourable environment due to constantly occurring diverse metabolic reactions in every functional cell, which at low concentration enhances plant growth and serve as growth promoter. Higher dosages of metabolites of fungal origin induce stunted growth, creating disturbances in normal karyokinesis of cell cycle, lead to chromosomal alteration and cause lethality (Bhajbhuje, 2013).Pathogens must find some alternative source for their survival in the absence of the cultivated host otherwise the infection chain will remain incomplete. Alternate host, weeds and crop residues are important sources for the primary inoculum in many *Alternaria* diseases through which over seasoning occurs.

Kodo millet is one of the oldest cultivated cereal of the genus *Paspalum*, and family Poaceace. Among the small millets, kodo has the maximum planted area after finger millet in India. It is grown for food and feed in the tribal belt of Madhya Pradesh, Chhattisgarh, Jharkhand, Andhra Pradesh, Tamil Nadu, Karnataka, and Gujarat. The crop has rich medicinal value and provides protein, carbohydrates and fiber for the body growth (Nagaraja *et al.* 2007). Kodo millet is particularly recommended for diabetics and has excellent storage life and can be stored even up to 100 years (Gowda *et al.* 1986).

Majority of the *Alternaria* species remain an increasing threat to several crops around the globe causing several diseases including *Alternaria* leaf blight, damping off of seedlings, producing brown to black leaf spots leading to reduction of photosynthetic area. The pathogen can survive as conidia on seed surface or as mycelium inside seed coat and produce both non-toxic as well as toxic metabolites in storage.*A. tenuissima* causal agent of leaf blight of kodo millet is a newly reported disease which produced metabolites in the inoculated broth. A metabolite is a substance that becomes toxic to host cells, damages cell components of actively growing cells to influence the course of symptom expression in host plant (Brakhage and Schroeckh, 2011; Madhavi *et al*. 2012; Bhajbhuje, 2013; Vedna Kumari *et al*. 2014).

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Response of host species to metabolites of *A. tenuissima* has so far not been reported. Hence an attempt is made to study the effect of metabolite produced in the culture filtrate from kodo leaf blight pathogen.

MATERIALS AND METHODS

Isolation of *A. tenuissima* metabolite was done employing methods of Karr *et al.* (1974), Bhaskaran and Kandaswamy (1978) and Amaresh and Nargund (2005). In the laboratory the pure culture of *A. tenuissima* was isolated from a monoconidial culture derived from blight infected leaves and was first cultured on PDA.The isolate that produced mycelia and spore in the Petri plate was inoculated to flasks containing PDB and incubated at 27±1ºC for 45 days. Mycelial mats were separated from the broth culture by filtration through cheese cloth and finally through Whatman No. 42 filter paper. Further, the culture filtrate was centrifuged at 12000 rpm for 10 minutes to remove the spores if any. The supernatant was reduced to 1/5th of its original volume by evaporating at 40ºC in hot water bath and was allowed to stand overnight at 4ºC. The culture filtrate so obtained was tested for its sensitivity to some selected cereal crops like *E.coracana*, *E.frumentacea, P.scrobiculatum, S. italica*, *O. sativa* by dipping the roots of tender seedlings for 48 hours.Similar set of seedlings in distilled water served as check. After 48 h of incubation, observations were made for symptom development and per cent leaf area affected.

Host range studies

The mycelium of the pathogen was artificially inoculated by pin prick method on different cereals for their sensitivity to *A. tenuissima* to know the host range among other cereals *viz*., barnyard millet (*E. frumentacea*), foxtail millet (*S. italica*), rice (*O. sativa*), finger millet (*E. coracana)*, and kodo millet (*P. scrobiculatum*). The inoculated plants were kept under observation for two weeks for symptom development.

RESULTS AND DISCUSSION

Mycotoxin secretion by several filamentous fungi has been reported in many crops (Vedna Kumari, *et al*. 2014). *Alternaria* species can invade crops at the pre- and post-harvest stage and cause considerable losses due to leaf spot, early blight, rotting of fruits and seeds. This may be a result of secretion of a range of mycotoxins as well as other non-toxic metabolites under favourable environment in plants (Wikipedia, 2014).

Many Plant pathogenic fungi produce toxic metabolites in culture media and in plant tissues which take part in the pathogenesis and symptom expression.Effect of culture filtrate was tested on kodo millet and other selected crops. The symptoms first appeared as small brown oval lesion which became irregular in shape gradually increasing in size and intensity of color. Later, several such spots coalesced and the whole leaf became yellow; ultimately turning brown and dried (Fig. 1).

Fig.1. Effect of *A. tenuissima* culture filtrate on selected cereals (top row distilled water, bottom row metabolites).

Sensitivity of culture filtrate on selected crops was observed in all the inoculated crop plants *viz*., *P. scrobiculatum*, *E. coracana*, *E.frumentacea, S. italica* and *O.sativa* indicating the role of metabolite in the pathogenesis and its non-host specific nature. Fungal culture filtrates contain a spectrum of secondary metabolites, such as polysaccharides, oligosaccharides, proteins, glycoproteins,

Table 1: Host range of *A.tenuissima*

Host	Reaction
Paspalum scrobiculatum	+
Eleusine coracana	+
Echinochloa frumentacea	+
Setaria italica	-
Oryza sativa	-

unsaturated fatty acids, that stem from the cell walls, cytoplasm of the fungi, growth regulators such as auxin, kinetin and gibberellic acid (Gentile

et al. 1992), along with toxins (host-selective and non-host-selective) that may play a role as co-determinants of pathogenicity during disease development (Svabova and Lebeda, 2005).

Studies indicated that the *A. tenuissima* has a wide host range. The results presented in Table 1 reveal that *A. tenuissima* could produce visible symptoms on *P.scrobiculatum* (Kodo millet), *E. coracana* (Finger millet), *E.frumentacea* (Barnyard millet) but not on *S. italic* (Foxtail millet)and *O.sativa* (Paddy).Sensitive plant species may serve as collateral hosts of the pathogen(Green *et al.*2001, Mangala *et al*. 2006) and may serve as source of inoculum for disease spread.

Alternaria tenuissima a leaf blight inciting fungal pathogen of kodo millet produced metabolites in nutrient medium during its growth and that the metabolite was non host specific. Host range studies confirmed that along with *P. scrobiculatum*, *E. coracana* and *E.frumentacea* were also infected and may serve as collateral host for *A. tenuissima*.

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