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Short communication

Physiological studies on mycelial growth and sporulation causing alternaria leaf spot of date palm

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Date palm (*Phoenix dactylifera* Linn.) is an important arid fruit plant. Datepalm fruits have high nutritive value as it has high calorific value 60-65 per cent sugar (3150 calories/ kg of fresh fruits) and fair amount of fibre (2.5%), protein (2.0 %), fat (upto 2.0 %) and minerals (upto 2.0 %) Pectic substances (less than 2.0%) and vitamins (Vitamin A, Vitamin B_1 and Vitamin B_2). The date palm tree plantation in arid regions of Rajasthan can improve the ecology of the arid region by providing green cover to the barren land and by improving the micro climate of the region.

Alternaria leaf spot is a serious disease of datepalm caused by a fungal pathogen *Alternaria alternata (Fr.)* Keissler. This disease was first reported by Elarosi *et al.* (1982) from Saudia-Arabia. It causes great losses to the date industries in both quality and quantity of production. It has been found in severe form at Datepalm Research Centre, Bikaner, Rajasthan since last several years. Once established, the pathogen can cause severe losses and drastically reduce fruit yield. No detailed physiological studies have been carried out on this serious pathogen. Studies on the optimum conditions for disease initiation and establishment are important for evolving suitable management strategies. Hence, detailed studies were carried out *in-vitro* to find out the suitable medium, carbon, nitrogen sources and temperature for mycelial growth and sporulation of *Alternaria alternata.*

In vitro effect of various media on mycelial growth and sporulation of _Alternaria alternata_

To ascertain the mycelial growth and sporulation on media, a 6 mm actively growing culture disc of *Alternaria alternata* from PDA was placed at the centre of respective medium into sterilized Petri dishes aseptically. The inoculated plates were incubated at 25 ± 1°C for 7 days. The diameter of mycelial growth was recorded and sporulation of the fungus was counted with the help of haemocytometer. The media viz, Brown's medium, Czapek's Dox, oat meal, potato dextrose agar and Richard's medium were used in this experiment.

Alternaria alternata grew well on all the solid media tested. The best mycelial growth was observed on potato dextrose agar medium (81.2 mm) which was significantly different (P=0.05) from oat meal medium (75.3 mm), Czapek's dox medium (63.0 mm) and Richard's medium (45.8 mm). Least growth was observed on Brown's medium (41.2 mm). *Alternaria alternata* sporulated on all the solid media. The best sporulation was observed on potato dextrose agar medium followed by Czapek's dox medium, Richard's medium and Brown's medium. Least sporulation was observed on oat meal medium. Similary Ionnsidis and Main (1973), Toor *et al.*, (1987) and Maheshwari *et al.*, (2001) reported that PDA was best for growth and sporulation of *Alternaria alternata* followed by oat meal agar.

In vitro effect of carbon sources on growth of _Alternaria alternata_

Carbon is required by fungi as a main structural and functional element. To find out the effect of various carbon sources on mycelial growth of *Alternaria alternata*, Czapek's-dox agar was used as basal medium and sucrose was substituted by adding different sources of carbon. Each Petri dish was inoculated with 6 mm disc of 7 day old culture. Three replications for each treatment were maintained. The inoculated dishes were incubated at 25 ± 1°C for 7 days and the diameter of mycelial growth was measured. Carbon sources used were Dextrose, D-Fructose, Maltose, Mannitol and Sucrose.

Maltose (82.4 mm) was the best source of carbon for the growth of the pathogen, which was significantly (P=0.05) better than dextrose (80.7 mm). Moderate growth was obtained on mannitol (62.1 mm) and sucrose (61.0 mm), when used as carbon source. Poor growth was observed on D-fructose (47.8 mm). Growth was comparatively less in the medium without carbon sources (15.7 mm). The above results indicate that the carbon is required essentially for growth of the pathogen. Kumar (2004) reported that maltose was the best source of carbon for growth of the pathogen

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Alternaria burnsii followed by sucrose and dextrose. However, Gupta (1993) reported that glucose and sucrose were the best sources of carbon for growth of the pathogen *Alternaria alternata* causal agent of leaf blight of henbane followed by fructose, maltose and galactose.

In vitro* effect of nitrogen sources on growth of *Alternaria alternata

Nitrogen is another essential element used by fungi for structural and functional purposes. To find out the effect of various nitrogen sources on mycelial growth of *Alternaria alternata,* Czapek's-dox agar was used as basal medium and sodium nitrate was substituted by adding various nitrogen sources. To ascertain the mycelial growth on media, a 6 mm actively growing culture disc of *Alternaria alternata* was placed at the centre of respective medium into the sterilized Petri plates aseptically. The inoculated plates were incubated at 25 ± 1°C for 7 days and the diameter of mycelial growth was measured. Each treatment was replicated thrice. Nitrogen sources used were Ammonium sulphate, Ammonium nitrate, Sodium nitrate, Potassium nitrate and L- asparagine.

L-asparagine (71.6 mm) was the best source of nitrogen for the growth of the fungus, which was significantly (P=0.05) better than ammonium nitrate (64.3 mm). Good growth was also recorded both on sodium nitrate (60.0 mm) and potassium nitrate (58.2 mm). Poor growth was obtained on ammonium sulphate (51.7 mm). Scanty growth of the fungus was observed in control (without nitrogen) (21.3 mm). The above results indicated that the nitrogen is required essentially for growth of the pathogen. Hackaylo *et al.* (1954) reported that many *Alternaria* spp. gave good mycelial growth on L-asparagine followed by ammonium nitrate. Orynbaev and Ermekova (1972) found that best growth of five different species of *Alternaria* on L-asparagine and tryptophane. However, Hasija (1970) reported that best growth of *Alternaria tenuis* on potassium nitrate, ammonium nitrate and other organic nitrogen sources.

In vitro* effect of temperature on growth of *Alternaria alternata

The effect of temperature on mycelial growth of *Alternaria alternata* was studied in this experiment. six mm actively growing culture disc of *Alternaria alternata* was placed at the centre of PDA medium into the sterilized Petri plates aseptically and incubated at 20°C, 25°C, 30°C, 35°C and 40°C in a growth chamber. The diameter of mycelial growth was measured after 7 days. Each treatment was replicated thrice.

Temperature is an important factor influencing the growth of the pathogen. *Alternaria alternata* grows fairly well within a range of 20 to 30°C but optimum temperature for growth (79.3 mm) of the fungus was found to be 25°C and with increase and lowering of temperature, growth decreased. Gupta (1993) found that *Alternaria alternata* causing leaf blight of henbane could grow fairly well within a range of 20°C to 30°C but optimum growth was found at 25°C temperature. Kumar (2002) found that severity of *Alternaria alternata* causing fruit rot of ber was significantly higher at 25°C temperature. Jakhar (2003) also found that 25°C and 30°C temperature were more congenial for *Alternaria alternata* causing ripe fruit rot of tomato.

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