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Nutritional Studies of *Colletotrichum gloeosporioides* (Penz.) Penz. and Sacc. The Incitant of Mango Anthracnose

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Abstract: Anthracnose caused by *Colletotrichum gloeosporioides* Penz.) Penz. and Sacc. is one of the most important diseases of mango. The nutritional studies were taken up to know the best source of carbon and nitrogen required for the growth and sporulation of the fungus. The study indicated that out of six different carbon sources tried, mannitol was found to be the best source of carbon for the growth followed by fructose and sucrose. Heavy sporulation was observed where maltose was used as carbon source followed by moderate sporulation in fructose and lactose. Among the different nitrogen sources tested, ammonium nitrate supported good growth and sporulation. Potassium nitrate and sodium nitrate also showed good growth but with moderate sporulation.

Key words: *Colletotrichum* · Carbon · Nitrogen · Growth · Sporulation

INTRODUCTION

The Mango (*Mangifera indica* L.) is grown through out the tropics and subtropics of the world. Anthracnose caused by *Colletotrichum gloeosporioides* (Penz.) Penz. and Sacc. is the most serious disease widely distributed in all mango growing regions of the world [1-4] and is a major constraint on the expansion of export trade of mango [5]. The disease incidence from different countries has been reported to be 32 per cent in South Africa [6], 64.6 per cent in Costa Rica during 1990 [7] and could reach almost 100 per cent in fruits produced under wet or very humid conditions [8]. Post harvest decay due to anthracnose was 29.6 per cent in Himachal Pradesh, India during 1990-92 [9]. All the fungi have specific requirement for its nutrition. Carbon and nitrogen are the most important and essential element, besides others, for their infection, growth and reproduction. So to know the best source of carbon and nitrogen for the good growth of *C.gloeosporioides*, the study was taken up.

MATERIALS AND METHODS

This experiment was conducted to find out the source of carbon and nitrogen which can be most efficiently utilized by the fungus for its growth and sporulation. Monosporic culture of *C.gloeosporioides* from the infected mango fruit was obtained in pure culture and maintained on potato dextrose agar slants. Richard's medium (Magnesium sulphate-0.25g, Potassium di-hydrogen phosphate -5.00g, Potassium nitrate-10.00g, Potato starch-10.00g, Sucrose-50.00g, Distilled water-1000.00ml) was taken as the basal medium. The carbon and nitrogen nutrition was studied by replacing the sucrose and potassium nitrate in the basal medium with various carbon and nitrogen compounds.

Six different carbon sources viz., fructose, glucose, lactose, maltose mannitol and sucrose were incorporating into Richard's liquid basal medium. Potassium nitrate was added as a source of nitrogen in all the treatments. Carbon sources were added to the basal medium @ 21.053 grams of carbon per liter of medium. Ammonium nitrate, Aspartic acid, L-Asparagine, L-Proline, Potassium nitrate and Ammonium nitrate were used as different nitrogen sources and incorporated into Richard's liquid medium @ of 1.3855 grams of nitrogen per liter of the medium. In control, no nitrogen source was added. Sucrose was used as source of carbon in all the treatments. Twenty-five milliliter of each medium was poured into 100ml flasks, plugged with non-absorbent cotton and autoclaved at 121°C (15psi pressure) for 20 minutes. Each of the treatments was replicated four times. All the flasks were aseptically inoculated with 5mm fungal discs from an actively growing zone of seven day old culture. Inoculated flasks were incubated at room temperature (27±1°C) for ten days. The fungal mycelial mat was filtered

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through Whatman No. 42 filter paper and the dry mycelial weight was recorded after drying it in hot air oven maintained at 60°C for 24 hours. The data thus recorded was statistically analyzed.

RESULTS

Carbon is the most important and an essential structural component of framework of the fungal cell. Fungi exhibit carbon heterotrophy and obtain their carbon requirement mainly from various organic sources and the nature of the organism largely determines the range of substrates [10,11]. Its requirement and utilization by *C.gloeosporioides* was studied with six different carbon sources using Richard's broth as the basal medium and the data is presented in Table 1 and Figure 1.

In the present study the pathogen varied in its ability to utilize different carbon sources. There were significant differences in the growth of *C.gloeosporioides* in various carbon sources. Mannitol gave maximum mean dry mycelial weight of the fungus (644.67mg) which was followed by fructose (552.33mg) and sucrose (506.67mg). Glucose, lactose and maltose follow it with mean dry mycelial weight of 471.67mg, 390.67mg and 430.33mg respectively, which were significantly superior over the control (135mg). The sporulation was heavy in the treatment where maltose was used as the carbon source. Fructose and lactose showed moderate sporulation. There was no sporulation in mannitol and control treatment.

Table 1: Effect on growth and sporulation of *Colletotrichum gloeosporioides* on different carbon sources

Treatments	Dry weight (mg)	Sporulation
Fructose	552.33	++
Glucose	471.67	+
Lactose	390.67	++
Maltose	430.33	+++
Mannitol	644.67	-
Sucrose	506.67	+
Control	135.00	-
S.Em.±	109.30	
C.D. 1%	325.40	

- : No sporulation
+ : Poor sporulation
++ : Moderate sporulation
+++ : Good sporulation

Nitrogen is an important component required for protein synthesis and other vital functions. Its requirement by *C.gloeosporioides* was studied using different sources and the results are presented in Table 2 and Figure 2.

The study revealed that maximum growth of *C.gloeosporioides* was in Richard's broth where ammonium nitrate (553.67 mg) was used as the nitrogen source. This was on par with potassium nitrate (550.67 mg), sodium nitrate (535.33 mg) and proline (521.00 mg). The minimum dry mycelial weight of fungus was in asparagine (351.33 mg). The Table 2 also indicates

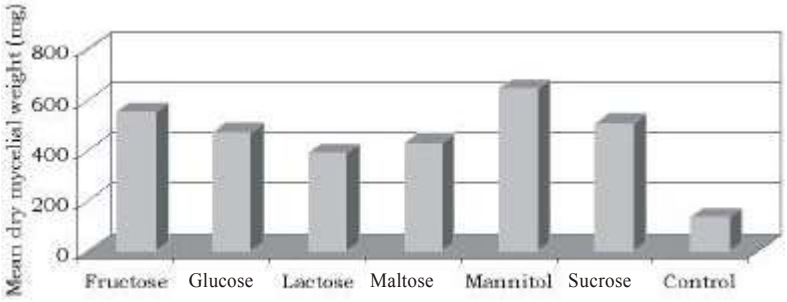

Fig. 1: Effect of different carbon sources on growth of Colletotrichum gloeosporioides

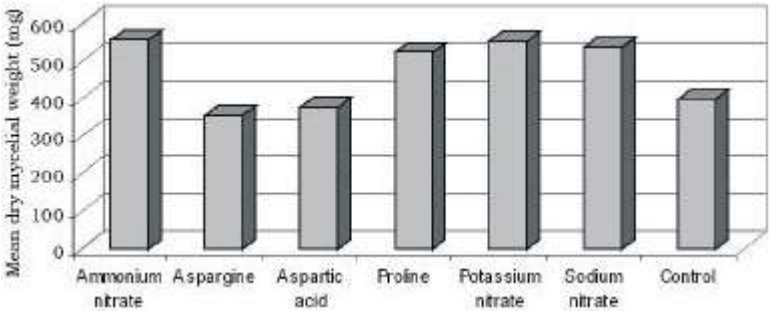

Fig. 2: Effect of different nitrogen sources on growth of Colletotrichum gloeosporioides

Table 2: Effect on growth and sporulation of *Colletotrichum gloeosporioides* on different nitrogen sources

Nitrogen sources	Dry mycelial weight (mg)	Sporulation
Ammonium nitrate	553.67	+
Asparagine	351.33	-
Aspartic acid	374.67	+
Proline	521.00	++
Potassium nitrate	550.67	++
Sodium nitrate	535.33	+++
Control	397.67	++
S.E.m.±	86.48	
C.D. 1%	257.44	

- : No sporulation
+ : Poor sporulation
++ : Moderate sporulation
+++ : Good sporulation

that sporulation was heavy where sodium nitrate was used as the nitrogen source. Proline, potassium nitrate and control (without any nitrogen source) showed moderate sporulation. Sporulation was not observed where asparagine was used as the nitrogen source.

DISCUSSION

The pathogen varied in its ability to utilize different carbon sources. The isolate showed much similarity with those from elsewhere. Similar reports of good growth of *C.gloeosporioides* where mannitol was used as carbon sources were by Chaturvedi [12] and Reddy [13] which is in conformity to the present studies. But sucrose was found to be the best source of carbon for growth of *C.gloeosporioides* by Durairaj [14], Naik [15] and Saxena [16] but these workers have not used mannitol as a source of carbon in their studies. Contradictory result of poor development on mannitol has also been reported [17]. Chaturvedi [12] reported good sporulation of *C.gloeosporioides* the incitant of leaf spot of *Polyscias baljuriana* in glucose, fructose, maltose and starch.

Nitrate compounds are excellet nitrogen sources for imperfect fungi and also ascomycetes [11]. *C.gloeosporioides* of mango utilized potassium nitrate more efficiently and ammonium nitrate less efficiently for growth and sporulation as reported by Ekbote [18] which is contradictory to the present findings. Naik [15] and Saxena [16] reported potassium nitrate as the best source for growth and sporulation of *C.gloeosporioides* isolated from betel vine and pomegranate, respectively.

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