Effect of Leaf Extract as a Natural Additive in Culture Medium to Optimize Growth of *Chaetomium indicum*

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Introduction:

Chaetomium indicum Corda, is the widely found species of the Genus *Chaetomium*, which is known for its cellulose degrading ability. It grows vigorously on the cellulose containing media. During our explorations, the leaf litter of bamboo was most often seen to be colonized and degraded by *Chaetomium* species. Consisting of 60-70% of cellulose, 20-30% of lignin and hemicelluloses, bamboo leaves are considered as rich source of nutrients (Tomalang F.N., May 28-30,1980). Hence in some countries, bamboo leaves are also used as prime source of fodder for the livestock (Coffie G.Y., 2014). Since the cellulolytic bacteria present in the rumen of the cattle make them easier to digest the cellulose containing fodder. This gives us the idea that bamboo leaves could have the ability to provide rich source of cellulose for the growth of the cellulolytic fungi.

Natural extracts were frequently found to be the growth stimulants for the fungi (Basu, 1947). In present study, the effectiveness of bamboo leaf extract, as a natural source of cellulose, for the growth of *C. indicum* species is studied.

Material and Methods:

Chaetomium indicum : The strain used was isolated from the half degraded leaf litter of forest floors of Pachmari biosphere and was maintained on a piece of filter paper immersed in the Czapek- Dox liquid media supplemented with Carboxyl methyl cellulose (0.5%).

The basal medium contained, Sodium Nitrite ($NaNO_3$) 2g; Potassium Phosphate (KH_2PO_4) 1g; Potassium Chloride (KCL) 0.5g; Magnesium Sulphate ($MgSO_4.7H_2O$) 0.5g; Ferric Chloride ($FeSO_4.7H_2O$) 0.01g in 1litre of distilled water, for solid media Agar 15g/l.

Preparation of leaf extract as a Substrate additive to the culture medium -

Dried leaves were used to prepare the extracts instead of fresh green leaves, since the phytochemicals present in the bamboo eaves are not significantly affected by the drying of leaves (Coffie G.Y., 2014). The clean dried leaves of bamboo are crushed to small pieces. 2 g of these leaves were boiled in 100 ml of distilled water and are autoclaved at 15 lb for 15 min. at least thrice to get a clear reddish brown extract. The supernatant was filtered and stored in refrigerator.

Initially experiment was set up as preliminary test to check the effectiveness of bamboo leaf extract (BLE) on the growth of the *C. indicum*. The plates were inoculated in duplicates initially taking the basal media mentioned above, along with the control and the complimentary plate containing 1 ml of BLE.

To study Optimum concentration of bamboo leaf extract for the growth of *C. indicum*.

On the basis of results of preliminary set, another experiment was set up to study the optimum concentration of BLE for the growth of *C. indicum* strain. For this, different concentrations of BLE, ranging from 2% to 10% were prepared by the method given above and plates were inoculated with the same strain of *C. indicum* on the optimum media (resulted from preliminary set) supplemented with 1ml of each concentration of BLE prepared earlier. The plates were kept at room temperature 27°C ± 2°C, observations were made after 7 and 15 days of inoculation.

Results:

Effect of Bamboo leaf extract on growth of *C. indicum*: The results obtained by the preliminary sets (Table 1), showed that the colony growth is enhanced by the bamboo leaf extract along with the CMC. On the other hand, both, either CMC or BLE alone could not enhance the colony growth as well as it is enhanced by their combined effect. Comparing the individual effect of CMC and BLE, superiority of bamboo leaf extract over CMC is observed, but the colony character has changed to irregular edges from smooth and even edges.

To study Optimum concentration of bamboo leaf extract for the growth of *C. indicum:* Results of the second experimental set were evaluated to find out the optimum concentration of bamboo extract for the growth. It shows the significant increase in the growth with the increase in concentration of bamboo extract in the media, at 6% concentration the growth rate has dropped down and remained constant even after 15th day. Same constancy was observed with fruiting frequency. Maximum amount of fruiting is recorded at 4% concentration at earliest on 7th day. The growth curve has again taken a leap at 8% and at 10% concentration of BLE it has slowed down again (plate 1 Table 2). Comparing the colony characters, the plate with concentration of 8%, showed the promising growth of the colony with luxuriant fruiting after 7 days and 15 days.

Table. 2-Effect of percent concentration of Bamboo leaf extract on colony characters and growth of *C. indicum*

Concent-ration Of BLE.	No. of days	Colony diameter in cm			average	Fruiting frequency
		plate1	plate 2	plate 3		
2%	7 days	2.5	1.2	-	1.85	-
	15 days	2.8	1.5	-	2.15	+
4%	7days	2.5	2.2	2.5	2.4	+
	15 days	2.5	2.5	2.8	2.6	+++
6%	7days	2.1	2.4	-	2.25	++
	15days	2.1	2.4	-	2.25	++
8%	7 days	2.8	2.5	2.5	2.6	+
	15 days	3	2.7	2.5	2.73	+++
10%	7 days	2.8	2.7	1.7	2.4	+
	15 days	2.8	2.7	2.1		++

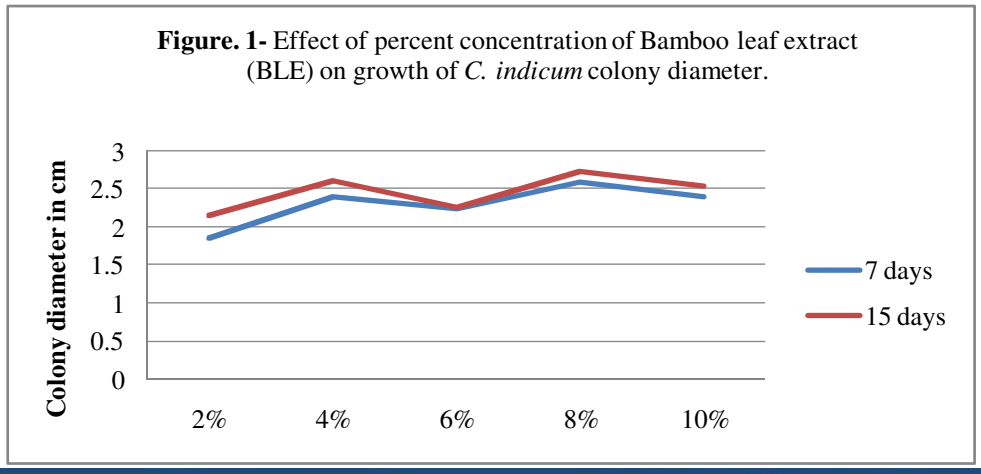

Figure. 1- Effect of percent concentration of Bamboo leaf extract (BLE) on growth of *C. indicum* colony diameter.

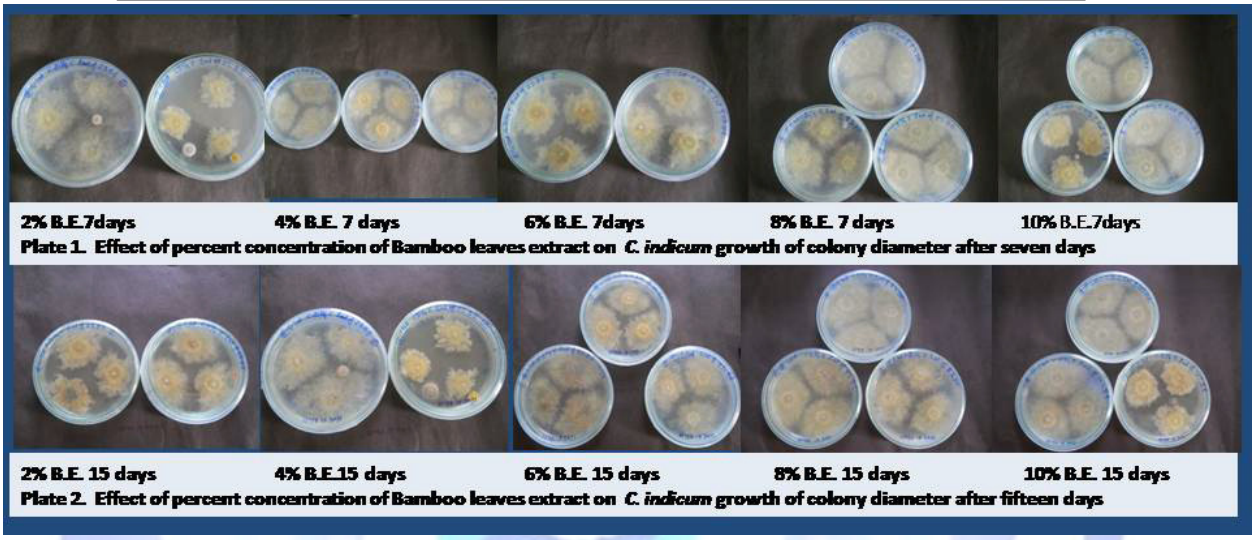

Figure. 2

Discussion:

In the present study combined effect of CMC and BLE on the growth of *C. indicum*, both are providing the complex sugars for the metabolism, which are seemed to be favoring the growth and the fruiting in the fungi (Table 1 and 2). Basu, 1947 observed that low concentration of hexose sugars in the medium whether initially provided or produced by prolonged incubation has been associated with fruiting. McDonough 1960, suggested that vigour of fruiting was apparently connected with the presence of organic phosphates in the media. Buston in 1951, also reported that hexose phosphates are involved in the fruiting.

Apart from the carbohydrates, nitrogenous compounds also playes a vital role in the growth of the fungi. Choudhary, 1975 tested 31 nitrogen sources with *C.aureum* for their ability to induce perithecial formation. He observed the superiority of sodium nitrate to the other nitrogen sources at different temperatures. Hawker, 1942 stated that in a wide range of fungi, fruiting and growth depands upon a balance between the concentration of carbohydrates and vitamine B_1. Considering the effect of BLE on the growth of *C. indicum*, bamboo leaf extract is a cheap natural substrate is capable to provide extra sugars and nitrogen to the fungi, but whether the actual "Growth and Fruiting Factor" lies in the BLE or

in the synergy of CMC and BLE, this still needs further investigations to be clear, At 4% concentration of leaf extract fruiting is recorded maximum this fact might be correlated with stress induced fruiting. Eight percent concentration of leaf extract showed the promising growth of the colony with luxuriant fruiting after 7 days and 15 days.

References:

McDonough, B., M. (1960). The influenc of certain simple Nitrogenous compounds on growth and sporulation of Chaetomium globosum. *Annals of Botany, 24*(96), 475-481.

Basu, B. H. (1947). Some Factores Affecting the Growth and Sporulation of Chaetomium globosum and Memnoniella echinata. *Journal of General Microbiology,, 2*(2), 162-173.

Choudhary, G. B. (1975). Comparative studies on the Role of Nitrogenous Compounds in the gGrowth and Perithecial Development of Chaetomium aureum. *Folia Microbiol., 20*, 157-165.

Coffie G.Y., C.-B. (2014). Phytohemical constituents o fthe three bamboo species (Poeceae) in Ghana. *Journal of Phytochemistry and Pharmacognosy 2 (6)*, 34-38.

J.King, B. H. (1951). Further observations on the Sporulation of Chaetomium globosum. *Journal of General Microbiology, 5*, 766-771.

L.E.Hawker. (1942). The Effect of Vitamin B1 on the Concentration of Glucose Optimal for the Fruiting of certain Fungi. *Annals of Botany, 6*(24), 631-636.

Tomalang F.N., A. S. (May 28-30,1980). Properties and utilization of Philippine erect bamboo. *International seminar on bamboo research in Asia, Singapore, proceedings edited by*, 266-275.