ISOLATION OF FUNGI FROM BLIGHT AFFECTED BAMBOOS IN BANGLADESH[1]

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Bamboo blight causing severe mortality, particularly of young culms, in the village groves of Rajshahi district of Bangladesh is reported. A brief history of the outbreak of the disease is noted. A review of bamboo diseases is provided. Symptoms and observed mode of infections are recorded. Four fungi have been isolated from diseased bamboo samples. The pattern of isolation strongly suggests that *Coniothyrium fuckelii* Sacc. is responsible for the blight.

রাজশাহী জেলার গ্রামাঞ্চলের বাঁশবনের বিশেষ করিয়া নতুন চারার মারাত্মক মড়ক সৃষ্টিকারী ব্লাইট সম্পর্কে এই নিবন্ধে বিবরণ দেওয়া হইয়াছে। এই রোগের প্রাদুর্ভাবের সংক্ষিপ্ত ইতিহাস লিপিবদ্ধ করা ছাড়াও রোগের লক্ষণ ও সংক্রমণের সম্ভাব্য প্রণালী সম্পর্কেও আলোচনা করা হইয়াছে। রোগাক্রান্ত বাঁশের নমুনা হইতে চারি প্রকারের ছত্রক পৃথক করা হইয়াছে। পৃথকীকরনের ধরণ হইতে সুস্পষ্ট ভাবে এই ইঙ্গিত পাওয়া যায় যে উল্লেখিত রোগের জন্য 'কনিওথাইরিয়াম ফুকলি' ছত্রকই প্রধানতঃ দায়ী।

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INTRODUCTION

Bamboo is an important economic crop. It is widely used for domestic purposes. In paper and rayon industries it serves as one of the important raw materials. There are two distinct groups of bamboos, one growing in the forest areas, commonly *Melocanna bambusoides* Trin, and the other is cultivated in the rural areas, mainly *Bambusa balcooa* Roxb, *B. vulgaris* Scrad, *B. nutans* Wall and *Cephalostachyum pergracile* Munro (Kurz).

A blight of village grown bamboos was noticed in some parts of Chapai Nawabganj Sub-Division of Rajshahi district of Bangladesh during 1960-61 (Zaman 1976). The disease spread with time and by 1970-71 took a serious turn and was reported in the press. To a lesser extent a similar disease of bamboo has been observed in the village groves of Pabna, Mymensingh, Sylhet, Comilla, Chittagong and Khulna.

Observations over large areas of Chapai Nawabganj Sub-division revealed that the mortality had been severe on *Bambusa balcooa*, the predominent species in the area, and moderate on *B. vulgaris*. The Incidence of mortality in the affected clumps was observed to be upto 80 percent of new culms (Fig. 1).

A study was, therefore, undertaken to find out the cause of the blight and to devise suitable control measures before the disease spread in an epedemic form all over the country. The present paper reports observation on the symptoms of disease-development, results of isolation and identification.

REVIEW OF LITERATURE

A critical review of literature does not reveal any report of blight of *Bambusa balcooa* anywhere in the world. Banerjee and Ghosh (1942) noted 31 species of basidiomycetes on dead bamboo of which seven types such as *Polyporus durus, P. friabilis, Ganoderma lucidus, Amauroderma rugusus, Trametes Persooni, Merulius similis* and *Stereum percome* were also found on living bamboo.

Banerjee and Mukhopadhyay (1962) reported *Merulis similis*, a rhiznme rot of *Bambusa bamboos* in Calcutta and suburbs. They recorded highest Incidence in August near ponds and in shade.

Lo, Chen and Huang (1966) reported *Erwinia sinoclami* wilt of edible shoots and clums of Taiwan giant bamboo, *Sinoclamus latiflorus*, in Taiwan.

Beradze (1972) recorded ten fungi associated with disease of bamboo leaves in Soviet Georgia.

Thirumalachar and Pavgi (1950) reported a shooty stripe disease of Bambusa in India caused by a fungus *Papularia arundis*.

Gibson (1975) reported isolation of fungi from a small number of blighted bamboo culms collected from Rajshahi and Sylhet region of Bangladesh He isolated *Coniothyrium fuchelii* Sacc. (from Rajshahi and Sylhet), *Fusarium moniliformae* Sheld. and *F. equiseti* (Corda) Sacc. (both from Rajshahi).

MATERIALS AND METHODS

Diseased very young culms and partially older culms were collected from

a large area of Rahanpur under Chapal Nawabganj Sub-division. A wound dressing fungicide, Santar, was then applied on cut ends to avoid secondary infections. These were then dried in shade, packed with provision for gaseous exchange to avoid rise in humidity and transported to Chittagong.

Fungi were isolated from diseased (A) culm sheaths ; (B) two-month old (younger) culm ; (C) fourteen-month old (older) culm ; (D) fruit bodies developed on dead culm sheath ; (E) fruit bodies developed on diseased younger culm on incubation in the laboratory ; (F) raised spore receptacles on dead portions of dying culms ; (G) white mycelial growth present in the central hollow of dead and dying portion of infected culms ; (H) white mycelial growth from pieces of culm having transition zone of infection on incubation in a humid chamber ; and (I) white mycelial growth developed from infected branches on incubation in a humid chamber.

In isolating fungi from samples of types A, B and C, small piecess of specimens of advancing zone of infection were cut, washed thoroughly in water, surface sterilized for 2 to 3 minutes in 0 35 percent sodium hypochlorite (NaOCl), washed in sterile distilled water, surface dried between sterile blotting paper and aseptically transferred onto potato sucrose agar (PSA) Bacterial contaminations were largely avoided by incorporating 1.3 mg streptomycin and 3 mg penicillin per 100 ml medium just before pouring plates at about 40°—50°C. The plates were incubated in darkness at 25°—27°C and examined periodically for upto ten days. Pure cultures were transferred to test tubes containing PSA medium. Fruit bodies of sample D were removed from culm sheath, washed clean in distilled water, dipped in 0.35 percent NaOCl, water soaked off and plated onto PSA medium. In case of samples E and F spores were directly transferred onto PSA medium taking aseptic precautions. Similar direct isolations were carried out from mycelial growth of samples G, H and I. A limited number of rhizomes of dead and dying bamboos were dug up and split to examine the state of their health compared to healthy ones.

RESULTS

a) Symptoms and mode of infections : Mortality of small young culms, still covered by culm sheath, starts as a light brown discolouration of culm sheath from the edge. With the advance of infection on culm sheath, infection also spreads on young nodal bud and finally to the culm tissue proper. The death of culm tissue is characterised by a light brown discolouration and decay. As decay advances, a wet rot develops and ultimately the whole culm dies and drops down (Fig, 2); Small black blotches consistently and profusely develop on dead culm sheaths. Close examination reveals these to be pycnidia.

A second type of symptom appears on 3 to 4 month old culm. In that case die back develops from the tip of culm and branches and continues downward (Fig. 3). Infection is quite often seen to develop on the node and spreads both up down. Advancing zone of infection develops a well demarcated reddish orange

Fig. 1. Shows the extent of die back of young bamboos in a clump

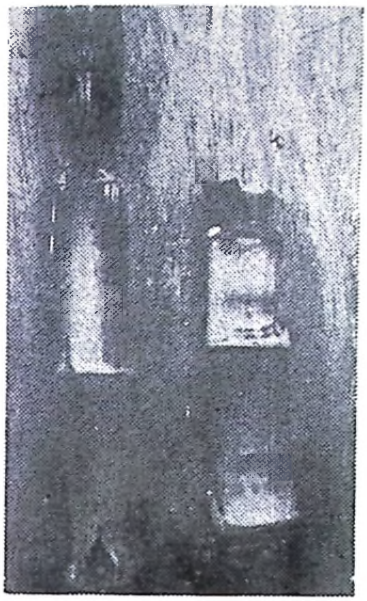

Fig. 2. Shows Portion of a young bamboo culm with advanced infection (black & rotten), advancing infection front; and both infected (black) and healthy (whitish) nodal buds.

Fig. 3. Shows a portion of older bamboo culm with dying culm and branches from top downward (dead portion white).

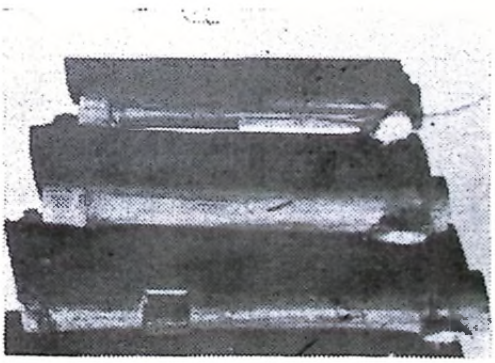

Fig. 4. Shows transition zone of advancing infection on 3-4 month old culms (distinct on smallest sample), and raised spore receptacles (black spots on dried portion of medium sample).

on the rind of the culm. Under the rind or cuticle the culm tissue turns reddish brown. The more advanced infected culm turns brownish grey and dries up. On such zone of infected culms both elongated and elliptical spore containing receptacles develop below the cuticle, and render the surface rough (Fig. 4). On close microscopic observation, the spore receptacles are revealed as stromata containing a number of ascocarps in which ascospores are developed. A white mycelial growth is generally found in the central hollow of infected portion of culm, but not found either in the healthy portion of infected culm or in healthy culm.

(b) Results of isolation : The results of isolation of fungi are given in Table 1.

Table 1. The details of fungal isolations from various types of inocula of diseased bamboo samples

Sample types	Number of samples	Number of inocula	Number of pure cultures	Types of fungi	Number of colony of each fungus
A	8	89	46	a	16
				b	24
				c	3
B	2	48	15	a	7
				b	8
C	8	139	139	a	135
				b	4
D	5	122	119	a	22
				d	97
E	3	22	22	a	22
F	2	37	37	a	37
G	2	6	6	a	6
H	16	75	69	a	52
				b	6
				c	11
I	13	X	13	a	4
				b	8
				c	1

From culm sheath and mycelial growth both from the transition zone and that developed from incubated branches, all these types of fungi were isolated. From the raised spore receptacles, the fruit bodies on dead culm sheaths and mycelial growth in the central hollows only one type of fungus was isolated while from the others two types of fungi were isolated.

From Table 1 it is apparent that 55.4 percent of fungal isolates yielded fungus type a as against 13.8 percent of type b, 26 7 percent of type d and 4.1 percent type c. Fungus type a was consistently isolated from all the nine types of sample, on the other hand fungus type b was isolated from five types of sample along with fungus type a. Fungus type d was isolated from one type of sample only whereas fungus type c was isolated from three types of sample along with fungus types a and b. Fungus type a has been identified as *Coniothyrium fuckelii* Sacc. (Herb. IMI, No. 215744), type d as *Stachybotrys bisbi* (Sriniv) Barron (Herb. IMI, No. 213722) and type b as *Fusarium sp.* Fungus type c was extremely rare and, therefore, discarded. Examination of rhizomes revealed that while rhizomes of dying bamboos still remain healthy, those of dead ones are relatively dried.

DISCUSSION

From the literatures reviewed it is apparent that blight on *Bambusa balcooa* has not been reported earlier. Banerjee and Mukhopadhyay (1962) noted rhizome rot on *Bambusa bamboos*, but in the present case field observations reveals that rhizome of dying bamboos are not rotten. Moreover, the clear transition zone of advancing infection, characteristic of fungal infection, and constant association of fungi remove the possibility of a bacterial pathogen for the disease as reported by Lo, Chen and Huang (1966) on Taiwan giant bamboo.

Gibson (1975) isolated fungi from a small number of blighted bamboo samples and advocated the necessity for further isolations from freshly collected diseased culms from different regions to determine those fungal species which are most frequently and widely associated with early expression of the blight condition. In the present study fungi have been isolated from 59 samples of blight affected bamboos collected over a large area and *Coniothyrium fuckelii* has been most commonly isolated along with lower proportion of *Fusarium* sp. *Stachybotrys baisbi* has been isolated only from the fruit bodies developed on dead culm sheath but not from advancing zone of infection on culm sheath from which *C. Fuckelii* and *Fusarium* sp. have been isolated. The overall pattern of isolation while confirms Gibson's (1975) isolation further strongly supports the view that *C. fuckelii* is most likely responsible for the blight of *Bambusa balcooa*. The pathogenicity test of these fungi is under investigation, which on completion will definitely establish the pathogen and will be reported later.

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