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Investigation into leaf blight of Palas (*Butea monosperma*) and its control

M.S. Ullah, M.R. Islam, N. Akter, Q.Y Akther, M.T. Islam and G.M. M. Rahman[1].
Department of Plant Pathology, [1]Department of Agroforestry, Bangladesh Agricultural University, Mymensingh -2202

Abstract: Prevalence of leaf blight of palash trees was studied in different plantation areas under two selected major locations of the country during December 2007-April 2008. The disease varied with respect to plantation areas, types of plantations and age of the plants. All the plants of several locations were found severely infected by the disease. In general, mixed plantations of palash trees were found less affected by the disease followed by scattered and solid plantations. Similarly, older plants were severely infected compared to younger ones. Leaf blight symptoms observed on palash trees was characterized by small, irregular, light brown spot on the edge of the leaf blade of young leaves extending to [1]/3rd portions of leaf blade. *Colletotrichum gloeosporioides* was consistently isolated from affected plant parts (leaves) which was subsequently confirmed as the cause of the disease through pathogenicity test. *In vitro* screening with fungicides and plant extracts showed that Rovral WP and Bavistin totally inhibited the mycelial growth of *C. gloeosporioides* at 2000 and 3000 ppm. Cupravit and Dithane M-45 also completely inhibited fungal growth at 3000 ppm. Plant extracts *viz., Allium sativum* and *Azadirachta indica* totally inhibited mycelial growth of *C. gloeosporioides* at 1:2 dilution ratio. *Eucalyptus citriodora* was also found effective at higher dilution.
Key word: Leaf blight, palash, control *Colletotrichum gloeosporioides*

Introduction

Butea monosperma is an important lac-host plant all over the world. This is a dry deciduous forest tree. This tree is commonly known as 'Palash' in Bangladesh. Palash is used as fibre, fodder or dye (Patil *et al*., 2006). *Butea monosperma* is also employed in various indigenous systems of medicine against several diseases and almost every part of the plant has diversified medicinal properties. The seeds are used as anthelmintic, aperient, digesti and to treat piles, skin disease and abdominal troubles (Srivastave *et al.,* 2002). It grows on variety of soils including dry regions also. As a deciduous tree, it adds large amount of organic matter into the soil that increase both productivity and fertility of the cultivated lands. No work has been done on leaf blight of palash in the country. In Bangladesh, apparently no research work has yet been taken to investigate the problem. Considering this fact an elaborate study was undertaken to record the prevalence of the disease and to identify the cause of the disease along with the control measures.

Materials and Methods

Survey on the severity of leaf blight of palash: Survey was made at different plantation areas in different locations of Mymensingh and Narsingdi districts. During survey, occurrence of leaf blight disease and its intensity were recorded in 12 different plantation areas of which five located at the Bangladesh Agricultural University (BAU) Campus, Mymensingh; one at Brahmaputra bridge to Shambhugonj roadside areas, Mymensingh, three at Raipura, Narsingdi and three at Belabo areas, Narsingdi. The details of major locations, sub-locations and individual plantation areas, and number of plants surveyed are given in (Table 1). During survey, variation in the prevalence of leaf blight as affected by the types of plantation was also recorded. For this purpose three types of plantations were selected such as (i) solid plantation of palash trees-where exclusively palash is grown (ii) mixed plantation of palash with Mahogoni, Jackfruti, Acacia, Mango, Citrus, Guava etc. and (iii) Scattered plantation of palash where palash trees are grown in scattered fashion having no other species in the close vicinity were considered. For the survey of leaf blight prevalence in solid, mixed and scattered plantation areas, a total of 19 individual plantation areas were selected. Three age groups such as 1- 6 years, 7-15 years and above 15 years were considered to findout relationship between disease severity and age of plants.

Table 1. Palash plantations surveyed to observe the leaf blight severity in different locations of the country

Major location	Sub-location	Individual plantation area	Total number of plants surveyed	Types of plantation
Mymensingh	BAU Campus	BAU-1: Garden of K.B. School.	6	Solid plantation
		BAU-2: Garden at the close vicinity of the Veterinary Faculty.	3	″
		BAU-3: Garden behind of Hossain Shahid Sharawardi Hall.	8	Scattered
		BAU-4: Garden beside Shahid Minar, BAU, Mymensingh.	5	″
		BAU-5: Botanical garden of BAU, Mymensingh.	10	″
	Shambhugonj	Shambhugonj: Roadside garden	20	Solid plantation
	Raipura	Raipura -1: Garden of Hafizul Islam	13	″
		Raipura -2: Garden of Nur-e-Rahim	20	″
		Raipura -3: Garden Of Rumon Uddin	9	Mixed plantation
Narsingdi	Belabo	Belabo -1: Garden of Abu Khear	15	″
		Belabo -2: Garden of Liton Sarker	17	Scattered
		Belabo -3: Garden of Rafiqul Islam	10	″

Collection, isolation, purification and identification of causal organisms: Diseased leaves were collected from the infected plants representing the different areas of survey Isolation of causal organism was done by tissue planting method. The fungi which grew out of the inocula were transferred to fresh culture plates from where sub-cultures were made into PDA plates by hyphal tip method. The fungus was identified by observing colony characters, linear growth, colour and sporulation (Arx, 1970; Kulshrestha *et al*., 1976; Sutton, 1980). Comparative efficacies of four fungicides viz Rovral WP, Cupravit, Bavistin and Dithane M-45 against leaf blight pathogen were determined in the laboratory. Following the poisoned food technique as designed by Nene and Thaplyal (1979).

In vitro evaluation of plant extracts: Six plant samples viz *Tagetes erecta, Zigniber officinale, Azadirachta indica, A. Cathertica, Eucalyptus citriodora, Allium sativum,* were collected from different areas of Bangladesh Agricultural University Campus which were used in this study against *Colletotrichum gloeosporioides*.

Results and Discussion

The prevalence of leaf blight of palash trees studied in different plantation areas at two major selected locations were found to vary depending on the plantations areas, types of plantations and age of the plants. In the present investigation, the highest average leaf blight disease severity (42.24%) was observed in Raipura out of 12 different plantation areas of this study (Table 2).

Table 2. Prevalence of leaf blight of palash in 12 different plantation areas in the two major locations of the country

Major location	Sub-location	Idividual plantation area	Total no. of plants	% Plant infected	Disease severity (%)	Average disease severity at sub-location (%)
Mymensingh	BAU	BAU-1	6	83.33	30.00	30.05
	Campus	BAU-2	3	100.00	33.35	
		BAU-3	8	62.50	41.5	
		BAU-4	5	80.00	25.65	
		BAU-5	10	100.00	19.75	
Narsingdi		Shambhugonj	20	100	35.25	35.25
	Shambhug	Raipura-1	13	76.92	41.12	38.90
	onj	Raipura-2	20	85	48.28	
	Raipura	Raipura-3	9	36.67	27.31	
		Belabo-1	15	33.33	23.75	38.25
		Belabo-2	17	82.35	27.89	
	Belabo	Belabo-3	10	20	33.11	

In case types of plantations the highest average percentage disease severity (44.7%) was recorded in solid plantations of Raipura followed by 30.5% severity of the disease in the scattered plantations of Belabo; while the mixed plantation had 27.31% severity of the disease. Similarly, in an average 36.68%, 28.25% and 42.24% disease severity were found at the same location in 1-6, 7-15 and above 15 years age group, respectively (Table 3). Miah and Fakir (1988) investigated the cause of die-back of *Citrus* spp. in Bangladesh where they also reported varying degree of prevalence of citrus dieback in different locations of the country. *Colletotrichum gloeosporioides, Botryodiplodia theobromae, Fusarium solani, Macrophoma montegazziana* and *Pestalotia* sp. were found to be associated with the disease.

Isolation, purification and identifications of causal organism: One fungal organism was consistently found to grow out of the inocula prepared from diseased parts (leaves) of palash. Sub-culture of the fungus was made on PDA for purification. After hyphal tip transfer to PDA separately the fungus was identified as *Colletotrichum gloeosporioides* based on growth characteristics and also by observing the prepared microscopic slides. Both the fungi growing out from leaf tissues were same. The mycelium was white and growth was slow upto 2 days, after 6 days, when the fungus covers the whole 9 cm diameter PDA plates, the colour of the mycelium remained white. The growth of the mycelium was fluffy. Alternate rings of raised and depressed areas on the surface of the culture was observed where acervuli and conidia formed. Conidia hyaline, in mass, oval or elliptical, straight, 1-celled. Condiophore was hyaline, elongated, setae were black and erumpment. The cause of leaf blight of polash was not investigated earlier. However, different authors reported *Colletotrichum gloeosporioides* as the cause of dieback of a no. of timber and fruit trees (Singh *et al*., 1967; Chandromohanan *et al*., 1987; Miah and Fakir,1988). *In vitro* screening of 4 fungicides viz. Cupravit, Bavistin, Rovral WP and Dithane M-45 showed that Bavistin and Rorval WP completely inhibited the mycelial growth of the fungus at 2000 and 3000 ppm. Cupravit totally inhibited the mycelial growth at 3000 ppm, but Dithane M-45 could not inhibit growth of the fungus even at higher concentrations (Table 4). *In vitro* screening of 6 plant extracts viz. *Allium sativum, Zingiber officinale, Azadirachta indica, Eucalyptus citriodora Allamanda cathertica*, and *Tagetes erecta* showed that *A. sativum* and *Azadirachta indica* totally inhibited the mycelial growth at 1:2 dilution. *Eucalyptus citriodora* was also found effective against the fungus *Zingiber officinale, Tagetes erecta* and *Allamanda cathertica* were ineffective in arresting the mycelial growth (Table 5).

Table 3. Prevalence of leaf blight of palash in Types of plantations and different age groups at different plantations areas of the country

Plantation areas	Types of plantation	% plant infected	Disease severity (%)	Av. disease severity at sub-location (%)	Plantation areas	Age group (in years)	% plant infec-ted	Disease severity (%)	Av. Disease severity at sub-location (%)
BAU-1	Solid	83.33	30.00	31.67	Paratali - 1	1-6	57.14	45.13	36.68
BAU-2	"	100.00	33.35		Paratali - 2	"	50.00	38.26	
Shambhu-gonj	"	100.00	35.25	35.25	Paratali - 3	"	42.86	26.66	
Raipura-1	"	76.92	41.12	44.7	Raipura - 4	"	35.29	31.35	29.3
Raipura-2	"	85.00	48.28		Raipura - 5	"	31.25	29.25	
					Raipura – 6	"	26.67	27.28	
Raipura – 3	Mixed	36.67	27.31	27.31	BAU- 1	7-15	83.33	30.0	24.87
					BAU- 5	"	100.0	19.75	
Belabo – 1	"	33.33	23.75	23.75					
					Belabo- 1	"	33.33	23.75	28.25
					Belabo- 2	"	82.35	27.89	
					Belabo- 3	"	20.0	33.11	
BAU-3	Scattered	62.50	41.5	28.97	BAU- 2	>15	100	33.35	33.5
BAU-4	"	80.00	25.65		BAU- 3	"	62.5	41.5	
BAU-5	"	100.00	19.75		BAU- 4	"	80	25.65	
Belabo-2	"	82.35	27.89	30.5	Shambhugonj	"	100	35.25	35.25
Belabo-3	"	20.00	33.11						
					Raipura- 1	"	6.92	41.12	42.24
					Raipura- 2	"	85.0	48.28	
					Raipura- 3	"	66.67	37.31	

Table 4. Comparative efficacy of four fungicides at different concentrations inhibiting the mycelial growth of *Colletotrichum gloeosporioides* after 7 days incubation at 28°C

Fungicides	Diameter (mm) of linear growth			
	500 ppm	1000 pmm	2000 ppm	3000 ppm
Rovral WP	8.0 (91.11%)	3.0 (96.67%)	0.0(100.00%)	0.0(100.00%)
Cupravit	13.0 (85.56%)	10.0 (88.89%)	3.0 (96.67%)	0.0(100.00%)
Bavistin	4.0 (95.56%)	2.0 (97.78%)	0.0 (100.00%)	0.0 (100.00%)
Dithane M-45	45.0 (50.00%)	30.0 (66.67%)	15.0 (83.33%)	12.0 (86.67%)
Control			90.00	

Data in parentheses indicate percentage of decrease in mycelial growth over control.

Table 5. Percent growth inhibition of Colletotrichum gloeosporioides by plant extracts using poisoned food technique

Plant extracts	**Mycelial growth percentage at different dilution of extracts (in cm)**		
	1:2	1:4	1:8
Tagetes erecta	40.0 (44.44%)*	20.0 (22.22%)	18.0 (20%)
Zingiber officinale	45.0 (50%)	35.0 (38.89%)	18.0 (20%)
Azadirachta indica	0.0 (100%)	54.0 (60%)	48.0 (53.33%)
Allamanda cathertica	63.0 (70%)	42.0 (46.67%)	36.0 (40%)
Eucalyptus citriodora	65.0 (72.22%)	60.0 (66.67%)	57.0 (63.33%)
Allium sativum	0.0 (100%)	75.0 (83.33%)	61.0 (67.78%)
Growth in control (mm)		90	

Figures as this parentheses were % of mycelial inhibition. Mycelial inhibition percentages were calculated on the basis of fungus growth in controlled plate incubated at 25°C ± 2 after 7 days of incubation.

No report on controlling leaf blight of polash was available in the country. But in vitro screening of fungicides against *C. gloeosporioides* showed that Rovral WP, Topsin-M, Cupravit and Bavistin successfully controlled the fungus (Miah and Khan ,1986; Das *et al*., 1988).

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