J. Mycopathol. Res. **40**(2) : 97–100 (2002)

Studies on diseases of banana (*Musa paradisiaca* L) in West Bengal

D. K. MISRA

Department of Plant Pathology, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Kalyani 741235, West Bengal

Survey work on banana showed that the major diseases in West Bengal are sigatoka leaf spot and Panama wilt. Sigatoka was the most important disease of the crop and caused a considerable loss of yield. The diseases prevalent in all orchards were surveyed throughout the state. Dwarf cavendish (AAA) and Martaman (AAB) the two widely grown cultivars were recorded to be highly susceptible while Atia, a cultivar (with edible seed) popular in North Bengal showed resistance reaction against the disease. Panama wilt also found to be a serious disease in some orchards where commercial cultivation of the crop increased rapidly with high yielding cultivars, which ultimatey cause economic loss.

Key words : Banana, diseases, West Bengal

INTRODUCTION

Banana is probably the most important fruit crop in West Bengal and its cultivation is widely distributed in all the districts. In recent years as commercial cultivation of the crop increases rapidly, attack of different types of diseases also become a serious problem, finally causing economic loss of the crop. Elangvan *et al.* (1990) reported from Tamil Nadu that the occurrence of Panama and sigatoka leaf spot along with *Erwinia* tip over, infectious chlorosis and bunchy top with a mean incidence of 25.9, 26.6, 10.9, 13.4 and 4.8% respectively. It has been observed that there are much varietal differences among the cultivars against disease reactions. Babylatha *et al.* (1990) screened 84 cultivars for tolerance to leaf spot and rhizome weevil among which the Pisang Litin, Sanna chenkadali and Tongat are found highly tolerent. There is no available informations about disease situation in the state. In this context, to assess the disease scenario of banana in West Bengal a survey programme was conducted in two consecutive years.

MATERIALS AND METHODS

Six districts of West Bengal were taken into consideration to assess diseases of banana. These included Coochbehar, Jalpaiguri, Darjeeling, Nadia, 24 Pgs(North) and Hooghly, belonging to different agro-climatic zones of the state. Survey works were conducted during June-July of two successive years—2000 and 2001. Cultivars grown in different orchards were—Martaman, Dwarf cavendish, Champa, Chini Champa, Atia (seeded), Malbogh, Gheeu Kela, Hanuman Jata, Monua and Hill Champa. Total of 53 orchards were surveyed distributed in 26 locations. Age of the plants ranges from 320 to 490 days.

Year round studies were also made in the Mondouri experimental farm of Bidhan Chandra Krishi Viswavidyalaya to assess the seasonal variations of different diseases of banana in fixed plot. For this purpose a newly introduced cultivar 'Martaman' (AAB) was taken. Old suckers of 30-40 days were planted in series at 15 days intervals from January to December, 2000. Scoring of different diseases were made as per cent disease incidence. To evaluate the importance of sigatoka leaf spot, severity of the disease was also calculated as per cent disease index (PDI) following 0-9 scale.

The degree of severity was calculated using the descriptive scale of Mayee and Datar (1986) :

Grade/ Scale	Disease reaction/Description
0	No visible symptoms on leaves
1	Small, visible sopts or stripes covering less than 1% leaf area
3	Small, yellow or brown lesions covering 1-10% leaf area
5	Lesions on leaves bigger covering 11-25% leaf area
7	Lesions enlarging and coalescing covering 26-50% area
9	Lesions coalescing covering 51% or more leaf area, drying of leaves.

$$PDI = \frac{\text{Sum of all numerical ratings}}{\text{Total numbers of observations x maximum disease grade}} \times 100$$

RESULTS AND DISCUSSION

Data recorded from different orchards are presented in the Table 1 as mean value. The diseases observed in the investigation were sigatoka leaf spot (C. O. *Cercospora musae*, perfect stage-*Mycospharella musicola*), panama wilt (*Fusarium oxysporum* f. sp. *cubense*), bunchy top (Banana virus – 1), anthracnose (*Colletotrichum musae*), rhizome rot (*Erwinia carotovora*), crown rot (*Fusarium pallidorosum, Verticillium* sp.) and leaf chlorosis (*cucumber mosaic virus*). Results showed that the sigatoka leaf spot was common in all the orchards surveyed though severity of the infection was highly variable among the cultivars. Dwarf cavendish and Martaman showed high susceptibility to the disease. Champa (poovan), Malbogh and Gheeu Kela were moderately susceptible ; Monua, Kanthali, Hanuman Jata and Hill Champa were moderately tolerant while Atia was recorded to be resistant against the leaf spot. Panama disease was severe in some orchards of Nadia district where plant damage reached upto 8.4%. Attack of anthracnose was comparatively more in Martaman and Malbogh (18% and 3.5% respectively). Rhizome rot or soft rot was the only bacterial disease recorded from few orchards and infection not exceeded 2.5%. Crown rot was noted from some ill managed old orchards only. Bunchy top and leaf chlorosis were observed in few plantations but not severe in any of the orchard surveyed.

In case of fixed plot survey, scoring of different diseases were made at every fortnight from Jan 2001 to Dec 2001. Results recorded roung the year were presented in the Table 2. The most important disease recorded as *Cercospora* leaf spot or

Table 1a : Survey on banana diseases in different districts of West Bengal.

Location in districts	Cultivars grown	Days after planting	Diseases recorded in different locations						
			Sigatoka (PDI)	Bunchy top (% stool infd.)	Panama (% plant infd.)	Anthracnose (% infd. bunch)	Rhizome rot (% infd. stool)	Crown rot (% infd. hands)	Leaf chlorosis (% infd. plant)
NADIA									
Fulia	D. Cavendish	360-385	27.82	0.5	1.5	3.5	–	0.5	2.0
Ranaghat	Martaman	340-360	19.56	–	6.0	11.0	1.5	–	–
Badkulla	D. Cavendish	370-390	29.50	–	2.0	1.5	1.0	1.5	–
Ghoragacha	Martaman	370-380	24.35	1.5	8.4	18.0	2.0	1.0	1.0
Tehatta	D. Cavendish	350-360	32.05	1.0	0.5	7.0	0.5	–	1.5
Kalyani	Hanuman Jata	400-410	11.25	–	0.5	10	–	–	–
24 Pgs (N)									
Mondouri	Martaman	380-395	21.65	–	4.0	15.0	–	–	1.0
Gadamara	D. Cavendish	375-390	30.80	1.0	2.5	6.5	2.5	–	–
Bangaon	Kanthali	380-400	12.85	–	–	2.5	–	–	0.5
Bagdah	D. Cavendish	360-380	23.72	2.0	1.5	3.0	1.0	0.5	–
HOOGHLY									
Chinchura	Champa	390-400	14.66	–	1.5	3.5	–	–	2.5
Tarakeswar	Champa	340-360	16.71	–	–	7.0	2.0	0.5	–
Polba	Champa	360-375	13.88	0.5	1.0	1.5	0.5	–	–
Pandua	D. Cavendish	380-400	25.64	–	0.5	5.0	1.0	–	1.0

Field data are the average of two years.

Table 1b : Survey on banana diseases in different districts of West Bengal

Location in districts	Cultivars grown	Days after planting	Diseases recorded in different locations						
			Sigatoka (PDI)	Bunchy top (% stool infd.)	Panama (% plant infd.)	Anthracnose (% infd. bunch)	Rhizome rot (% infd. stool)	Crown rot (% infd. hands)	Leaf chlorosis (% infd. plant)
Coochbehar									
Pundibari	Monoa	370-380	10.65	–	4.0	–	–	–	–
Dinhata	Malbogh	390-400	21.30	1.0	1.5	11.0	–	2.0	1.0
Dhaluabari	Chinichampa	340-350	14.55	–	–	–	1.0	1.0	–
Baneswar	Atia	440-490	8.46	–	–	0.5	–	–	–
Jalpaiguri									
Mohitnagar	Champa	365-370	17.05	0.5	05.	–	–	1.5	3.0
Moynaguri	Atia	370-380	10.22	–	–	–	–	–	–
Dhupguri	Malbogh	350-370	18.80	–	1.0	13.5	1.0	1.0	2.0
Falakata	Monoa	400-410	13.36	1.5	1.5	–	–	–	–
Darjeeling									
Kalimpong	Gheeu Kela	380-390	16.45	–	1.0	–	3.0	–	2.0
Matigara	Monoa	360-365	11.56	–	–	2.0	–	2.0	–
Sevak	Hill Champa	390-400	13.35	–	–	1.0	–	–	–
Pedong	Hill Champa	320-340	12.10	–	–	–	1.0	2.5	–

Field data are the average of two years.

sigatoka. The other diseases recorded were Panama wilt, anthracnose, rhizome rot and tip drying (due to an unidentified casual agent) respectively. Incidence of sigatoka was prevalent throughout the year but severity of the disease recorded to be more during July to December and reached its peak in September-October. Anthracnose was observed to be higher during the period of July to January though the incidence was recorded throughout the year. Attack of the pathogen was restricted only on the skin of the developing fruits and underside of few fruits in a hand. Fusarial wilt or Panama appeared first as cracking of false stem at the base of the plant and then yellowing of leaves and discolouration of vascular bundle in rhizome as well as in false stem led to colapse of affected plants. Rhizome rot was recorded in few plants only and infection was not severe. In some plants yellowing and drying of central leaf was observed. The youngest heart leaf unable to unfurled, further growth of the plant checked and finally causing death of infected plants. Occasionally recovery of the affected plant was also recorded.

In recent years a newly introduced exotic cultivar 'Martaman' is mostly grown commercially in addition to Cavendish banana and Champa, consequently incidence of different diseases also increased. Two diseases, Sigatoka leaf spot and Panama were the most common in almost all the locations. Rawal (2000) also reported the above two diseases as national importance in India. Sigatoka was severe during the period of August to November ie, at medium high temperature with high relative humidity. Weak plant showed more susceptibility and severity increased with the age of the plant, as the production of propagule increased and availability of fresh area for infection decreased. This observation corroborated with the assessment of Singh and Chadha (2000). According to them disease spread very fast in rainy season. Production of spores, their dispersal and infection favoured at 25°-35°C temperature. Orozco and Ramirez (1991) revealed that both the pathogens, *M. musicola* and *M. fijiensis* casual agents of yellow and black leaf spot respectively, causing yield loss upto 50% which was recorded in September, 1989 at Colima, Mexico. Atia, a seeded cultivar showed resistant reaction against the disease, visible symptoms seen in some plants only in the margins of older leaves. Severity of disease varied from 8.46 in Atia upto 32.05 (PDI) in Dwarf cavendish. Panama wilt was common in Martaman and its severity recorded upto 8.4%. In some orchards anthracnose infection reached at 18% bunch and 15-20% finger in each bunch, lowered market value of the crop. Bacterial soft rot or rhizome rot was recorded not more than 3% and the

Table 2 : Incidence of banana diseases in different months of the year in a fixed plot survey.

Months (fortnight)		Sigatoka leaf spot Incidence (% leaf inf)	Severity (PDI)	Panama wilt (% infected plant)	Anthracnose (% infected bunch)	Rhizome rot (% stool infected)	Tip drying (% infected plant)
Jan I	75	17.3	1.5	20	1.0	–	
	II	72	14.8	1.0	18	0.5	1.0
Feb I	55	12.0	1.0	12	–	–	
	II	46	12.5	0.5	13	1.5	–
Mar I	34	11.8	1.0	12	–	–	
	II	24	12.6	1.0	10	–	1.5
Apr I	22	10.5	2.0	13	–	2.0	
	II	25	10.0	1.5	15	1.0	–
May	I	26	11.4	1.5	17	–	1.5
	II	22	10.2	2.0	13	–	–
June	I	32	12.7	2.5	15	2.0	–
	II	49	16.4	2.0	19	1.5	–
July I	62	19.7	2.5	22	–	–	
	II	69	20.4	3.8	28	1.0	–
Aug	I	76	23.0	2.0	35	3.0	1.0
	II	89	28.8	3.5	39	1.5	–
Sept	I	96	35.5	2.5	41	1.0	–
	II	100	37.3	3.0	40	2.5	2.0
Oct I	100	39.0	2.2	36	3.0	–	
	II	100	38.2	3.0	37	1.5	1.5
Nov	I	92	35.1	2.5	31	1.0	2.5
	II	93	30.6	1.5	33	–	1.0
Dec I	85	20.7	1.0	28	–	1.5	
	II	81	21.3	1.5	25	1.0	–

Field data are the average of two years (2000 & 2001).

rotting was aggravated by the attack of banana rhizome weevil (*Cosmopolites sordidus*). Laxmanan and Mohan (1992) showed that Cavendish bananas were severely affected by *Erwinia carotovora* and incidence of 60-80% was recorded in some fields of Tamil Nadu during summer. Two virus diseases mentioned earlier were recorded in this investigation are of minor importance and do not cause economic loss of the crop. Fusarial wilt and rhizome rot were more severe in ratoon crop probably due to multiplication and spread of the pathogen in the infected stool as well as in the rhizosphere soil. Observation indicated that in a near future the Panama disease become a serious menace for commercial cultivation of banana with the popular high yielding cultivar like Martaman.

REFERENCES

Babylatha, A. K.; Amma, S. P., and Puskaran, K. (1990). Field tolerance of banana cultivars to leaf spot diseases and rhizome weevil. *South Indian Horticulture*. **38** (2) : 102-107.

Elangvan, R.; Mohan, S.; Arumugam, R.; and Jearajan, R. (1990). A survey report on the incidence of major diseases of banana in Tamil Nadu, *South Indian Horticulture*. **38** (6) : 339-340.

Laksmanan, P.; and Mohan, S. (1992). Studies on rhizome rot and tip over disease of banana. *Madras Agricultural Journal*. **79** (1) : 56-57.

Mayee, C. D., and Datar, V. V. (1986). Phytopathometry. Technical bulletin 1 (Special Bulletin 3), Marthwada Agricultural University, Parabani, pp 74-75

Orozco, S. M.; and Remirez, S. F. (1991). Black sigatoka of banana in the state of Colima, Mexico. *Revista Mexicnna de Fitopatologia*. **9** (2) : 69-75.

Rawal, R. D. (2000). Proceedings of the conference on challenges for banna production and utilization in 21st Century, on 24-25 September, 1996 as Banana-improvement, production and utilization, 2000. Editted by H. P. Singh and K. L. Chandha, 2000. pp. 355.

Singh, S. P.; and Chadha, K. L. (2000). Banana-Improvement, Production and Utilization. pp. 1-503.

(Accepted for publication June 6 2002)