

## Original Research Article

# Integrated Disease Management of Yellow Sigatoka Leaf Spot Disease of Banana

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## ABSTRACT

A field experiment was conducted during 2007-08, 2008-09 and 2010-11 on the farm of Banana Research Station, Nanded to study the effectiveness of different treatments against yellow sigatoka leaf spot disease of banana. The experiment was laid out in Randomized Block Design in three replicates with eight treatments. The treatments used were T<sub>0</sub> – suckers as a source of planting material, T<sub>1</sub> – Soaking suckers in 0.1 percent carbendazim solution for 30 minutes, T<sub>2</sub> – Tissue culture sapling as a planting material, T<sub>3</sub> – Drenching tissue culture saplings with 0.1 percent carbendazim solution T<sub>4</sub> – Phytosanitation (cleaning the plot), T<sub>5</sub> – Spraying of propiconazole 25 EC @ 0.05 percent at 15 days interval, T<sub>6</sub> – Integrated diseases management treatment (T<sub>3</sub>+ T<sub>4</sub> + T<sub>5</sub>) and T<sub>7</sub> – Integrated diseases management treatment (T<sub>2</sub> + T<sub>4</sub> + T<sub>5</sub>). Considering the effectiveness of different treatments, integrated diseases management treatment T<sub>7</sub> (T<sub>2</sub> + T<sub>4</sub> + T<sub>5</sub>) i.e. combine effect of banana garden planted with tissue culture saplings, phytosanitation and spraying of propiconazole @ 0.05 percent at 15 days interval (5.78 %) and treatment T<sub>6</sub> i.e. combine effect of drenching tissue culture sapling with 0.1 percent carbendazim solution, phytosanitation and spraying of propiconazole @ 0.05 percent at 15 days interval (6.24%) recorded significantly minimum percent disease index of sigatoka and were found at par with each other as compared with rest of the treatments under study. Significantly maximum yield of banana was obtained from treatment T<sub>7</sub> i.e. T<sub>2</sub> + T<sub>4</sub> + T<sub>5</sub> (83.9 Mt/ha) and treatment T<sub>6</sub> i.e. T<sub>3</sub> + T<sub>4</sub> + T<sub>5</sub> (83.3 Mt/ha) as compared with rest of the treatment under study. From three years data it can be concluded that, for effective management of sigatoka leaf spot and yield of banana, garden should be planted with tissue culture saplings, cleaning of the garden and 4 to 5 sprayings of propiconazole 25 EC @0.05 percent (5 ml/10 lit of water) at 15 days interval after 30 days of planting the garden.

## Keywords

Banana,  
Sigatoka,  
Propiconazole,  
Phytosanitation.

## Introduction

Banana and plantain are the staple food of millions of people in several countries where there are popularly grown. In addition they are the commercial crops for the majority of the farmers. Apart for cultural and nutritional aspects the crop suffers heavily from the attack of fungal, bacterial and viral diseases which limits the successful

cultivation of banana. Mycosphereella leaf spot disease of banana have threatened world banana production, it does not only affect banana leaves but also bunch weight and fruit quality, yield losses from 40-100 percent have been reported in some cases (Merdith, 1970; Maurichown *et al.*, 1997; Porras and Perez, 1997; Cordeio, *et al.*,

1998) during second cropping cycle plantain yield loss due to black sigatoka could reach 76% (Ngongo, 2002), due to premature bunch (Meredith, 1970; Bulbin and Zapata, 2001).

Yellow sigatoka leaf spot disease of banana was first reported from Colombia 1937 with the highest incidence in the Audeorl Colombian where it is generally not controlled. Although economic losses more than 50 % due to yellow sigatoka are reported worldwide (Burt *et al.*, 1997). Present investigation was carried out at Banana Research Station, Nanded during the year 2007-08, 2008-09 and 2010-11 to evaluate the efficacy of different integrated treatments for managements of sigatoka leafspot diseases of banana.

### **Materials and Methods**

The field experiment was conducted on the farm of Banana Research Station, Nanded of V.N. Marathwada Krishi Vidyapeeth, Parbhani. During the year 2007-08, 2008-09 and 2010-11, to test the efficacy of different integrated treatment on the intensity of sigatoka leaf spot and yield of banana. The experiment was conducted in Randomized Block Design with three replications and eight treatments. Recommended package of practices were used. The gross plot size was 9.0m X 7.5m and net plot size was 7.5 X 6.0 m. recommended spacing of 1.5 X1.5 m was maintained. Ardhapuri tissue culture saplings and suckers were used as a source of planting material.

The treatment details were T<sub>0</sub>- suckers as a source of planting material, T<sub>1</sub>- Soaking suckers in 0.1 percent carbendazim solution for 30 minutes, T<sub>2</sub> – Tissue culture sapling as a planting material, T<sub>3</sub> – Drenching tissue culture saplings with 0.1 percent carbendazim solution T<sub>4</sub> – Phytosanitation

(cleaning the plot), T<sub>5</sub> – Spraying of propiconazole 25 EC @ 0.05 percent at 15 days interval, T<sub>6</sub> – Integrated diseases management treatment (T<sub>3</sub> + T<sub>4</sub> + T<sub>5</sub>) and T<sub>7</sub>- Integrated diseases management treatment (T<sub>2</sub> + T<sub>4</sub> + T<sub>5</sub>).

Five representative plants were selected from each treatment for recording the observations on growth parameters, percent diseases index of sigatoka at monthly interval and yield of banana (mt/ha) at harvest of the crop.

The data on each character were analyzed as per the procedure given by Panse and Sukhatme (1985).

### **Diseases assessment**

Diseases development and efficacy of each treatment were assessed at monthly interval on five plants of similar maturity per plot using the younger leaf spotted method (Stover and Pickson, 1970). The diseases severity index were assessed by using Gauhl's modification of Stover's severity scoring system (Gauhl *et al.*, 1993)

The proportion of leaf area showing symptoms was recorded on a scale of 0 to 6 as follows,

0 = No disease symptoms

1 = less than 1 percent symptoms

2 = 1-5 percent showing symptoms

3 = 6- 15 percent showing symptoms

4 = 16- 33 percent showing symptoms

5 = 34- 50 percent showing symptoms

6 = more than 50 percent showing symptoms

Disease Severity Index (DSI) was calculated as follows.

$$DSI = \frac{\sum nb}{(N-1) T} \times 100$$

Where,

n = number of leaves in each grade

b = grade

N = number of grades used (7)

T = total number of leaves graded on each plant

## **Results and Discussion**

### **Percent diseases index of Sigatoka**

The pooled data on percent diseases index of sigatoka presented in Table 1 revealed that the significant influence was observed on the intensity of sigatoka leaf spot due to the different integrated diseases management treatments. Significantly minimum percent disease index of sigatoka leaf spot was recorded by the treatment T<sub>7</sub> i.e. tissue culture saplings soaking in 0.1% carbendazim solution, cleaning of the plot and spraying of propiconazole 25 EC @0.05% at 15 days interval (5.78%) and was found at par with treatment T<sub>6</sub> i.e. tissue culture saplings as a planting material, cleaning of the plot and spraying of propiconazole 0.05% at 15 days interval (6.24 %) as compared with rest of the treatments under study. The highest percent disease index of sigatoka was observed in control treatment (21.74 %).

### **Banana yield**

Pooled data of banana yield presented in Table 2 revealed that the significant

influence on banana yield was observed due to different integrated disease management treatments. Significantly maximum banana yield was recorded by the treatment T<sub>7</sub> i.e. tissue culture sapling as a planting material phytosanitation and spraying of banana garden with 0.05 percent propiconazole at 15 days interval (83.9 mt/ha) and was found at par with treatment T<sub>6</sub> i.e. drenching tissue culture seedling with 0.1 % carbendazim solution, phytosanitation and spraying the banana garden with 0.05 percent propiconazole 15 days interval (83.3 mt/ha) as compared with rest of the treatments under study.

### **C: B ratio**

Pooled data presented in Table 3 revealed that the maximum C: B ratio (2.37) was obtained by the treatment T<sub>7</sub> i.e. tissue culture seedlings as a planting material, phytosanitation and spraying of propiconazole @ 0.05 at 15 days interval followed by the treatment T<sub>6</sub> i.e. drenching the tissue culture seedling with 0.1 percent carbendazim solution, phytosanitation and spraying of propiconazole @ 0.05 % at 15 days interval (2.34) as compared with rest of the treatments under experimentation.

Integrated disease management treatments i.e. planting of banana with tissue culture saplings, cleaning the banana garden and spraying the banana garden with 0.05 percent propiconazole found the considerable decrease in severity index, leaf spot disease of banana. The similar results were reported by the Kernot (1998). The increase in yield of banana in integrated disease management treatments were observed due to the minimum disease severity index of sigatoka and leaf spot. The integrated disease management treatment were retained the maximum green leaves upto the harvest

**Table.1** Pooled means of percent diseases index of sigatoka in different months as affected by different integrated diseases management treatments

Tr. No.	Treatment details	Pooled means of PDI of Sigatoka (%)					Pooled PDI of all months (%)
		Aug.	Sept.	Oct.	Nov.	Dec.	
T <sub>0</sub>	suckers as a source of planting material (control)	22.09	23.14	22.68	21.65	19.15	21.74
T <sub>1</sub>	Soaking suckers in 0.1 percent carbendazim solution for 30 min.	19.52	20.51	20.45	18.65	17.49	19.32
T <sub>2</sub>	Tissue culture sapling as a planting material	19.84	19.69	18.88	19.03	17.48	18.98
T <sub>3</sub>	Drenching tissue culture saplings with 0.1 percent carbendazim solution	18.41	18.03	17.00	15.57	15.15	16.83
T <sub>4</sub>	Phytosanitation (cleaning the plot)	17.69	18.67	17.06	16.13	16.21	17.17
T <sub>5</sub>	Spraying of propiconazole 25 EC @ 0.05 percent at 15 days interval	6.87	6.83	7.70	7.58	6.50	7.09
T <sub>6</sub>	Integrated disease management treatment (T <sub>3</sub> + T <sub>4</sub> + T <sub>5</sub> )	6.14	6.42	6.81	6.13	5.71	6.24
T <sub>7</sub>	Integrated disease management treatment (T <sub>2</sub> + T <sub>4</sub> + T <sub>5</sub> )	5.89	5.99	6.27	5.51	5.23	5.78
	SE	0.30	0.28	0.27	0.29	0.23	0.27
	CD at 5%	0.86	0.83	0.79	0.83	0.65	0.79

**Table.2** Pooled means of yields of banana as affected by different IDM treatments

Tr.No.	Treatment details	Banana yield (Mt/ha)			Pooled means of yield (Mt/ha)
		2007-8	2008-09	2010-11	
T <sub>0</sub>	Suckers as a source of planting material (control)	60.4	74.0	68.6	67.5
T <sub>1</sub>	Soaking suckers in 0.1 percent carbendazim solution for 30 min.	62.2	82.6	71.0	72.0
T <sub>2</sub>	Tissue culture sapling as a planting material	65.3	88.1	80.9	78.1
T <sub>3</sub>	Drenching tissue culture saplings with 0.1 percent carbendazim solution	66.0	84.0	81.9	77.3
T <sub>4</sub>	Phytosanitation (cleaning the plot)	64.2	83.3	73.5	73.7
T <sub>5</sub>	Spraying of propiconazole 25 EC @ 0.05 percent at 15 days interval	72.9	91.1	80.7	81.5
T <sub>6</sub>	Integrated disease management treatment (T <sub>3</sub> + T <sub>4</sub> + T <sub>5</sub> )	72.2	90.7	86.9	83.3
T <sub>7</sub>	Integrated disease management treatment (T <sub>2</sub> + T <sub>4</sub> + T <sub>5</sub> )	74.0	89.6	88.0	83.9
	SE	0.45	2.06	2.75	1.15
	CD at 5%	1.37	6.25	8.35	3.28

**Table.3 C:** B ratio as affected by different IDM treatments (2007-08 to 2010-11)

Tr.No.	Treatment details	Cost of production (Rs/ha)	Gross monetary returns (Rs/ha)	Additional income over control (Rs/hs)	C:B ratio
T <sub>0</sub>	suckers as a source of planting material (control)	153650	331767	--	2.16
T <sub>1</sub>	Soaking suckers in 0.1 percent carbendazim solution for 30 min.	154850	352441	20674	2.27
T <sub>2</sub>	Tissue culture sapling as a planting material	165613	382924	51157	2.31
T <sub>3</sub>	Drenching tissue culture saplings with 0.1 percent carbendazim solution	166927	379095	47328	2.27
T <sub>4</sub>	Phytosanitation (cleaning the plot)	166056	360949	29182	2.18
T <sub>5</sub>	Spraying of propiconazole 25 EC @ 0.05 percent at 15 days interval	172163	399693	67929	2.31
T <sub>6</sub>	Integrated disease management treatment (T <sub>3</sub> + T <sub>4</sub> + T <sub>5</sub> )	174427	408358	76591	2.34
T <sub>7</sub>	Integrated disease management treatment (T <sub>2</sub> + T <sub>4</sub> + T <sub>5</sub> )	173113	411144	79377	2.37
	SE	4641	5710	--	0.36
	CD at 5%	14057	16220	--	1.08

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