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Prevalence and distribution of cucumber mosaic virus disease of banana in major banana growing districts of Western Maharashtra state during 2021-2022

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Abstract

In order to ascertain the prevalence and severity of the viral disease cucumber mosaic virus in the major banana-growing districts of Western Maharashtra state, a roving survey was conducted during 2021-22. Seven districts in Western Maharashtra were visited viz., Ahmednagar, Jalgaon, Pune, Solapur, Dhule, Nandurbar, Satara to identify the symptoms, their severity, and yield loss in banana plants. Cucumber mosaic virus was found to be more prevalent during a survey in the majority of banana fields in Maharashtra. The most CMV affected district was Jalgaon where 54 percent disease incidence was observed. The Dhule and Nandurbar districts also experienced high incidence of CMV disease. Climate and cultural practices were noticed to have an impact on the vector population and so on infection level.

Keywords: CMV, survey, banana, disease incidence, symptoms, severity, vector

1. Introduction

The banana (*Musa* spp.) is India's second major fruit crop, after mango, and the fourth most important food crop after rice, wheat, and maize. Its year-round availability, affordability, varietal range, flavor, nutritional and medicinal benefits make it a favorite fruit of people of all socioeconomic backgrounds. Because of its low cost and great nutritional value, bananas are a widely popular fruit. It is eaten fresh or cooked, as well as ripe and raw fruit. It also has a high export potential. Hi-tech crop farming is a financially feasible enterprise that leads to increased production, improved product quality, and early crop maturity, with the produce commanding a premium price. As per the advanced estimate of horticultural statistics at a glance 2021-22, the production of banana was 32454 thousand MT in an area of 880 thousand ha in India while 83.52 thousand ha area in Maharashtra is under banana cultivation which gives production of 4628.04 thousand MT. Viral diseases are the major constraints to the production of banana in India.

Banana is known to be infected by four major viruses viz., Banana Bunchy Top Virus (BBTV), Cucumber Mosaic Virus (CMV), Banana Bract Mosaic Virus (BBrMV), and Banana Streak Virus (BSV). Over 1000 types of plants are affected by the cucumber mosaic virus (CMV), one of the most prevalent viral plant pathogens. Among plant viruses, CMV has the greatest host range (Roossinck, 2002) [8]. CMV is a Cucumovirus belonging to the Bromoviridae family (Gildow *et al.* 2008) [3]. CMV is a multicomponent virus with a single-stranded positive sense RNA genome made up of three RNA species and a fourth genomic RNA.

CMV exhibit complex symptoms viz., mosaic, leaf distortion, mottle, veinal chlorosis and stunting causing considerable loss in plant vigor and yield (Rashid *et al.*, 2007) [7]. CMV causing yellow mosaic and stripes on leaf lamina, also distorting the leaf along with stunting of banana plant, contribute serious threat to banana cultivation (Niblett *et al.*, 1994) [6]. Plants infected by CMV at the early stage are severely stunted in growth, leaves are distorted, and fruits are unsalable because of obvious crease (Agrios, 2005) [2]. Cucumber mosaic virus is transmitted by more than 60 species of aphids, CMV were transmitted by the cotton aphids, *Aphis gossypii* glov, and the green peach aphid, *Myzus persicae* Sulz in the non-persistent manner (Simons 1957) [9].

2. Material and Methods

2.1 Field Survey

The survey for assessment of disease incidence and severity of cucumber mosaic virus disease of banana was carried out in major banana growing area of Maharashtra State. In each village

5 banana orchards having different growth stages from seedling to flowering and harvesting stages were selected randomly on both side of the roads. In each orchard 20 plant were selected randomly for assessment of intensity and incidence. For assessment of severity, 3 leaves each from top, middle and bottom of the plant based on the leaf area covered mosaic symptoms, reduced leaf lamina.

2.2 Analysis of symptoms

The samples were analyzed to assess the presence of cucumber mosaic virus disease on collected leaf samples. The severity score was given according to the scale given by Murphy (2003)^[5] with some modifications. 0= no disease, 2 = Mild mosaic symptoms on leaves, 4 = Severe mosaic symptoms on leaves, 6 = Mosaic and deformation of leaves 8 = Severe mosaic symptoms and Deformation of leaves, 10 = Severe mosaic and deformation of leaves with stunted growth.

2.3. Prevalence of CMV

Occurrence of CMV was determined by calculating the percent disease incidence for each plot observed by the formula given by Wheeler (1969)^[11]. The percent disease incidence calculated by dividing no. of infected plants with total no. of plant observed.

3. Result and Discussion

A survey was conducted in 2021–22 to learn more about the incidence of CMV in various banana growing areas of the Ahmednagar, Jalgaon, Solapur, Dhule, Nandurbar, Pune and Satara districts of Western Maharashtra State. While considering that CMV was found one of the major devastating constraint to banana production in Maharashtra State. Prevalence of the disease was found everywhere in major banana growing areas. Average disease incidence ranged from 3.8 to 54 percent. According to the data of surveyed and indicated in Table No. 1, in Ahmednagar district highest mean disease incidence was noticed at Kolhar bk (75%) village of Rahata tehsil with maximum severity score of 10 while lowest in Rahuri (2%) tehsil with minimum severity score of 2. In

Jalgaon district, Amdgaon village of Raver tehsil showed maximum mean percent disease incidence (83%) and severity of 10 and minimum in Bhadgaon tehsil (15%) with severity score 2.

In Pune district percent disease was maximum in Nhavre village of Shirur tehsil with PDI (13.1%) and minimum in Rui village of Indapur tehsil with less PDI (1.6%) and both the village had same severity score of 2. Babda village of Shirpur tehsil in Dhule district showed highest disease incidence of (41.9%) with severity score 6 while lowest in Borkheda village with PDI (23.7%) and severity 4. Satara district showed maximum incidence in Sonawadi (3.5%) and minimum in chadharwadi (1%) with two severity score. In Nandurbar district, Hol village of shahada tahsil showed highest incidence (36.5%) and severity 6 while lowest in Talava village Taloda tehsil (10.5%) with severity 4. In Solapur district, Washimbe village of Karmala tehsil showed highest disease incidence of (16%) with severity 4 and lowest in Jeur village had no disease incidence. The current finding of disease incidence and distribution of cucumber mosaic virus of banana are similar to those reported previously by several banana researchers. Tejashwini *et al.*, (2019)^[10] revealed during their survey that the disease incidence ranged from 13 to 66% which was highest in Badami Taluka with highest number of aphid and Jamakhandi taluka had the lowest disease incidence rate with lowest number of aphids. whereas, Kadhivel *et al.*, (1986)^[4] observed that the percent incidence of banana mosaic in ratoon crop (2.8%) was significantly high as compared to main crop (1.6%) irrespective of type of planting material used for establishing plantations and reported 20 to 80 percent of banana mosaic reported by in Poovan from Tamil Nadu in Trichy district. The survey on incidence of CMV in 20 villages of Parbhani and Nanded districts of Marathwada on different banana cultivars conducted by Aglave *et al.*, (2007)^[11] revealed that the incidence of CMV varied from 1.5 to 27.5 percent. Among the different cultivars surveyed, Ardhapuri (27.5%) showed highest incidence followed by Basrai (16.5%), Shrimanti (16.0%) and was not found in the Grand nain.

Table 1: Incidence of tomato leaf curl virus disease in the district of Maharashtra during 2021-22

Taluka	Incidence (%)	Severity score of ToLCV	Symptoms observed
Ahmednagar District			
Kolhar bk	75	10	Stunted growth, Reduced leaf lamina with severe mosaic, Heart rot
Pravaranagar	70	10	Severe mosaic with stunted plants, Curled leaf lamina
Rahuri	2	2	Mild mosaic symptoms on leaves
	49		
Jalgaon District			
Amadgaon	83	10	Stunted growth of the plant, Reduced leaf lamina, Severe mosaic
Raver	81.4	8	Severe mosaic symptoms and Deformation of leaves
Bhadgaon	15	2	Mild mosaic symptoms on leaves
	59.8		
Pune District			
Nhavare	13.1	2	Mild mosaic symptoms on leaves
Indapur	5.3	2	Mild mosaic symptoms on leaves
Rui	1.6	2	Mild mosaic symptoms on leaves
	6.66		
Dhule District			
Babda	41.9	6	Mosaic and deformation of leaves
Borkheda	23.7	4	Severe mosaic symptoms on leaves
Hisale	39.8	4	Mosaic and deformation of leaves
	35.13		
Nandurbar District			
Hol	36.5	6	Mosaic and deformation of leaves
Bamkheda	34.6	6	Mosaic and deformation of leaves

Talava	10.5	4	Severe mosaic symptoms on leaves
Satara District			
Sonawadi	3.5	2	Mild mosaic symptoms on leaves
Sastewadi	2.3	2	Mild mosaic symptoms on leaves
Chaudharwadi	1	2	Mild mosaic symptoms on leaves
	2.26		
Solapur District			
Washimbe	16	4	Severe mosaic symptoms on leaves
Wangi	14	4	Severe mosaic symptoms on leaves
Jeur	0	0	No symptoms

4. Conclusion

It is concluded from above mentioned analyzed surveyed data that CMV infection is widespread throughout banana growing areas at all crop stages where banana grow intensively indicating necessity of urgent management of the viral disease.

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