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Survey of Mango sudden Decline Disease in Major Mango Growing Regions of Andhra Pradesh

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ABSTRACT: A Survey was conducted to assess the incidence and severity of Mango sudden decline in major Mango growing areas of Andhra Pradesh *viz.*, Krishna and West Godavari districts during 2021-22. During this survey Symptoms like dieback, oozing odgum, vascular discolouration and stem cracking was mostly observed. Among the orchards surveyed disease incidence is more in the Krishna district when compared to West Godavari with an average disease incidence of 31.20%, whereas in West Godavari it was recorded 12.80%. The maximum per cent disease incidence was recorded 42.80% in Tatakuntla village of Vissannapetamandal in Krishna district, followed by 33.40% and 32.40% in Narsapuram and Hanumathunigudem respectively, whereas minimum percent disease incidence of 10.40% was observed in Dorasanipadu village of Dwaraka Tirumala mandal in West Godavari district. Among the surveyed orchards the mean severity of Krishna district was 22.96% which is much higher than West Godavari which has recorded a mean severity of 4.61%. Highest disease severity (34.60%) was recorded in Tatakuntla village in Krishna district followed by Narsapuram and Hanumathunigudem with severity of 25.30% and 22.60% respectively, while the minimum severity was observed as 2.40% in Dorasanipadu village in West Godavari district.

Keywords: Mango sudden decline, Mango, Disease incidence, Disease severity, Survey.

INTRODUCTION

Mango (*Mangifera indica* L.) is one of the most important and esteemed fruit of the tropical and subtropical world and is cultivated extensively as commercial fruit crop in India. Mango occupies top position among the mango growing countries of the world with an area of 22.91 lakh hectares and production of 204.44 lakh Metric tonnes Narasimhudu and Reddy (1992). Uttar Pradesh ranks first in the mango production with a share of 23.47% and highest productivity, followed by Andhra Pradesh with a share of 22.4% APEDA (2019). In A.P. mango is being in an area of 3.63 lakh ha with a production of 43.73 lakh Metric tonnes. It is known as 'King of fruits' for its delicious taste, superb flavor, very high nutritive and medicinal value as well as great religio-historical significance Gupta and Zachariah (1945). It is universally regarded as superb fruit as it is nutritionally rich in carbohydrates, vitamins A and C, fatty acids. The fruit can be consumed raw or ripe. The mango crop is susceptible to various diseases like Antracnose, Powdery mildew, Blight, die back, red rust, gummosis and sooty mould etc. Among the diseases, Mango sudden decline (MSD) is minor problem which has been encountered in the mango orchards and gaining economic importance year after year and became a major threat to mango cultivation now-a-days.

Mango sudden decline is caused by *Lasiodiplodia theobromae* (Pat.) Griffon & Moube [synonym: *Botryodiplodia theobromae*]. In India it was first reported by Gupta and Zachariah (1945) as *Botryodiplodia* sp. causing dieback, while in Andhra Pradesh it was first reported by Narsimhudu and Reddy (1992). In 1949 in Florida, the death of mango trees was attributed to a higher incidence of *Diplodia* sp. (Smith and Schudder 1951). Reckhaus and Adamou (1987) reported that dieback causes severe damage in mango trees in the Republic of Niger. The symptoms of mango decline were found alone or in a combination of two or more symptoms in different mango orchards in Brazil and Pakistan (Ploetz *et al.*, 1996; Iqbal *et al.*, 2007).

In Andhra Pradesh, Mango sudden decline is reported from major mango growing areas and is gaining importance due to the death of the trees with high

disease severity. The disease is characterized by the presence of dieback (dying of tips from the top), oozing of gum on the surface of the affected wood and bark of the trunk and also on the large branches but more common on the cracked branches. Under severe infection, droplets of gum trickle down on stem and bark turns dark brown with longitudinal cracks and the tree dies up because of cracking, rotting and girdling of the stem (Hayes 1953; Madden *et al.*, 2007). Severely infected mango trees also die.

A roving survey was conducted in major mango growing areas of Andhra Pradesh, *i.e.*, Krishna and West Godavari districts during October to March in the year 2021-22, to known the disease incidence and severity of Mango sudden decline disease.

MATERIALS AND METHODS

To survey the disease incidence and severity in major mango growing areas of Andhra Pradesh.

A roving survey was conducted in major mango growing areas of Andhra Pradesh *i.e.* Krishna and West Godavari districts during October to March in the year 2021-22.

(a) Disease incidence. The number of trees showing one or more of the disease symptoms will be counted and used to calculate the disease incidence (I) (Madden *et al*., 2007). The disease incidence was recorded by counting the number of infected plants out of the total number of plants assessed and expressed in percentage. The per cent disease incidence (PDI) was calculated as below:

$$\text{Disease incidence (I)} = \frac{\text{Number of diseased plants (x)}}{\text{Total number of plants evaluated (N)}} \times 100$$

(b) Per cent Disease severity (PDS). Per cent Disease severity (PDS) was calculated, using 0-5 scale as furnished below (Table). Randomly 15 trees were selected from each orchard surveyed and 0-5 rating was given as per scale and disease severity was calculated by using formula (Wheeler, 1969).

$$\text{Disease severity (S)} = \frac{\text{Sum of all disease ratings}}{\text{Total no. of plants} \times \text{Maximum disease scale}} \times 100$$

Table 1: Score Chart of Mango sudden decline (Cardoso *et al*., 2004).

Disease Scale	Disease Infection
0	No symptoms
1	Wilting of upper tips
2	Wilting and small exudation of gum, Yellowing of leaves and little browning of vascular tissues
3	Drying of branches, heavy gum exudation from branches, large-scale browning of vascular tissues
4	Splitting of the bark, gum exudation from branches as well as from main trunk, drying of more than half of the tree
5	Death of plant

RESULT AND DISCUSSION

(a) Disease incidence. A roving survey was conducted to assess the incidence and severity of Mango sudden decline in two agro climatic zones of Andhra Pradesh during 2021-2022 from October to March in the predominant mango growing districts of Andhra Pradesh *viz*., West Godavari and Krishna districts.

The information pertaining to the survey of Mango gardens area, district Mandals, Villages, Details of farmers, variety, per cent disease incidence and age of the garden was presented in Table 2. Four mandals were taken in each district and in each mandal two villages altogether 16 villages and 5 gardens in each village were surveyed and Mango sudden decline disease was recorded.

The surveyed districts come under two agro climatic zones of Andhra Pradesh with West Godavari district under Godavari zone and Krishna district under Krishna zone and according to the data presented in the Table 2, the disease incidence is more in the Krishna district when compared to West Godavari with an average disease incidence of 31.20%, whereas in West Godavari it was recorded 12.80%.

Table 2: Details of Mango growing Areas Surveyed in Andhra Pradesh during 2021-22.

S. No.	District	Mandal	Village	Area (in hac)	Age of Garden	Variety	PDI*
1.	Krishna	Nuzvid	Annavaram	2.80	5	Chinnarasam	30.40
2.			Hanumathunigudem	4.00	10	Totapuri	32.40
3.		Vissanapeta	Tatakuntla	6.00	8	Chinnarasam	42.80
4.			Narsapuram	3.20	7	Chinnarasam	33.20
5.		Agiripalli	Vadlamanu	4.00	8	Baneshan	29.20
6.			Edlagudem	3.20	3	Baneshan	27.60
7.		Mylavaram	Ganapavaram	8.00	5	Chinnarasam	25.20
8.			Jangalapalli	2.40	5	Totapuri	28.80
Mean							**31.20**
9.	West Godavari	Chintalapudi	Nagireddigudem	2.40	3	Swarnarekha	12.40
10.			Errampalli	2.00	4	Baneshan	11.60
11.		Pedavegi	Donkapadu	4.00	6	Totapuri	10.60
12.			Gokinepalle	3.20	10	Swarnarekha	15.60
13.		Dwaraka Tirumala	Dadavalli	3.60	10	Baneshan	17.60
14.			Dorasanipadu	4.00	8	Chinnarasam	10.40
15.		Bhimadolu	Mallavaram	2.80	4	Chinnarasam	11.20
16.			Kodurupadu	3.20	3	Totapuri	13.60
Mean							**12.80**

*All values represent the mean of five replicates; PDI – Per cent disease incidence.

In Case of Mandals the per cent disease incidence is more in mandals present in Krishna district when compared with West Godavari district, among all the orchards surveyed in two districts, Tatakuntla village of Vissannapetamandal in Krishna district has recorded maximum disease incidence of 42.80% followed by 33.40% and 32.40% in Narsapuram and Hanumathunigudem respectively, whereas minimum percent disease incidence of 10.4% was observed in Dorasanipadu village of Dwaraka Tirumala mandal in West Godavari district.

The different areas surveyed and their geographic locations such as latitude, longitude, Mean Sea level and Disease severity were recorded and presented in the Table 2 showed that there is no effect of latitude and longitude on disease incidence and severity because they are the imaginary lines drawn, to know the exact location of places on earth surface. So, incidence and severity of diseases were not affected.

(b) Disease severity. The different areas surveyed in two agro climatic zones and their geographic locations such as latitude, longitude, Mean Sea level and Disease severity were recorded and presented in the Table 3, showed that there is no effect of latitude and longitude on disease severity.

According to the disease severity data, which was tabulated in Table 3 the disease severity in Krishna and West Godavari ranged from 16.00% to 34.60% in Krishna district and 2.40% to 8.00% in West Godavari district. The mean severity of Krishna district was 22.96% which is much higher than West Godavari which has recorded a mean severity of 4.61%. Highest disease severity (34.60%) was recorded in Tatakuntla village in Krishna district followed by Narsapuram and Hanumathunigudem with severity of 25.30% and 22.60% respectively, while the minimum severity was observed as 2.40% in Dorasanipadu village in West Godavari district. The disease severity also followed the same pattern as disease incidence and showed more severity in Krishna zone in comparison with Godavari zone.

Similar results was found by Saeed *et al*. (2011), reported that disease incidence of about 20 and 60 per cent in Punjab and Sindh Province of Pakistan. Khaskheli *et al*. (2011) surveyed Sindh province in Pakistan and observed maximum disease prevalence of 80% and 66.67% in Siroli and Sufida varieties respectively, which were cultivated at very low density and reported that disease prevalence will decrease when there is increase in the intensity of trees.

In Mexico, Tovar *et al*. (2012) observed 70 per cent dieback insapotemamey grafts and identified L. *theobromae* as the causal agent of the disease. Syed and Perveen (2015) conducted survey in Punjab province in Pakistan and reported that highest disease severity was observed in North zone (15.02%) followed by West zone (14.10%) and East zone (13.33%), while the minimum disease severity (9.88%) was recorded at South plane.

Suresh *et al.* (2017) reported that among the four district surveyed maximum disease incidence recorded 13.3 per cent in chinnarasam, while the lowest disease incidence 2 per cent was recorded in Baneshan at Rekunta village in Krishna district.

Table 3: Geographic Details and Disease severity of Mango growing areas Surveyed in Andhra Pradesh during 2021-22.

Sr. No.	District	Mandal	Village	Mean Sea Level (in m)	Latitude	Longitude	*Disease severity
1.	Krishna	Nuzvid	Annavaram	28 m	16.83°N	80.84°E	21.30
2.			Hanumathunigudem	28 m	16.84°N	80.83°E	22.60
3.		Vissanapeta	Tatakuntla	73 m	16.95°N	80.79°E	34.60
4.			Narsapuram	73 m	16.99°N	80.80°E	25.30
5.		Agirapalli	Vadlamanu	24 m	16.69°N	80.79°E	18.60
6.			Edlagudem	24 m	16.68°N	80.84°E	28.00
7.		Mylavaram	Ganapavaram	69 m	16.69°N	81.46°E	16.00
8.			Jangalapalli	69 m	16.80°N	80.64°E	17.30
						Mean	**22.96**
9.	West Godavari	Chintalapudi	Nagireddigudem	74 m	17.12°N	81.29°E	5.30
10.			Errampalli	21 m	16.99°N	80.96°E	4.00
11.		Pedavegi	Donkapadu	103 m	16.45°N	81.03°E	2.60
12.			Gokinepalle	100 m	17.14°N	80.06°E	6.60
13.		Dwaraka Tirumala	Dadavalli	90 m	16.95°N	81.25°E	8.00
14.			Dorasanipadu	114 m	16.96°N	81.25°E	2.40
15.		Bhimadolu	Mallavaram	20 m	16.48°N	81.64°E	3.60
16.			Kodurupadu	20 m	16.80°N	81.33°E	4.40
						Mean	**4.61**

CONCLUSION

Survey conducted in two major mango growing districts of Andhra Pradesh, in India revealed that there is more incidence in Krishna district and the pathogen is soil borne. It is minor problem encountered in mango orchards but gaining importance now-a days due sudden death of mango trees. Therefore, precautionary action is needed to prevent any future outbreaks of this disease.

FUTURE SCOPE

1. Screening for the resistant varieties and development of new resistant varieties through various breeding programmes
2. Extended genetic variability studies can be performed using molecular markers.
3. Extensive studies on etiology of the pathogen.

4. Development of a weather based predictive models for the occurrence of disease with long term disease and weather datasets.

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Conflicts of Interest: None.

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