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Mango gummosis disease incidence studies under natural and artificial conditions

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Abstract

A planned survey was conducted to assess the incidence of gummosis in the major mango growing areas of Telangana, Andhra Pradesh viz., Krishna, Khammam, Rangareddy, Medak in 2012-13. During the survey conducted in different mango orchards symptoms like gummosis, dieback and vascular discoloration were mostly observed. Among the orchards surveyed maximum per cent disease incidence was recorded 13.3 per cent in Chinnarasam at Rekunta village of Krishna district followed by Suvernakha (Rekunta), Navaneetham (Aswaraopet), Manjeera, Khader pasand (Sangareddy) recorded 10.0 per cent of gummosis incidence and less incidence was recorded in varieties kobbarimamidi, Baneshan (Rekunta) (2.00 per cent) in natural condition. One year old seedlings of ten different varieties of mango viz., Chinnarasalu, Manjeera, Tellagulabi, Totapuri, Baneshan, Alphonso, Amrapali, Imampasand, Suvernakha, Pandurivari mamidi were screened for against *Lasiodyplodia theobromae* laid out in a Randomized Block Design. Among these cultivars, Suvernakha showed highly susceptible to mango gummosis with disease severity of 84 per cent followed by Chinnarasalu, Manjeera and Tellagulabi showed 50 per cent disease severity. Baneshan, Alphonso, Imam pasand and Pandurivari mamidi have shown moderately resistant reaction.

Keywords: Gummosis, *Lasiodyplodia theobromae*, Mango, Natural condition, Survey

Introduction

Mango (*Mangifera indica* L.) is one of the world's most important and esteemed fruit of the tropical and subtropical world and is cultivated extensively as a commercial fruit crop in India. Mango is the important fruit crop in India, and occupies top position among mango growing countries of the world with an area of 25 lakh ha and annual production of 18002.4 MT, and productivity of 7.2 MT per ha. In India, mango is grown mainly in Andhra Pradesh (4.89 lakh ha) followed by Maharashtra (4.82 lakh ha). Andhra Pradesh recorded highest production of 4,406 thousand MT and 9.0 MT per ha productivity^[1]. The fruit is very popular among people due to its wide range of adaptability, high nutritive value, richness in variety, delicious taste and excellent flavor. It is a rich source of vitamin A and C. The fruit is consumed raw or ripe.

The mango crop is susceptible to various diseases like powdery mildew, anthracnose, die back, blight, red rust, gummosis and sooty mould etc. Gummosis incited by *Lasiodyplodia theobromae* (Pat.) Griffon & Moube [synonym: *Botryodyplodia theobromae*] is becoming a serious problem in India on many popular varieties of mango particularly during monsoon and post-monsoon periods. The incidence of gummosis was reported to be 20 and 60 per cent in Punjab and Sindh Provinces of Pakistan, respectively and 60 percent in Al Batinah region of Oman^[2].

In Andhra Pradesh, mango gummosis 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 profuse oozing of gum on the surface of the affected wood and bark of the trunk and also on the larger branches but more common on the cracked branches. Under severe infection in susceptible varieties, droplets of gum trickle down on stem and bark turns dark brown with longitudinal cracks and the tree dries up because of cracking, rotting and girdling of the stem^[3, 4]. Severely infected mango trees also die.

A roving survey was conducted in major mango growing areas of Andhra Pradesh and Telangana, i.e., Krishna, Khammam, Medak and Rangareddy districts during 2012-13 rainy season (June to October) to know the prevalence of mango gummosis and screened different mango popular varieties against gummosis for disease susceptibility in artificial inoculation.

Materials and Methods

To survey for disease incidence in major mango growing areas of Andhra Pradesh & Telangana.

A roving survey was conducted in major mango growing areas of Andhra Pradesh & Telangana *i.e.*, Krishna, Khammam, Medak and Rangareddy districts during 2012-13 rainy season (June to October) to know the prevalence of mango gummosis. The disease incidence in each cultivar was recorded by counting the number of infected plants out of the total number of plants assessed per cultivar and expressed in percentage.

$$\text{Disease incidence (\%)} = \frac{\text{Number of infected plants}}{\text{Total no. of plants assessed}} \times 100$$

Observations recorded

1. Variety
2. Age of the plant
3. Type of symptoms observed: Twig blight, gum exudation

and blackening

To evaluate different varieties of mango for resistance to gummosis

One year old seedlings of ten different varieties of mango were collected from Horticultural Research Station, Aswaraopet, Khammam district. The popular mango varieties, Chinnarasalu, Manjeera, Tellagulabi, Totapuri, Baneshan, Alphonso, Amrapali, Imampasand, Suvernakha and Pandurivari mamidi were selected for resistance screening to *L. theobromae* laid out in a Randomized Block Design. Five replications were maintained for each cultivar. The observations on disease severity were recorded after one month of inoculation. The severity of disease symptoms in twigs, branches, leaves and stem of individual plant was rated using a 1-5 scale^[5] corresponding to per cent disease severity from 0 to 100 % which has been described as under

Disease severity scale

Scale	Description	Percent disease severity (%)	Reaction
1	Seedlings free of disease	0	Resistant
2	An early stage of infection characterized by browning of leaf petioles and mid-veins and presence of marginal leaf blade necrosis	1-25	Moderately Resistant
3	The presence of dead leaves, which may remain attached at the tip of main stem, vascular browning, and evidence of gummosis from the stem	26-50	Moderately Susceptible
4	Dead leaves with progressive browning and extensive gummosis from the stem portions	51-75	Susceptible
5	Severe dieback that extended to major portions of the plant with profuse gummosis	76-100	Highly Susceptible

Percent Disease index (PDI) was calculated as per the formula of Wheeler^[6].

$$\text{PDI} = \frac{\text{Sum of individual ratings} \times 100}{\text{No. of seedlings assessed} \times \text{Max. Disease grade}}$$

Results and Discussion

Survey of mango gummosis incidence

Survey was conducted to assess the incidence of gummosis in the major mango growing areas during June to October in 2013. The information pertaining to disease incidence is furnished in Table. 1. During the survey conducted in different mango orchards symptoms like gummosis, dieback and vascular discoloration were mostly observed. (Plate 1)

Among the orchards surveyed in four districts, maximum per cent disease incidence was recorded 13.3 per cent in Chinnarasam at Rekunta village of Krishna district, while the varieties, Suvernakha (Rekunta), Navaneetham (Aswaraopet), Manjeera, Khader pasand (Sangareddy) recorded 10.0 per cent of gummosis incidence. The cultivars Suvernakha, Lalmuni, Mala-1 from Sangareddy and Manjeera (Aswaraopet) showed 6.66 per cent while Totapuri (Aswaraopet), Bobbilipunasa, Navaneetham (Sangareddy) varieties showed 3.33 per cent disease incidence the varieties kobarimamidi, Baneshan (Rekunta) recorded less incidence (2.00 per cent). The cultivar Suvernakha recorded highest disease incidence in Rekunta (10 per cent), while minimum was recorded in Sangareddy (6.66 per cent).

Among orchards surveyed the varieties Chinnarasalu, Suvernakha, Navaneetham, Manjeera, Khader pasand varieties were exhibiting profuse gum oozing when compared to Baneshan and Totapuri. In the present study, the per cent disease incidence ranged from 2.0 to 13.3.

Similarly Maduleti^[7] recorded 0 to 40 per cent of mango dieback (*B. theobromae*) disease incidence in different

orchards in Andhra Pradesh. Severe incidence of mango dieback recorded in Uttar Pradesh by Prakash and Singh^[7]. Panhwar *et al.*^[9] also reported that maximum disease severity in Hyderabad (4.76%) followed by Tandu allahyar (4.18) and minimum disease severity was recorded in naushahro feroz (1.32%) and Khirpur (1.46 %) respectively in major mango growing districts of Sindh, Pakistan. Similarly Iqbalet *al.*^[10] also reported maximum disease incidence in Sahiwal district and observed Chaunsa variety was most susceptible cultivar with 6.95 per cent disease incidence Punjab, Pakistan. Khan *et al.*^[11] and Rehman *et al.*^[12] also reported varied disease incidence in different mango growing areas around the world.

Evaluation of different varieties of mango for resistance to gummosis

One year old seedlings of ten different varieties of mango *viz.*, Chinnarasalu, Manjeera, Tellagulabi, Totapuri, Baneshan, Alphonso, Amrapali, Imampasand, Suvernakha, Pandurivari mamidi were screened for resistance against *L. theobromae* and the results are presented in Table 2 and 3.

Marginal necrosis, twig blight, gum oozing and vascular discoloration were the most frequent symptoms of mango gummosis disease. Perusal of the data revealed that all the symptoms characteristic of the disease were observed in the cultivars, Suvernakha, Chinnarasalu, Manjeera and Tellagulabi. Marginal necrosis was observed in all the cultivars inoculated and is the only symptom observed in the cultivars, Totapuri, Alphonso, Imampasand and Pandurivari mamidi. Profuse gummosis was observed in suvernakha and Chinnarasalu followed by Manjeera and Tellagulabi. However, gummosis symptoms were not observed in Totapuri, Baneshan, Amrapali, Alphonso, Imampasand and Pandurivari mamidi. (Plate.2)

Data on per cent disease severity showed that the cultivar Suvernakha is highly susceptible to mango gummosis with

disease severity of 84 per cent. Chinnarasalu, Manjeera and Tellagulabi were also found susceptible to mango gummosis with more than 50 per cent disease severity. The cultivars, Totapuri and Amrapali were found moderately susceptible with 32 and 36 per cent disease severity, respectively. Baneshan, Alphonso, Imam pasand and Pandurivari mamidi have shown moderately resistant reaction. (Table 3)

Reddy *et al.* [13] screened 10 cultivars of mango (Neeleshan, Dasher mahmooda, AU Rumani, Totapuri, Swarnarekha, Vikarabadmahmooda, Baneshan, Cherukurasam, Dasher and Manjeera) and reported low PDI of stem end rot disease (*B. theobromae*) in Dasher mahmooda (12.3%), Neeleshan (24.4%), Baneshan (29.4%) and Totapuri (30.0%). The

varieties AU Rumani, Cherukurasam and Vikarabadmahmooda recorded high mean PDI for stem end rot.

Saeed *et al.* [14] reported that the cultivar Dosehri was comparatively tolerant to the disease and the cultivar Ratol-12 was highly susceptible to the *L. theobromae*. Khan *et al.* [15] also reported Dosehri variety was comparatively tolerant to the mango disease as compared to others. Ratol-12 showed the highest disease symptoms followed by Langra, Fajri and then black Chounsa similarly The present study revealed that mango varieties, viz., Baneshan, Alphonso, Imam pasand and Pandurivari mamidi are found moderately resistant to gummosis.

Table 1: Gummosis disease incidence in major mango growing areas of Andhra Pradesh and Telangana

Sample No.	District	Mandal	Village	Variety	Age of trees (Yrs)	Type of symptoms			Disease incidence (%)
						Die back	Gum exudation	Vascular discoloration	
1	Krishna	Nuziveedu	Nuziveedu	Baneshan	40	No	No	No	-
		"	"	Totapuri	40	No	No	No	-
		"	Rekunta	Chinnarasam	30	Yes	Yes	Yes	13.3
		"	"	Suvarnarekha	15	Yes	Yes	Yes	10.0
		"	"	Totapuri	15	Yes	No	No	3.3
		"	"	Baneshan	15	No	No	No	2.0
		"	"	Kobbarimamidi	15	Yes	No	No	2.0
		"	"	Cherukurasam	15	No	No	No	Nil
2	Khammam	Aswraopet	Aswraopet	Navanetham	30	Yes	Yes	Yes	10.0
		"	"	Manjeera	30	Yes	Yes	Yes	6.66
3	Rangareddy	Chevella	Chevella	Baneshan	45	No	No	No	Nil
		"	parigi	Baneshan	45	No	No	No	Nil
4	Medak	Sangareddy	Sangareddy	Manjeera	40	Yes	Yes	Yes	10.0
		"	"	Lalmuni	57	Yes	Yes	Yes	6.66
		"	"	Mala-1	57	Yes	Yes	Yes	6.66
		"	"	Bobbilipunsa	57	Yes	Yes	Yes	3.3
		"	"	Khader pasand	57	Yes	Yes	Yes	10.0
		"	"	Navaneetham	50	Yes	Yes	Yes	3.33
		"	"	Suvarnarekha	50	Yes	Yes	Yes	6.66

Table 2: Symptoms observed in mango seedlings inoculated with *Lasiodiplodia theobromae*

S.no	Genotypes	Reaction	Marginal necrosis	Twig blight	Gum oozing	Vascular browning
1	Chinnarasalu	Susceptible	Yes	Yes	+++	++
2	Manjeera	Susceptible	Yes	Yes	+++	+
3	Tellagulabi	Susceptible	Yes	Yes	++	+
4	Totapuri	Moderately Susceptible	Yes	Yes	+	No
5	Baneshan	Moderately Resistant	Yes	No	No	No
6	Amrapali	Moderately Susceptible	Yes	Yes	+	No
7	Alphonso	Moderately Resistant	Yes	No	No	No
8	Imam pasand	Moderately Resistant	Yes	No	No	No
9	Suvarnarekha	Highly Susceptible	Yes	Yes	+++	+++
10	Pandurivari mamidi Mamidi mmamidimamidi	Moderately Resistant	Yes	No	No	No

+: Low; ++: Moderate; +++: High

Table 3: Reaction of different varieties of mango seedlings to *L. theobromae*

Sl. No.	Genotype	Per cent Disease Index (PDI)	Disease Reaction
1.	Chinnarasalu	72	Susceptible
2.	Manjeera	68	Susceptible
3.	Tellagulabi	64	Susceptible
4.	Totapuri	32	Moderately Susceptible
5.	Baneshan	24	Moderately Resistant
6.	Amrapali	36	Moderately Susceptible
7.	Alphonso	24	Moderately Resistant
8.	Imam pasand	24	Moderately Resistant
9.	Suvarnarekha	84	Highly Susceptible
10.	Pandurivari mamidi	24	Moderately Resistant



A) Die back



B) Gummosis



C) Bark splitting



D) Vascular discolouration

Plate 1: A, B, C, D Symptoms on mango gummosis



A) Gum oozing from the inoculated mango seedling



B) Twig blight



C) Marginal necrosis of foliage in inoculated seedling



Control

Inoculated

D)

Plate 2: A, B, C, D Disease susceptibility studies its symptoms against *L. theobromae*

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