

PREVALENCE OF MANGO SUDDEN DECLINE/ DEATH SYNDROME (MSDS) ON VARIOUS VARIETIES AT THE ORCHARDS OF DIFFERENT AGE IN THE VICINITY OF TANDO QAISER, HYDERABAD, SINDH

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ABSTRACT

Mango sudden decline or death syndrome (MSDS) has been reportedly present in Pakistan including Sindh for the last five years or so, however, its varietal preference or prevalence is not established. Thus a preliminary study was undertaken to assess the prevalence of MSDS in different mango varieties growing in orchards around Tando Qaiser in district Hyderabad. Considering a possible variation in age response of mango trees, three age levels were also assessed. The occurrence percentage was recorded on the basis of symptoms and/or mortality. The study revealed that some mango varieties had more prevalence of MSDS than others and the age-wise differences were also noticed. The findings indicate that trees of some varieties have the ability to overcome MSDS at specific age, and the severity of MSDS may be manageable till that. The variable incidence in different mango varieties at different ages can also be attributed to a possible natural tolerance against MSDS. This preliminary investigation provides the basis for further studies on the issue, leading to prioritization for cultivation of a particular variety and interventions at optimal age limits.

Keywords: Age, decline, mango, sudden, variety

INTRODUCTION

Mango (*Mangifera indica* L.) is one of the most important and oldest fruit of the tropical world including Indo-Pak subcontinent. Pakistani mangoes have attained a good reputation due to their excellent flavour, delicious taste and nutritive values (Muhammad *et al.*, 1999). It is nutritionally rich in carbohydrates, vitamins A and C, amino acids, fatty acids and proteins (Saleem and Akhtar, 1989) and is considered as second important fruit crop of the country to earn foreign exchange by exporting to Middle East and Europe (Tahir *et al.*, 2003). The climatic and soil conditions are highly suitable for mango cultivation in Pakistan and are helpful to produce good yield of high quality fruit. It is extensively grown

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in Sindh and Punjab and well established for international trade (Chaudhary, 1994). Sindh produces some famous mango varieties, having 8000 to 21600 kg/hectare yield potential, including Sindhri, Zafran, Siroli, Langra, Dusehri and Gulab Khasa as early season, Swarnarika, Summer Behisht Chaunsa, Beganpali, Saleh Bhai and Anwar Ratole as mid season and Neelum as late season variety. Sindh's mangoes mature earlier hence are transported to other parts of the country and world. The mango farming provides seasonal job opportunities to most common illiterate and less literate villagers of the countryside, associated with the growing and managing the orchards, picking, packing, the shipment and processing of mango fruits. One of the most common job opportunities for people in Tando Qaisar, Hyderabad, Sindh, Pakistan is the production of solar dried mangoes (Jiskani *et al.*, 2007).

The average yield however, is not appreciable due to the negligence of growers and attack of several diseases. About 83 different diseases of mango tree and fruit have been reported which cause losses in the world including 03 bacterial and 52 fungal diseases, whereas 03 are caused by plant parasitic nematodes and 25 are listed as miscellaneous diseases and disorders, but no one disease is caused by virus (Pernezny and Simone, 2000). In Pakistan, 27 diseases have been reported in mango tree (Ghafoor and Khan, 1976) and about 21 most important diseases have been reported in Sindh province by Jiskani *et al.*, (2007).

The most important reported diseases are Anthracnose (*Colletotrichum gloeosporioides*, Penz.) [*Glomerella cingulata* Stonem (S and VS)] (Kamal and Moghal, 1968; Hafiz, 1986; Saleem and Akhtar, 1989), Powdery mildew (*Oidium mangiferae* Bert.) (Kamal and Moghal, 1968; Sheikh, 1988; Saleem and Akhtar, 1989), Malformation (*Fusarium moniliforme*) (Sheikh, 1988); Saleem and Akhtar (1989) reported *F. oxysporum*; and Khaskheli (2008) recently isolated and identified *Fusarium nivale* (Fr.) Ces. in highest frequency followed by *F. oxysporum*, *F. moniliforme*, and *F. semitectum* as cause of mango malformation, Bacterial leaf spot (*Erwinia mangiferae* Doidge) (Kamal and Moghal, 1968 and Hafiz, 1986), Mango bacterial black spot (MBBS) (*X. campestris* pv. *Mangiferae indicae*) reported by Afzal (1987), Crown gall (*Agrobacterium tumefaciens*), Sooty mould (*Capnodium citri*), Fruit rot (*C. gloeosporioides* and *Aspergillus niger*) (Kamal and Moghal, 1968 and Hafiz, 1986), Root rot (*Rhizoctonia solani* Khun and *F. oxysporum* Schl (Khan, (1977-78) and Saleem and Akhtar (1989), Die back (*Diplodia natalensis* (Saleem and Akhtar, 1989); *Lasiodiplodia theobromae* (Pat.) reported by Khanzada *et al.*, 2004, Gummosis (*Botryodiplodia* or *Lasiodiplodia theobromae*) (Khanzada *et al.*, 2004, Pathan *et al.*, 2005), Ball formation on mango trunk and branches (Jiskani, 2006) and mango sudden decline .

The same disease, named as Mango Decline or Mango Sudden Decline Syndrome (MSDS) or Mango Sudden Death Syndrome (MSDS) or Mango Tree Mortality (MTM), is the most common and destructive disease throughout Pakistan. Different workers have isolated various fungi and other organism from infected mango tree. Ahmed *et al.* (1995) reported that the onset of dieback

becomes evident by discoloration and darkening of twigs from tip to downward due to *Diplodia natalensis*. Ploetz *et al.*, (1997) observed the symptoms of decline, tip dieback and gummosis from mango nurseries artificially inoculated with *Alternaria alternata*, *Glomerella cingulata*, *Dothiorella dominicana*, *Botryodiplodia theobromae* and *Phomopsis* sp. According to Saleem and Akhtar (1989), it is caused due to root rot, anthracnose and die back. Jiskani (2002) stated as disease complex caused by combined attack of several different fungi and abiotic factors. Shahbaz *et al.* (2005) pointed out disorders like twig blight, gummosis, bark splitting/cracking and wilting as cause. Leghari (2005) isolated 12 species of fungi belonging to 10 different genera from infected mango trees showing sudden death syndrome symptoms, with 20-83.30% incidence and 62.50-85% severity of mango gummosis caused by *Botryodiplodia theobromae* and 56.66-73.33% incidence and 62.50-78.75% severity of mango decline caused by *Fusarium solani*. Hakro (2006) isolated nine species of plant parasitic nematodes and seven species of fungi from roots of dead mango tree and also studied interaction of most predominant nematode (*Xiphinema index*) with fungi (*Fusarium oxysporum* and *Rhizoctonia solani*). Khanzada *et al.* (2005) and Saleem *et al.* (2006) reported that gum was the most common symptom and *Botryodiplodia* or *Lasiodiplodia theobromae* was the most abundant isolated fungus, whereas, Fateh *et al.* (2006) reported *Ceratocystis fimbriata*.

However, according to Jiskani *et al.* (2007), it is complex problem and actually is a result of anthracnose, die back, root rot, tip die back, gummosis and dying of plants; and is observed very common in the orchards of different age in Sindh. Keeping in view the importance of the disease, the research work was carried out to observe the mango sudden decline or death syndrome (MSDS) prevalence on various varieties at the orchards of different age in the vicinity of Tando Qaiser, Hyderabad, Sindh

MATERIALS AND METHODS

Mango sudden decline or death syndrome (MSDS) has been reportedly present in Pakistan including Sindh for the last five years or so, however, its varietal preference or prevalence is not established. Thus a preliminary study was undertaken to assess the prevalence of MSDS in different commonly available commercial mango varieties viz: Almas, Chaunsa, Desi, Dusehri, Langra, Neelam, Sindhri, Siroli and Swarnarika growing in orchards around Tando Qaiser in district Hyderabad. The occurrence percentage was recorded on the basis of symptoms present in infected trees and/or mortality of diseased plant. Considering a possible variation in age response of mango trees, three age levels viz: 13 ±5, 23 ±5 and 33 ±5 year old plants were also assessed. The data was analyzed using computer software package Statistics 8.1.

RESULTS AND DISCUSSION

The result with reference to mango sudden decline syndrome (MSDS) indicated that all varieties of different age groups from different locations significantly vary in disease prevalence. Two varieties, Siroli and Sufida which were cultivated at

very low density showed the maximum disease prevalence (80 and 66.67%), if the intensity of trees increased than it may be possible that disease prevalence percentage will be decreased and might become near to other varieties. However, in other varieties, the highest prevalence was recorded in Langra (27.50%) followed by Dusehri (24.74%), Desi (17.87%) and Sindhri (16.83%). While the minimum prevalence was observed in Neelam (9.82%) followed by Swarnarika (13.58), Chaunsa (13.64%) and Almas (15.65%) (Table 1). The mean prevalence of disease in different varieties at different age groups in the vicinity of surveyed area was 28.63%. The analysed data showed the Standard Error (SE) of 7.69 among all varieties.

Table 1. Prevalence of mango decline in different varieties in the vicinity of Tando Qaiser, Hyderabad

Variety	Total No. of observed plants	Diseased plants	%age
Almas	147	23	15.65
Chaunsa	88	12	13.64
Desi	207	37	17.87
Dusehri	97	24	24.74
Langra	40	11	27.50
Neelam	275	27	9.82
Sindhri	820	138	16.83
Siroli*	30	24	80.00
Sufida*	3	2	66.67
Swarnarika	81	11	13.58
Mean			28.630
S.E			7.6962
P value			0.0048

* The varieties are cultivated at very low intensity, if number of observed plant increased than it may be possible that % of diseased trees decreased and might become near to other varieties.

Table 2. Prevalence of mango decline in 13 ±5 years old plants in the vicinity of Tando Qaiser, Hyderabad

Variety	13 ±5							Mean
	Location 1	Location 2	Location 3	Location 4	Location 5	Location 6	Location 7	
Desi	0.00	16.67	0.00	0.00	0.00	0.00	0.00	2.38
Neelam	5.00	28.57	0.00	0.00	4.00	4.00	0.00	5.94
Swarnarika	20.00	28.13	0.00	0.00	0.00	0.00	5.00	8.85
							Mean	5.7233
							S.E	1.8709
							P value	0.0923

Different age groups of mango trees were observed to record prevalence of mango sudden decline syndrome. Only three varieties of 13 ±5 age group were

available in surveyed location that indicates significant variation in disease prevalence. The maximum occurrence of MSDS was recorded in case of Swarnarika (8.85%) whereas the minimum percentage was recorded in Desi variety (2.38%). The mean percentage of MSDS of the age group of 13±5 was observed 5.72%. The analysed data indicated 1.87 SE among all three varieties (Table-2).

Table 3. Prevalence of mango decline in 23 ±5 years old plants in the vicinity of Tando Qaiser, Hyderabad

Variety	23 ±5			Mean
	Location 1	Location 2	Location 3	
Almas	16.67	20.00	0.00	12.22
Chaunsa	40.00	0.00	12.50	17.50
Desi	5.00	25.00	0.00	10.00
Dusehri	16.67	20.00	50.00	28.89
Langra	20.00	0.00	0.00	6.67
Sindhri	16.00	16.00	12.00	14.67
Siroli	0.00	0.00	0.00	0.00
Mean				12.85
S.E				3.42
P value				0.0095

The age group of 23 ±5 showed the significant difference in the prevalence of mango sudden decline syndrome. The maximum prevalence of MSDS was observed in Dusehri variety (28.89%) followed by Chaunsa (17.50%) and Sindhri (14.67%) from three locations. Whereas the minimum occurrence was recorded in case of Langra (6.67%) followed by Desi (10.00%) and Almas (12.22%). The prevalence of MSDS under this age groups was not recorded in case of Siroli variety in all three observed locations. The average occurrence percentage among the age group of 23±5 of these locations was observed 14.99. The analysed data indicated 3.16 SE among all observed varieties (Table-3).

Table 4. Prevalence of mango decline in 33 ±5 years old plants in the vicinity of Tando Qaiser, Hyderabad

Variety	33 ±5				Mean %
	Location 1	Location 2	Location 3	Location 4	
Almas	0.00	10.00	20.00	15.00	15.00
Chaunsa	0.00	13.33	40.00	25.00	19.58
Desi	0.00	20.00	30.00	0.00	25.00
Dusehri	43.75	20.00	75.00	0.00	34.69
Langra	0.00	26.67	50.00	0.00	19.17
Sindhri	40.00	10.00	32.00	37.50	29.88
Siroli	0.00	0.00	80.00	0.00	20.00
Mean					23.331
S.E					2.6122
P value					0.0001

The MSDS prevalence among the age groups 33 ± 5 showed the highly significant difference under four observed locations in the vicinity of Tando Qaiser. The maximum prevalence of MSDS was observed in Dusehri variety (34.69%) followed by Sindhri (29.88%) and Desi (25.00%). While the minimum occurrence was recorded in Almas (15.00%) followed by Langra (19.17%), Chaunsa (19.58%) and Siroli (20.00%). The overall average occurrence percentage among the age group of 33 ± 5 of these four locations was recorded 23.33. The analysed data indicated 2.61 SE among all observed varieties (Table 4).

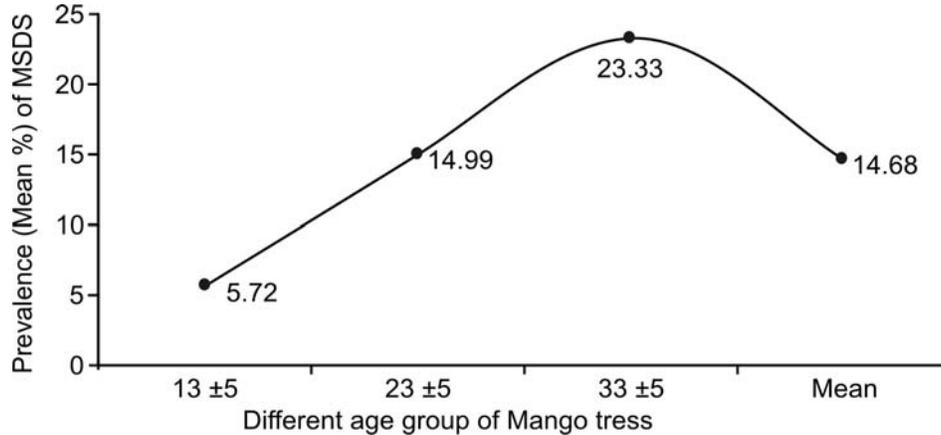


Figure 1. Overall mean prevalence of mango decline in different age group and varieties of plants in the vicinity of Tando Qaiser, Hyderabad.

CONCLUSION

The present investigation revealed that some mango varieties had more prevalence of MSDS than others and the age-wise differences were also noticed. The findings indicate that trees of some varieties have the ability to overcome MSDS at specific age, and the severity of MSDS may be manageable till that. The variable disease incidence in different mango varieties at different ages can also be attributed to a possible natural tolerance against MSDS which if true, can help in MSDS management. This preliminary investigation provides the basis for further in depth investigations on the issue, leading to prioritization for cultivation a particular variety and interventions at optimal age limits.

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