

DISEASE INCIDENCE IN CONTEXT OF SUDDEN DECLINE IN MANGO

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ABSTRACT

In the present investigation, experiment was conducted to develop an assessment key for evaluating the sudden decline incidence and per cent disease index on three locations. The study was conducted in at least 5 orchards selected from each location and disease incidence was estimated on 30 mango trees of each location were randomly marked and record the per cent disease incidence on 15 ± 5 years old plants in the year 2013. The maximum disease incidence was found at Sainik farm (46.66%) followed by 20 % Horticulture Research Station (HRC, Pattarchatta) and 10 % at Pantnagar vicinity. Per cent disease index (PDI) of sudden decline was highest in Sainik farm (1.48), followed by Horticulture Research Centre (HRC) (1.11). Minimum (PDI) was recorded from Pantnagar (0.74) respectively. A disease scale was developed on the basis of visual observations of symptoms on infected mango tree. On the basis of this disease assessment method, a sustainable management for mango sudden decline would be devised.

INTRODUCTION

Mango (*Mangifera indica* L.) is one the world's most important and esteemed fruits and described by some as the "king of all fruits" (Basha *et al.*, 2010). It is unique species with respect to diversity, also a most favorite fruit of Indian sub-continent (Sial, 2002). It occupy an area of 2.51lakh ha having annual production of 18.4lakh ton giving productivity 7.3 ton/ha in India and contributes 20.7 per cent production share of major fruit crops in India. (National Horticultural Board, 2014, Singh *et al.*, 2014). Because of diverse production conditions and the vast area grown, mango suffers from a number of diseases, some of them taking heavy toll on the crop and limiting production and productivity. Among them sudden decline of mango caused by *Botryodiplodiatheobromae* L. is one of the major plant pathological constraints in growing healthy mango orchards affecting almost all the parts of the plant namely, trunk, branch, twig, leaf, petiole, flower and fruit(Adhikary *et al.*, 2013)Accurate and precise assessments of plant diseases are important in any study relating the disease severity to disease losses and further management tactics. Phytopathometry is an important tool for disease assessment and helpfullin developing resistant cultivars. Crop losses can be prevented by measuring the intensity of disease and thus they are part of any disease survey and surveillance programme. The accuracy and precision of visual disease severity assessment can be improved by quantitatively measuring and comparing the accuracy and precision of rates and or assessment methods using computer based

programmes and by developing and using pictorial/ diagrammatic keys (Standard area diagrams) (Nutter *et al.*, 2006). Very little work has been done on Phytopathometry under Uttarakhand region. Therefore, the present study was planned to develop a disease assessment key for sudden decline with the objective of evaluating the disease incidence and per cent disease index (PDI) for devising the tactics for sustainable management of disease.

MATERIALS AND METHODS

A detailed methodology for MSD was assessed on at least 5 orchards selected from each area and disease incidence was estimated on 30 mango trees of each location were randomly marked and record the per cent disease incidence on 15 ± 5year old plants in the year 2013. The study area which was selected for the generating the data were HRC Pattarchatta, Sainik farm and Pantnagar.

Evaluation of disease parameters for assessment of sudden decline disease

In each location (Horticulture Research Station, Pattarchatta, Sainik farm and Pantnagar) to observe its oozing, rotting and blackening studied. At least 5 orchards were selected from each area and disease incidence was estimated on 30 mango trees of each location were randomly marked and record the per cent disease incidence on 15 ± 5 year old plants in the year 2013.The assessment carried out by using self designed 0-9 grades disease rating scale on the basis of severity from the given disease rating scale on sudden decline by Panhwar

et al. (2007); Masood *et al.* (2010); Rehman *et al.* (2011); Saeed *et al.* (2011); Khaskeli *et al.* (2011); Naqvi *et al.* (2015); Poussio *et al.* (2016).

Rating Scale	Severity
0	No signs of disease
1	Gum traces oozed out
2	Gum traces oozed out and few smaller branches become dry
3	Oozing of gum started and few smaller branches become dry
4	Gum oozed out and few branches become dry
5	Up to 15 per cent of the tree become dead
6	16-35 per cent of the tree become dead
7	36-50 per cent of the tree become dead
8	51-75 per cent of the tree become dead
9	> 75 per cent of the tree become dead

Pictorial diagram of sudden decline symptoms on mango tree

The disease symptoms were observed from sides of the tree according to the direction indicator *i.e.* east, west, north and south. On the basis of the symptoms and range of infection was allocated scale from 0-9 showing 0 → 75 % given in (Fig. 1).

Study of symptoms

The infected parts were collected separately in polythene bags and carried in laboratory and symptoms were studied with the help of microscope.

Disease evaluation parameters

The infection was identified on basis of symptoms *i.e.*, cankers, oozing, rotting and blackening specifically on collar and root portions of mango tree. Therefore, disease incidence was calculated as number of infested plants showing above mentioned any single symptoms out of total numbers of mango plants observed.

$$\text{Disease incidence} = \frac{\text{No. of infected panicles}}{\text{Total no. of panicles examined}} \times 100$$

The disease severity on mango was determined according to the development of severity scale as the infected area of mango sudden decline symptomatic portion of mango tree divided by total area and multiplied by 100 given by Masood *et al.*, 2010.

$$\text{PDI (\%)} = \frac{\text{Sum of all the disease rating}}{\text{No. of panicle observed} \times \text{Maximum disease grade}} \times 100$$

RESULTS AND DISCUSSION

Disease symptom of sudden decline

The characteristic symptoms (Fig. 2) of the disease appeared are gum oozing, bark splitting, rotting sign, vascular discoloration, canker formation and withered leaves attached over after drying of tree. The wood underside the decayed barks stained yellow and brown to black followed by blockage of the vascular system caused decline of the associated part or the whole tree

Prevalence of sudden decline

The results with reference to mango sudden decline syndrome (MSDS) indicated in Table No.1 revealed that out of three selected locations, maximum disease incidence was found at Sainik farm (46.66%) followed by 20 per cent Horticulture Research Station (HRC, Pattarchatta) and 10 per cent at Pantnagar vicinity. Per cent disease index of sudden decline was highest in Sainik farm (1.48), followed by Horticulture Research Centre (HRC) (1.11). Minimum per cent disease index was recorded from Pantnagar (0.74) respectively. In Sainik farm there was no cultural/management practice to be followed

while in HRC, cultural, chemical management tactics were followed so less disease incidence and severity, while in Pantnagar vicinity people followed proper cultural, chemical practices thereby reducing the disease incidence and severity. The result was supported by Al Adawi *et al.*, (2003); Panhwar *et al.*, (2007); Van Wyk *et al.*, (2007); Masood *et al.*, (2010); Khaskheli *et al.* (2011); Rehman *et al.* (2011); Saeed *et al.*, (2011); Rashid *et al.* (2013); Naqvi *et al.* 2015; Alam (2015); AQAS (2015); Poussio *et al.*, (2016). Panhwar *et al.*, (2007) recorded the disease severity at different locations and indicated maximum severity index (4.78%) and minimum disease index was found to be 1.32 per cent. He also found that the infections on lower (basal) parts of the tree were sudden killer of the whole tree. Masood *et al.*, (2010) given a detailed methodology for assessment of mango sudden decline. Khaskheli *et al.*, 2011 recorded the prevalence of sudden decline at different locations of different age groups. Van Wyk *et al.*, (2007); Rehman *et al.*, (2011); Saeed *et al.*, (2011); Naqvi *et al.*, 2015; Alam (2015); Poussio *et al.*, (2016) recorded disease incidence and severity on commercial mango varieties.

Table 1: Prevalence of sudden decline

Locations	No. of trees observed	Characters under study			Disease incidence (%)	Disease index (%)	
		Bark splitting	Oozing	Drying of branches			Wilting
HRC	30	3	0	1	2	20	1.11
Sainik farm	30	6	1	2	5	46.66	1.48
Pantnagar	30	0	0	1	2	10	0.74



Figure 1: Pictorial key for sudden decline according to scale (0-9)



Figure 2: Symptoms of Sudden decline

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