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MANGO FLORAL MALFORMATION: DISEASE RATING

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ABSTRACT
In the present investigation, experiment was conducted to develop a pictorial key for evaluating the floral malformation incidence and per cent disease index on each twenty different mango cultivars. The study was conducted in randomized block design with three replications during cropping season 2013 and 2014. The incidence of disease was more in the commercially successful varieties like Amrapali (15.50%), Dashehari (11.55%) and was minimum in local variety Neelum (2.63%) in both the years. The maximum PDI was found in cultivars Amrapali (2.75), while minimum PDI was observed in cultivar Neelum (1.63) in both the years. The study indicated that during both the years of study the commercially grown cultivars like Amrapali and Dashehari were found to be more suspectible, and the local cultivar Neelum was least suspectible indicating the role of local cultivars in incorporating floral malformation resistance for future mango breeding programme.

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. It occupy an area of 2.51 lakh ha having annual production of 18.4 lakh ton giving productivity 7.3 ton/ha in India and contributes 20.7 per cent production share of major fruit crops in India (NHB, 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 malformation is one of the most destructive malady of mango in nature (Adhikary *et al*., 2013). It is a major constraint to mango production in India and other mango growing countries of the world. Affected panicles either do not set fruit or abort fruit shortly after they have set; yields can be reduced by as much as 50 to 80 % (Kumar *et al*., 2011). 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 the study of suffering in plants and an important tool for disease assessment and helpful in developing resistant cultivars (Anonymous, 2014). Crop losses can be prevented by measuring the intensity of disease and thus they are part of any disease survey and surveillance programme (Akhtar and Alam, 2002). 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 mango floral malformation with the objective of evaluating the disease incidence and per cent disease index (PDI) for developing the resistant cultivars in breeding programmes.

MATERIALS AND METHODS

The field experiment was conducted at Horticulture Research Centre (HRC), Pattarchatta G.B. Pant University of Agriculture andTechnology, Pantnagar whereas glass house experiment was carried out in Department of Plant Pathology Pantnagar, Uttarakhand. The experiment was conducted at HRC on 10-15 years old trees of 20 cultivars during 2013 and 2014 with three replications. The 30 randomly selected panicles from 20 cultivars were selected for generating data.

Evaluation of disease parameters for assessment of floral malformation disease

The 30 randomly selected current year panicles from all the four sides of the test plants were labeled before symptoms were detected and malformed shoot lets were recorded at seven days interval. The assessment carried out by using self designed pictorial diagram 0-5 grades disease rating scale on the basis of range of mango panicles affected by the disease from the given disease rating on malformation by (Hafiz *et al*., 2008) (Iqbal *et al*., 2011) (Chakraborti and Misra 2014)

Pictorial diagram of powdery mildew 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 0-5 showing 0 - > 50 % disease severity on each panicle of mango tree as given in (Figure1).

Study of Symptoms

The panicles 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 present in the panicle. Thereafter, disease incidence was calculated as the number of infested panicles showing symptoms out of total numbers of mango panicles observed.

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

The percent disease intensity (PDI) was calculated by using the formula developed by McKinney (1923) is given below

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

RESULTS AND DISCUSSION

Disease symptom of floral malformation

The characteristic symptom (Figure 2) of the disease appeared in the primary, secondary and tertiary rachises are short, thickened and much enlarged or hypertrophied and highly branched. Such panicles are greener and heavier with increased crowded branching, possess numerous flowers that remain unopened, are male and rarely bisexual. The characteristic symptoms observed due to the disease were compared with the available literature and these were found to be similar to those documented by (Iqbal *et al*., 2004) (Khaskheli *et al*., 2008) (Krishnan *et al*., 2009) (Iqbal *et al*., 2011) (Khaskheli *et al*., 2008) (Krishnan et al., 2009) (Haggag *et al*., 2010) (Iqbal *et al*., 2011) (Kumar *et al*., 2011) (Rymbai and Rajesh ,2011) (Ansari *et al*., 2015) (Youssef, 2015).

Mango floral malformation incidence and per cent disease index on twenty mango cultivars

The floral malformation of mango is widespread throughout most of the mango growing areas and the incidence varied from cultivar to cultivar. The perusal data from Table No. 1. Revealed that in general the disease incidence was more in the year 2014 as compared to the year 2013. A sudden rise in the temperature and high humidity in Feburary (hotter and drier periods) might have created the more favorable conditions for the floral malformation development in the year 2014. It was also observed that during the year 2013, disease incidence was found maximum in cultivar Amrapali minimum in cultivar Neelum. However in the year 2014, maximum disease incidence was found in cultivar Amrapali minimum in cultivar Neelum. (Freeman *et al*., 2007) (Iqbal *et al*., 2004) (Hafiz *et al*., 2008) (Khaskheli *et al*., 2008) (Krishnan *et al*., 2009) (Haggag *et al*., 2010) (Iqbal *et al*., 2011) (Kumar *et al*., 2011) (Rymbai and Rajesh, 2011) (Chakraborti and Misra 2014) (Ansari *et al*., 2015) (Youssef, 2015) have also reported that sudden high temperature and high humidity at the time of flowering increases the floral malformation incidence. The pooled analysis revealed that maximum disease incidence was found in cultivar Amrapali minimum in cultivar Neelum. It is clear from the result that the floral malformation incidence was more in the commercially successful varieties like Amrapali in both the years and was minimum in local variety Neelum. The low incidence of floral malformation in cultivar Neelum in both the years clearly demonstrated the importance of local germplasm as a source of resistance for this disease in

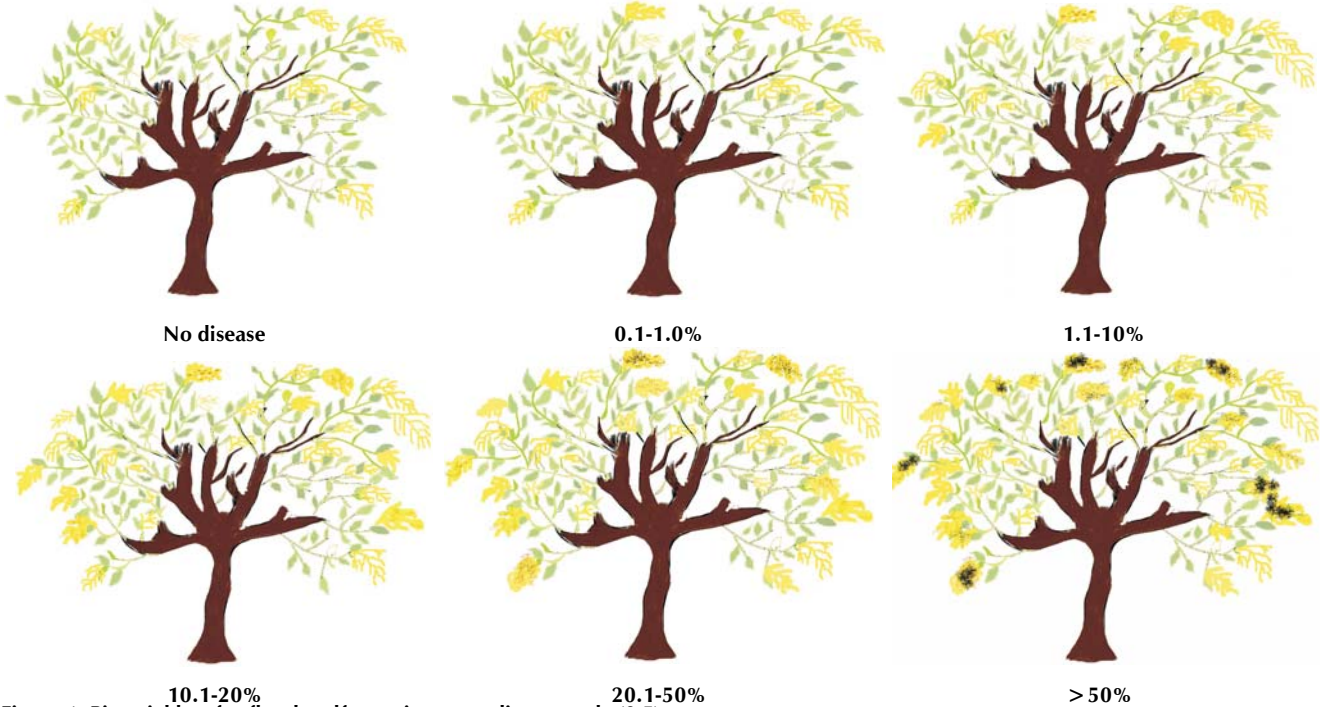

Figure 1: Pictorial key for floral malformation according to scale (0-5)

Table No 1 : Mean mango floral malformation incidence and per cent disease index on twenty mango cultivars

S.No	Cultivar	Disease incidence (%)			Per cent disease index (%)		
		2013	2014	Mean	2013	2014	Mean
1	Pantsinduri	10.7	11.95	11.33	2.38	2.5	2.44
2	Dashehari	10.98	12.11	11.55	2.38	2.63	2.51
3	Amrapali	14.86	16.13	15.5	2.75	2.75	2.75
4	Neelum	2.13	3.12	2.63	1.63	1.63	1.63
5	Hathijhool	7.02	7.82	7.42	2	2.13	2.07
6	Rasgulla	8	8.95	8.48	2	2.13	2.07
7	Redtotapari	9.63	10.94	10.29	2.38	2.38	2.38
8	Langra	6.95	7.99	7.47	2	2	2
9	Nashpati	6.73	7.81	7.27	2.13	2.13	2.13
10	Ramkela	7.64	8.4	8.02	2.13	2.13	2.13
11	Gaurjit	7.09	8.21	7.65	2.13	2.13	2.13
12	Golazafrani	8.43	9.3	8.87	2.13	2.13	2.13
13	Gulabkhas	7.04	8.24	7.64	2	2	2
14	Gorakhpurlangra	8.99	10.17	9.58	2.13	2.38	2.26
15	Kalahafus	9.6	10.83	10.22	2.38	2.38	2.38
16	Karela	11.19	12.4	11.8	2.38	2.5	2.44
17	Tamancha	12.53	13.37	12.95	2.5	2.5	2.5
18	Barahmasi	8.45	9.48	8.97	2.13	2.25	2.19
19	Husnara	5.12	6.41	5.77	1.88	2	1.94
20	Chausa	3.65	4.85	4.25	1.38	1.5	1.44

Floral malformation

Vegetative malformation

Figure 2: Symptoms of malformation (a) Floral (b) Vegetative

the development of improved mango varieties. In the year 2013, maximum PDI was found in cultivars Amrapali and Tamancha and minimum in cultivars Neelum and Chausa While in the year 2014, maximum PDI was observed in cultivars Amrapali and Dashehari and minimum in cultivars Neelum. However in the pooled analysis maximum PDI was found in cultivars Amrapali and Dashehari while minimum PDI was observed in cultivar Neelum. It is evident from the study that suspectible cultivars against the disease are Amrapali and Dashehari and resistant cultivar is Neelum. This again indicated that the local cultivars though are less yielder but possesses better resistance against floral malformation and can be used in the mango breeding programmes. (Freeman *et al.,* 2004) (Iqbal *et al*., 2004) (Hafiz *et al*., 2008) (Khaskheli *et al*., 2008) (Krishnan *et al*., 2009) (Haggag *et al*., 2010) (Iqbal *et al*., 2011) (Kumar *et al*., 2011) (Rymbai and Rajesh, 2011) (Chakraborti and Misra , 2014) (Ansari *et al*., 2015) (Youssef 2015) have also reported the differential response of floral malformation incidence on different cultivars of mango.

REFERENCES

Adhikary, N. K., Dey, S. and Tarafdar, J. 2013. Studies on morphology of mango anthracnose disease causing fungus *C. gloeosporiodies* (Penz.) Penz and Sacc. and efficacy of Azoxystrobin against the fungus under invitro and in vivo condition. *The Bioscan*. **8(2):** 493-497.

Akhtar, K.P. and Alam, S.S. 2002. Assessment keys for some important Diseases of Mango.*Pak. J. Biological Sci.* 5**:** 246-250.

Anonymous, 2014. www.horticultureworld.net. Major mango diseases and their control

Ansari, M.W., Rani, V., Shukla, A., Bains, G., Pant, R.C., Tuteja, N.2015. Mango (Mangifera indica L.) malformation: a malady of stress ethylene origin. *Physiol Mol Biol Plants*. **21(1):**1-8.

Basha, S. T., Suvarna,J., Hemalatha, T. M. and Reddy, N. P. E. 2010. Compatibility of native potential bioagents with different fungicides against *C. gloeosporioides* Penz. causing mango anthracnose. *The*

Bioscan. **5(1):** 19-20.

Chakraborti, K.and Misra, D. K. 2014. Evaluation of Taxa for tolerance against floral malformation in Gangetic West Bengal. *Universal J of Plant Sci*. **2:** 21-30.

Freeman, S., Klein-Gueta, D.and Korolev, N. 2004. Epidemiology and Survival of *Fusarium mangiferae*, the Causal Agent of Mango Malformation Disease. *Acta Hort*. **645:** 487-491.

Hafiz, I. A., Ahmad, S., Abbasi, S. A., Anwar, R., Chatha, Z.A. and Grewal, A.G.2008. Intensity of panicle malformation in mango (*mangifera indica* L.) Varieties. *Pak J Agri Sci*. **45(4):** 418-423.

Haggag, M., Hazza, M., Sehab and Wahab, M. 2010. Epidemiology and the Association of the *Fusarium Species* with the Mango Malformation Disease in Egypt. *Nature and Science*. **8(4):**129-135.

Iqbal, Z., Saleem, A. and Dasti, A.A.2004. Assessment of Mango Malformation in Eight Districts of Punjab (Pakistan). In *J of Agri and Bio*. **6:** 620-623.

Iqbal, Z., Akhtar, N., Ghazanfar, M. U., Shehzad, S. M., Ahmad, S., Asif, M., Yasin, M., Pervez, M.A., Dasti, A.A. and Saleem, A.2011. Management of mango malformation through physical alteration and chemical spray. *African J of Agril Res*. **6(7):** 1897-1901.

Khaskheli, M. I., Pathan, M. A., Jiskani, M. M., Wagan, K. H., Soomro, M. H and Poussio, G. B. 2008. First record of *Fusarium nivale* associated with mango malformation in Pakistan. *Pak J Bot*. **40(6):** 2641-2644.

Krishnan, A. G., Nailwal, T. K., Shukla, A. and Pant, R. C.2009. Mango (*Mangifera indica*. L) Malformation an Unsolved Mystery. *Researcher*. **1(5):** 20-36.

Kumar, P., Misra, A.K. and Modi, D.R. 2011. Current status of Mango Malformation in *India*. *Asian J of Plant Sci*. **10(1):** 1-23.

McKinney, H. H. 1923. Influence of soil temperature and moisture oninfection of wheat seedling by *Helminthosporium sativum*. *J. Agric.Res*. **26:** 195-217.

National Horticulture Database. 2014. http://nhb.gov.in/area-pro/ NHB Database 2015. (retrieved on 21.9.2015).

Nutter, F.W., Esker, P.D. and Netto, R.A.C.2006. Disease assessment concepts and the advancements made in improving the accuracy and precision of plant disease data. *European J*. **115:** 95-103.

Rymbai, H.and Rajesh, A. M.2011. Mango Malformation: A Review. Life sciences Leaflets. **22:**1079-1095.

Youssef, S.2015. Mango Malformation Disease: Etiology, Epidemiology and Management. *Acta Hort*. **1075:** 207-214.