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## ***In vivo* and *in vitro* effect of pH level on growth of *Fusarium moniliforme* var. *subglutinans* causal organism of mango malformation**

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*In vivo* disease incidence of mango malformation was significant in pH range of 6.5 to 7.2 as compared to pH range of 7.0 to 7.5. *In vitro* results revealed that the linear growth of the pathogen *Fusarium moniliforme* var. *subglutinans* was maximum at pH 6.5 in potato dextrose agar and potato dextrose broth respectively. Below and above pH 6.5 the mycelial linear growth as well as mycelia dry weight tended to decrease.

**Key words:** Mango (*Mangifera indica* L.), disease incidence, potato dextrose broth, potato dextrose agar

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### **INTRODUCTION**

Mango malformation caused by *Fusarium moniliforme* var. *subglutinans* Wollew. and Reink. is the most serious disease of mango (*Mangifera indica* L.) in India. The disease has posed a serious threat to mango industry in several mango growing areas of the country because it produces abnormal vegetative shoots and inflorescence on the affected plants which ultimately do not bear any fruit. The disease is widely prevalent over different mango growing tracts of India including North-East, North-West and South (Varma *et al.*, 1974).

Although some works have been done regarding mango malformation from different parts of the country and outside India (Khan and Khan, 1960) but information regarding *in vivo* and *in vitro* effect of pH level on growth of the pathogen *F. moniliforme* var. *subglutinans* Wollew and Reink is lacking. Keeping in view the present study was undertaken.

### **MATERIALS AND METHODS**

*In vivo* study was undertaken during the year 2003, 2004 and 2005 under natural condition at three locations namely, Agri-Horticultural nursery, (22.43° N and 88.34° E) Chowgacha (District North 24 Parganas), Agri-Horticultural Farm (22.75° N and 88.10° E) Pandua (District Hoogly) and Sarkar Nursery (22.54° N and 88.28° E), Shyamnagar, (District North 24 Parganas). The cultivar Bombay Green was raised in all these locations. The distance between seedling to seedling was 22.5 cm, while row to row distance was kept at 45.0 cm. Soil samples were randomly collected from each location and pH level was determined. Before planting of seedlings IFCO-NPK fertilizers containing nitrogen (N), phosphorus (P) and potash (K) respectively in the ratio of 10:26:26 was applied @500 g per bed during September and October. Incidence and severity of mango malformation was recorded in all the three locations in the scale of 1.0-5.0.

*In vitro* method for studying growth of *F. moniliforme* var. *subglutinans* Wollew. and Reink. was studied on potato dextrose agar (PDA) me-

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dium using 10 cm sterilized Petriplates. Using buffers described by Gomori (1955) different levels of pH (5.0 to 8.0) of the culture medium were adjusted with the help of a photoelectric pH meter. PDA plates with different pH levels of 5.0, 6.0, 6.5, 7.0 and 8.0 having 5 replication each were then inoculated at the centre with the 6 mm disc of the fungal culture followed by incubation at  $27 \pm 1^\circ\text{C}$  and mycelia growth (mm) was recorded after 7 days.

Effect of different pH levels of (5.0-8.0) on mycelial dry weight was studied on potato dextrose broth (PDB) in 100 ml Erlenmeyer flasks having 5 replication for each pH level. The flasks containing sterilized PDB were seeded with 6 mm disc of fungal culture and incubated at inoculated at the centre with the 6 mm disc of the fungal culture followed by incubation at  $27 \pm 1^\circ\text{C}$ . After 14 days of incubation mycelial mats were taken out from each of the flasks and the culture filtrate was filtered through folded Whatman No.1 filter paper of known weight (x). The mycelial mats were then allowed to dry in a drier at  $45^\circ\text{C}$  for 48 h. The weight of the dry mycelial mats along with the filter papers (Y) was taken. Finally subtracting the weight of the filter paper from the dried mycelia mat including the filter paper (y) the weight of the dried mycelial mat (Y-X) was calculated.

## RESULTS AND DISCUSSION

### *In vivo* disease incidence in different nurseries with different level of soil pH

The result revealed that the disease incidence was highest at both Agri- Horticultural Nursery,

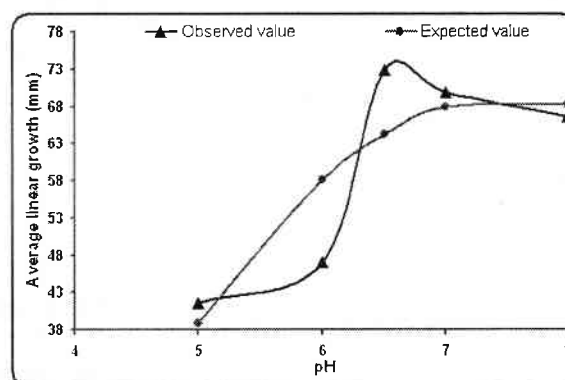
Chowgacha (pH 6.5 to 6.7) and Sarkar Nursery, Shyamnagar (pH 6.5 to 7.2) as compared to (mean

**Table 2 :** Effect of different level of pH on linear growth of *F. moniliforme* var. *subglutinans* on PDA medium

pH (X)	Average linear growth (mm)	
	Observed value (y)	Expected value (Y)
5.0	41.5	38.84
6.0	47.0	58.17
6.5	72.8	64.25
7.0	69.8	67.95
8.0	66.6	68.18

Quadratic regression equation

$$\text{Average linear growth : } Y = 200.91 + 71.8086X - 4.7714 X^2$$



**Fig. 1 :** Graphical representation of effect of different level of pH on linear growth of *F. moniliforme* var. *subglutinans* in PDA medium

**Table 1 :** Effect of different soil pH on incidence of *F. moniliforme* var. *subglutinans* in different nursery

Nursery with different level of soil pH	Average disease index in different years			Mean disease index
	2003	2004	2005	
(i) Agri - Horticultural nursery, Chowgacha, (Dist. North 24 Parganas) (6.5 to 6.7)	4.9	4.7	4.9	4.8
(ii) Agri - Horticulture Farm, Pandua nursery, (Dist. Hooghly) (7.0 to 7.5)	4.8	4.6	4.7	4.7
(iii) Sarkar nursery, Shyamnagar, (Dist. North 24 Parganas) (6.5 to 7.2)	4.9	4.8	4.7	4.8

S.E. (mean) = 0.010, Critical difference  
at P = 0.05 0.039  
at P 0.01 0.065

disease index 4.7) Agri-Horticultural Farm, Pandua nursery (pH 7.0 to 7.5 ) and the disease incidence of both Agri- Horticultural Nursery , Chowgacha (pH 6.5 to 6.7 ) and Sarkar Nursery, Shyamnagar significantly differed from that of Agri-Horticultural Farm , Pandua (Table 1).

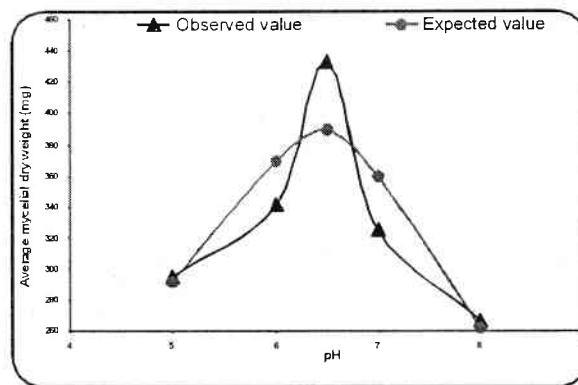
**Table 3 :** Effect of different level of pH on mycelial dry weight of *F. moniliforme* var. *subglutinans* in PDA Broth medium

pH (X)	Average dry weight of mycelium (mg)	
	Observed value (y)	Expected value (Y)
5.0	295.2	292.45
6.0	340.2	369.88
6.5	433.2	375.82
7.0	325.1	359.91
8.0	267.0	262.54

Quadratic regression equation Average dry weight :  $Y = 1405.7 + 558.130X - 43.700 X^2$

***In vitro* effect of different level of pH on linear growth and mycelial dry weight of the pathogen**

The linear growth of the pathogen was maximum at pH 6.5. Below and above pH 6.5 the mycelial growth gradually tended to decrease. A good linear growth was recorded at pH 7.0 (Table 2, Fig.



**Fig. 2 :** Graphical representation of effect of different level of pH on mycelial growth of *F. moniliforme* var. *subglutinans* in PDA medium

1). Mycelial dry weight of the pathogen was highest at pH 6.5. However, below and above pH 6.5 the mycelial dry weight gradually tends to decrease (Table 3, Fig. 2).

From the result of the present study it may be concluded that the incidence of the malformation is influenced by soil pH. *In vivo* study revealed that disease incidence was highest in soil pH between 6.5 to 7.2. *In vitro* study shows that both linear growth and mycelial dry weight was maximum at pH 6.5. A good linear growth and mycelial dry weight was recorded at pH 7.0.

**REFERENCES**

Gomori, G. 1955. Preparation of butter for use in enzyme studies. *Methods in enzymology*. 1:138-146.  
 Khan, M.D. and Khan, A. H. 1960. Studies on malformation of mango inflorescences in West Pakistan. *Punjab Fruit J.*, **23**: 247-258.  
 Varma ,A. Lele, V.C. and Goswami, B.K. 1974. Mango malformation. In Raychowdhuri, S.P. and Verma , J.P. (eds.) *Current Trends in Plant Pathology*, Lucknow Univ., Lucknow, 196-208.