

## FUSARIUM WILT ENDANGERS RIVERBED CULTIVATION OF CUCURBITS

BY

P. R. PALODHI AND BINEETA SEN

Division of Mycology & Plant Pathology,  
Indian Agricultural Research Institute,  
New Delhi-110012

Wilt caused by four *Fusaria* viz., *Fusarium-oxysporum*, *F. solani*, *F. moniliforme* and *F. moniliforme* var. *subglutinans* has become a serious disease of cucurbits cultivated at Jamuna river bed in Delhi. This first systematic survey from 1974 to 1978 enabled disease assessment in five major cucurbits, viz., bottlegourd, watermelon, muskmelon, cucumber and pumpkin. Leaf yellowing and necrosis, stunting and wilting being the parameters, the disease rating was found to increase from 11.99 in 1974-75 to 19.52 in 1977-78. Bottlegourd was the worst affected crop followed by watermelon, muskmelon, cucumber and lastly pumpkin. The disease being seedborne, higher relative humidity during the seed storing period in 1975 and 1977 were presumed to increase the seed infection resulting in peaks in wilt incidence. Farmers have been advised to collect seeds from healthy plants only and to store them in well ventilated dry condition.

### INTRODUCTION

*Fusarium* wilt of cucurbit is amongst the earliest known diseases which called awareness of the pathologists from late nineteenth century (Smith, 1899; Stone, 1911). Since then attention was called towards prominent disease incidence and perceptible loss in cucurbit crop yield due to infection of *Fusarium* spp. all over the world (Voglino, 1925; Conroy, 1953; Leach and Currence, 1938; Nikiforova, 1966). Recently in India also this disease has become a serious threat to cucurbit cultivation. In 1963, damaging seed-borne infection of squashmelon (*Citrullus vulgaris* var. *fistulosus*) by *F. oxysporum* was first pointed out by Suryanarayana and Nath. Incidence of muskmelon wilt caused by *F. oxysporum* f. sp. *melonis* was reported in 1971 by Bhaskaran *et al.* Later *F. solani* was recognised as a serious wilt pathogen of muskmelon of Punjab (Watraitch *et al.*, 1976) and Delhi (Sen and Palodhi, 1979). Extensive surveys revealed that four pathogenic *Fusaria* viz. *F. oxysporum*, *F. solani*, *F. moniliforme* and *F. moniliforme* var. *subglutinans* are constantly prevalent and are responsible for causing this disease in the riverbed area of Delhi (Palodhi, 1979).

This work reports the first systematic survey of wilt diseases at Jamuna riverbed, which forms one of the potential cucurbit cultivating areas in the North-West of India.

## MATERIALS AND METHODS

- a) Survey period : 1974-'78 (4 years)
- b) Locality : Jamuna riverbed, Delhi
- c) Field : One acre per crop ; 24 (12+12) rows ; each row 62.4 m ; row-to-row distance 2.7 m ; hill-to-hill spacing 1 m ; 1 to 3 plants per hill.
- d) Crops : Bottle-gourd (*Lagenaria siceraria*) (Molina) Sandl.  
Watermelon (*Citrullus vulgaris* Sohrad.)  
Muskmelon (*Cucumis melo* L.)  
Cucumber (*Cucumis sativus* L.)  
Pumpkin (*Cucurbita maschata* Pois)
- e) Criteria : (i) Stunting  
(ii) Leaf yellowing and necrosis  
(iii) Wilting

In the field condition, disease could be effectively assessed on the basis of the broad symptomatological criteria mentioned above, found during the flowering period of the crops.

f) *Rating* : In rating the disease incidence all the three criteria were given equal weightage as the stunted or yellowed plants were unable to yield any marketable produce and were therefore, no better than the wilted plants. Plants showing any of these symptoms were considered as diseased. Disease incidence per acre for the individual crops was recorded as :

$$\text{Field rating} = \frac{\sum \text{row rating}}{\text{rows}}$$

$$\text{Row rating} = \frac{\sum \% \text{ plants diseased}}{\text{row}}$$

Assessment of total disease incidence per year was made by taking average of sum total field rating of individual crops of respective years.

## RESULTS AND DISCUSSION

Disease initiation was noticed in the form of typical leaf yellowing, necrosis and stunting of the vines, sometimes leading to a sudden or a gradual wilting of the plants. Stunted, yellowed plants bore large number of fruits which were remarkably reduced in size and sometimes shrivelled and thus totally unmarketable.

The disease incidence in each crop during 1974-'75, '75-'76, '76-'77 and '77-'78 is presented in Table 1 and Fig. 1. In bottlegourd, both disease incidence and rate of progress of disease was the highest as compared to the other four

crops, although in the initial year of study disease prevalence in bottlegourd was lower than that in muskmelon and watermelon. Pumpkin was the least affected crop.

The trend in disease increase followed an identical sequence in all the five crops. This was marked by peaks in 1975-'76 and 1977-'78 and fall in 1976-'77. But this sudden decline did not surpass the initial stage of disease during 1974-'75. Combining all the five crops (Table 2) the disease situation increased from 11.99 in 1974-'75 to 19.82 in 1977-'78.

Table 1. *Incidence of Fusarium wilt in five cucurbitaceous crops at Jamuna river bed during a four year period from 1974-1978.*

Crops	Field rating			
	1974-75	1975-76	1976-77	1978-78
Bottle gourd	14.58	30.94	25.91	31.36
Watermelon	15.19	21.34	19.21	20.93
Muskmelon	15.30	20.91	15.76	22.78
Cucumber	13.81	17.10	15.99	17.90
Pumpkin	1.07	4.61	2.12	6.14

Table 2. *Assessment of Fusarium wilt incidence in cucurbitaceous crops at Jumna river bed from 1974-1978.*

Year	Average field rating
1974-75	11.89
1975-76	18.98
1976-77	15.78
1977-78	19.82

The wilt pathogen though normally soil borne, was proved conclusively to be carried in the seeds in this case. Soil did not play any decisive role in disease perpetuation in riverbed cultivation (Palodhi, 1979). Under such circumstances, seed storage conditions greatly determine the fate of the ensuing crop. The farmers of Jamuna riverbed store their seeds in cloth bags in improperly ventilated lofts. It was rather interesting to note a direct correlation between the disease incidence and the relative humidity. The higher relative humidity during the storing period (July to November) of '75 and '77 (Table 3)

Table 3. Relative humidity (per cent) during 1974-1977

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Av. of seed Storing period
1974	86	85	78	50	52	57	88	85	76	77	70	81	79.2
1975	90	80	67	50	44	70	86	92	93	81	87	88	87.2
1976	94	93	80	59	51	73	83	91	82	77	86	88	67.2
1977	90	88	71	69	58	67	96	87	89	86	96	94	80.8

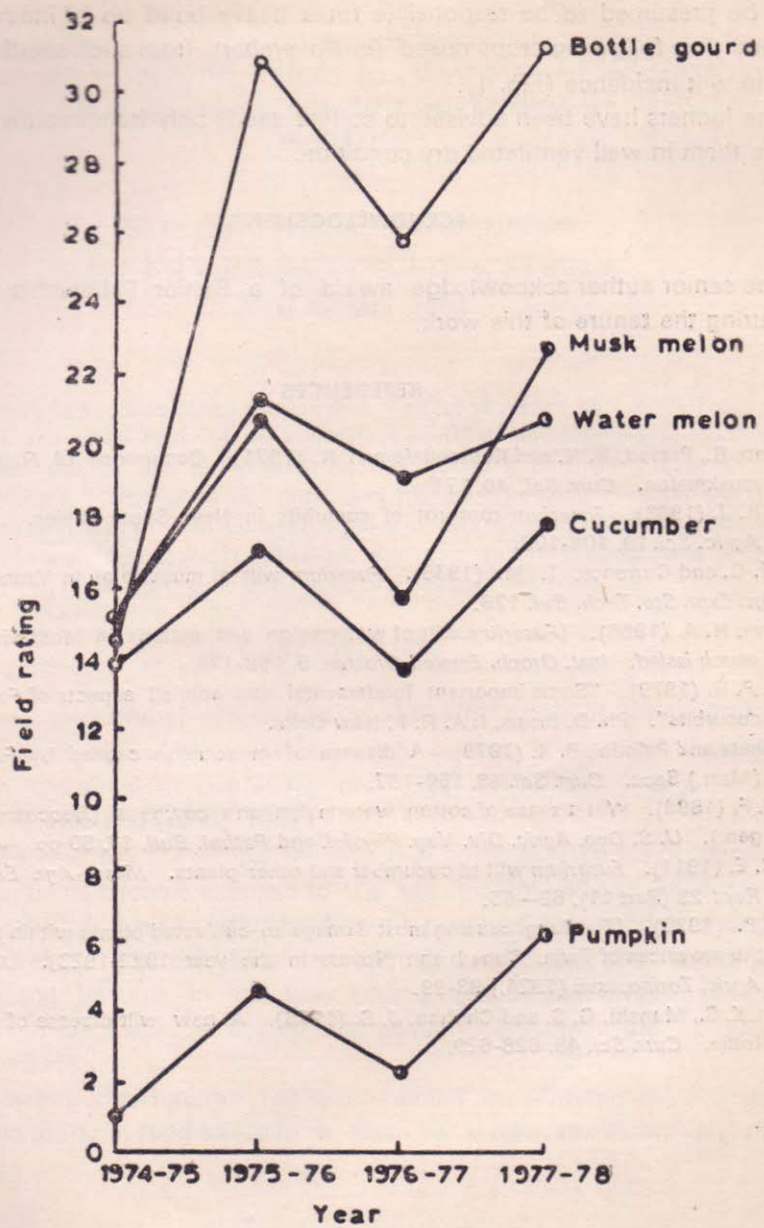


Fig. 1. Incidence of *Fusarium* wilt incidence in five cucurbitaceous crops at Jamuna riverbed during four year period from 1974 - 78

could be presumed to be responsible for a heavy build up of inoculum in the seed and thus following crops raised (in November) from such seedlots showed peaks in wilt incidence (Fig. 1).

The farmers have been advised to collect seeds only from healthy plants and to store them in well ventilated dry condition.

#### ACKNOWLEDGEMENT

The senior author acknowledge award of a Senior Fellowship by the I. A. R. I. during the tenure of this work.

#### REFERENCES

- Bhaskaran, R., Prasad, N. N. and Kothandaraman, R. (1971). Occurrence of *Fusarium* wilt of muskmelon. *Curr. Sci.*, **40**, 171.
- Conroy, R. J. (1953). *Fusarium* root rot of cucurbits in New South Wales. *J. Aust. Inst. Agric. Sci.* **19**, 106-108.
- Leach, J. G. and Currence, T. M. (1938). *Fusarium* wilt of muskmelon in Minnesota. *Minn. Agr. Expt. Sta. Tech. Bul.* 129.
- Nikiforova, N. A. (1966). (*Fusarium* wilt of watermelon and melons in Moldavia) *Trudy mold nauch issled. Inst. Oroch. Zemled Orostch.* **5**, 168-176.
- Palodhi, P. R. (1979). "Some important fundamental and applied aspects of *Fusarium* wilt of cucurbits". Ph. D. thesis, I. A. R. I., New Delhi.
- Sen, Bineeta and Palodhi, P. R. (1979). A disease of muskmelon caused by *Fusarium solani* (Mart.) Sacc. *Curr. Sci.* **48**, 166-167.
- Smith, E. F. (1899). Wilt disease of cotton, watermelon and cowpea (*Neocosmospora* nov. gen.). *U. S. Dep. Agric. Div. Veg. Physiol. and Pathol. Bull.* **17**, 50 pp.
- Stone, C. E. (1911). *Fusarium* wilt of cucumber and other plants. *Mass. Agr. Expt. Sta. Ann. Rept.* **23** (Part 11), 62-65.
- Voglino, P. (1925). (The fungi causing most damage to cultivated plants within the bounds of the provinces of Twin, Cuned and Novara in the year 1922-1923). *Ann. Accad. of Agric. Torino*, **lxvii** (1924), 93-99.
- Waraitch, K. S., Munshi, G. S. and Chohan, J. S. (1976). A new wilt disease of muskmelon in India. *Curr. Sci.* **45**, 628-629.