

A Case Study :

Surveillance of onion basal rot disease incidence caused by *Fusarium oxysporum* f.sp. *cepae* and varietal reaction under field condition

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Onion (*Allium cepa* L.) is one of the most important vegetable crops grown in different parts of our country for its local consumption and export. The major constraints in the production of onion are the diseases viz., basal rot, anthracnose, stem blight etc. which cause severe loss in the productivity. both in field and in storage condition. Of all the diseases the basal rot caused by *Fusarium oxysporum* f.sp. *cepae* is the serious disease in onion growing areas, causing considerable economic losses. The disease occurs in all stages of growth of the crop. Yield loss up to 50 per cent has been recorded in susceptible cultivars (Evert *et al.*, 1985) and 90 per cent losses during seedling stage (Davis and Reddy, 1983), and storage loss accounted to 30 per cent (Barnocakine Stoilova, 1986).

The study was undertaken to survey onion basal rot disease incidence in some parts of Coimbatore and Dindigul districts of TamilNadu state and the varietal reaction was assessed in field condition. The survey conducted in two districts of Tamilnadu state and the population count of pathogen were taken from five different places of the two districts. The pathogenicity of the *Fusarium oxysporum* f.sp. *cepae* was assessed at different age of the crop. In field condition, about six varieties were assessed for varietal reaction against the pathogen.

Survey on the occurrence of the onion basal rot:

Surveys were undertaken in important onion growing pockets in two districts of Tamil Nadu viz., Coimbatore and Dindigul. At each place, five plots were selected. In each plot one metre square area at five randomly selected places were used for taking observation on basal rot. The formula used for calculating disease incidence is as follows (Rajendran, 1995).

$$\text{Disease incidence} = \frac{\text{Total number of plants infected}}{\text{Total number of plants observed}} \times 100$$

Estimation of soil population of basal rot pathogen at different places:

Dilution plate technique was adopted to assess the population of soil borne pathogens as per the method followed by Allen (1953). The infected soil samples were collected from Palladam, Pollachi, Sulur, Thondamuthur and TNAU orchard. One gm soil sample was diluted with ten ml of sterile distilled water. Serial dilution were made. One ml of the final dilution (10⁶) was poured into the Petri plate and 15ml of PDA medium was added and kept at room temperature for 3 days. Colony forming units were counted at the end of the incubation period.

Pathogenicity of *Fusarium oxysporum* f.sp. *cepae*:

The fungus was multiplied by inoculating in sand maize medium (Muthusamy, 1972). Sand and ground maize seed were mixed at the ratio of 19: 1, moistened and autoclaved at 1-4 kg/cm² for 2 hours about 2-3 times consequently. In this sterilized medium, one week old culture of *Fusarium oxysporum* f.sp. *cepae* was inoculated and incubated at 28±2°C for 14 days. Sieved garden soil was taken in pots and autoclaved at 1-4 kg/cm² for 2 hours about 2 days consequently. Inoculum multiplied on sand maize medium was incorporated @50g/kg of soil. After 10 days, 50 days old onion seedlings of variety Rampur Rose were transplanted into pots. Symptom development were observed 30 days after transplantation. From the infected plants, the causal agent was re-isolated.

Effect of inoculum level and age of the plant on disease incidence:

The method followed by Bohra and Lodha (1998) was

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adopted to determine the age of plant and disease incidence.

Sieved garden soil was taken in earthen pots of 22 cm diameter and sterilized in an autoclave at 1.4 kg/cm² pressure for 2 hour. Ten days before transplanting *Fusarium oxysporum* f.sp. *cepae* multiplied in sand maize medium was added at the rate of 10, 25, 50, 75 and 100g/kg of sterile soil in pots. To each pot 10 seedlings of onion Rampur Rose variety were transplanted at each inoculum level simultaneously. Disease incidence was recorded on 25 DAT, 50 DAT and 75 DAT. Experiments were laid out under completely Randomised design (CRD). Suitable control was maintained without the pathogen.

Assessment of varietal reaction against basal rot under field condition:

In different locations such as TNAU orchard, Palladam,

in Amblikkai (9.5 per cent).

Estimation of soil population of Fusarium oxysporum f.sp. cepae at different places in Coimbatore:

The population of *Fusarium oxysporum* f.sp. *cepae* was recorded from soils collected from different places of Coimbatore (Table 2). The maximum population was recorded in Pollachi (17.2 X 10⁶ CFU/g) and the minimum population was observed in TNAU orchard (10.0 x 10⁶ CFU/g).

Influence of inoculum level and age on susceptibility to onion basal rot:

Basal rot incidence was less at 1.0 per cent inoculum level compared to 2.5, 5.0, 7.5 and 10.0 per cent inoculum level (Table3). The disease incidence ranged from 2.5 per cent to 90.0 per cent. Significant differences were

Table 1 : Occurrence of onion basal rot incidence in farmers field

Sr. No.	Place	Crop stage	Variety	Soil type	Mean per cent disease incidence
I. Dindigul district					
1.	Athikombai	Bulb formation	Local	Red soil	13.6
2.	Chinnalapatti	Bulb formation	CO 2	Black soil	14.0
3.	Palanigoundenpudur	Bulb formation	Local	Red soil	10.5
4.	Amblikkai	Bulb formation	Local	Red soil	9.5
5.	Kosavapatti	Bulb formation	Local	Red soil	15.0
II Coimbatore district					
1.	Palladam	Nursery	Agrifound Dark Red	Red soil	17.5
2.	Pollachi	Nursery	Rampur Rose	Red soil	18.7
3.	Sulur	Maturity	Agrifound Dark Red	Red soil	11.8
4.	Thondamuthur	Maturity	Local	Red soil	13.0
5.	TN A U orchard	Maturity	CO 2	Red soil	10.0

Mean of 5 replications

Sulur, Thondamuthur and Pollachi areas for different varieties, viz., Nasik Red, Rampur Rose, Agrifound Dark Red, Co 1, local variety and aggregate onion, the percentage disease incidence was recorded following quadrat based statistical measures (Ridout and Xu, 2000).

Survey on the occurrence of basal rot incidence:

Survey was conducted to assess the intensity of basal rot incidence in Dindigul and Coimbatore districts. In all places, incidence of basal rot was recorded during different stages of crop growth (Table 1). The disease incidence ranged from 9.5 to 18.7 per cent with a mean of 13.36 per cent. Highest disease incidence was observed in Pollachi (18.7 per cent), while the incidence was least

observed with the different inoculum levels. The basal rot incidence also differed significantly at different stages of growth with maximum incidence recorded at 90 days

Table 2 : Population of *F. oxysporum* f.sp. *cepae* in soils from different places

Sr. No.	Places	Mean soil population of <i>F. oxysporum</i> f.sp. <i>cepae</i> (x10 ⁶ CFU)
1.	Palladam	16.50
2.	Pollachi	17.20
3.	Sulur	11.75
4.	Thondamuthur	13.20
5.	TNAU orchard	10.00

C.D. (P=0.05) = 2.9257

Mean of 4 replications

Table 3 : Influence of inoculum level and age on susceptibility to onion basal rot

Days after planting	Inoculum				
	1.0%	2.5%	5.0%	7.5%	10.0%
25	2.5 (9.00)	12.0 (20.23)	16.5 (23.93)	19.0 (25.79)	23.0 (28.79)
50	2.5 (8.99)	15.0 (22.76)	18.0 (25.06)	19.5 (26.19)	25.5 (30.32)
60	3.0 (9.88)	15.0 (22.76)	28.0 (31.9)	32.0 (34.43)	33.5 (35.35)
70	3.0 (9.89)	20.0 (26.52)	42.0 (40.39)	59.5 (50.47)	77.5 (61.70)
80	3.5 (10.73)	25.0 (29.97)	80.0 (63.52)	85.0 (67.37)	85.0 (67.38)
90	3.5 (10.75)	30.0 (33.20)	82.0 (64.91)	88.0 (69.84)	90.0 (71.59)
Control	0.0	0.0	0.0	0.0	0.0

C.D. (P=0.05) Days = 1.103 Inoculum level = 0.932

Days x inoculum level = 2.468 Mean of 3 replications

(Figures in the parentheses are arcsine transformed values)

after planting.

Varietal reaction against onion basal rot under field conditions:

Among Bellary types, the local varieties showed higher disease incidence (41.6 per cent) while Rampur Rose variety showed lower incidence of disease of 14.7 per cent followed by Nasik Red (15.5 per cent) (Table 4).

Table 4 : Reaction of onion varieties to basal root under field conditions

Sr. No.	Treatments	Disease incidence (percentage)
1.	Nasik Red	15.5 (23.18)
2.	Rampur Rose	14.7 (22.54)
3.	Agrifound Dark Red	22.7 (28.45)
4.	CO 1 (TANu)	20.5 (26.92)
5.	Local	41.6 (40.16)
6.	Aggregate onion (bulbs)	25.5 (30.33)

C.D. (P=0.05) = 9.69 Mean of 5 replications

(Figures in parentheses are arcsine transformed values)

Aggregate onion showed a disease incidence of 25.5 per cent which is lesser than local varieties but higher than other varieties such as CO 1 (TNAU) (20.5 per cent),

Agrifound Dark Red (22.7 per cent), Nasik Red and Rampur Rose.

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