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**M Manasa**  
PG Scholar, Department of  
Plant Pathology, Dr. YSR  
Horticultural University,  
College of Horticulture,  
Anantharajupeta, Andhra  
Pradesh, India

**Y Sireesha**  
Assistant Professor,  
Department of Plant Pathology,  
Dr. YSRHU-COH,  
Anantharajupeta, Andhra  
Pradesh, India

**Y Deepthi Kiran**  
Assistant Professor,  
Department of Plant Pathology,  
Dr. YSRHU-COH,  
Anantharajupeta,  
Andhra Pradesh, India

**K Arunodhayam**  
Assistant Professor,  
Department of Plant Pathology,  
Dr. YSRHU-COH,  
Anantharajupeta, Andhra  
Pradesh, India

**P Syam Sundar Reddy**  
Associate Professor, Department  
of Horticulture, Dr. YSRHU-  
COH, Anantharajupeta, Andhra  
Pradesh, India

**Ch. Ruth**  
Professor, Department of Plant  
Pathology, Dr. YSRHU-COH,  
Anantharajupeta, Andhra  
Pradesh, India

**Corresponding Author:**  
**M Manasa**  
P. G. Scholar, Department of  
Plant Pathology, Dr. YSR  
Horticultural University,  
College of Horticulture,  
Anantharajupeta, Andhra  
Pradesh, India

## Survey and collection of *Fusarium* wilt isolates from tomato intensive areas of Rayalaseema zone of Andhra Pradesh

**M Manasa, Y Sireesha, Y Deepthi Kiran, K Arunodhayam, P Syam Sundar Reddy and Ch. Ruth**

### Abstract

Tomato (*Lycopersicon esculentum*, Mill.) also known as poor man's orange belongs to the family Solanaceae is one of the most grown vegetables globally. It is intensively grown in Chittoor, Kurnool and YSR Kadapa districts of Andhra Pradesh. The yield of tomato is confronted to losses caused by many soil borne pathogens, amongst majorly by *Fusarium* wilt caused by soil borne fungus *Fusarium oxysporum* f. sp. *lycopersici* (FOL). To understand and estimate the percentage of *Fusarium* wilt infection, a roving survey was conducted in tomato intensive growing areas of Rayalaseema zone of Andhra Pradesh during Kharif, 2021. The occurrence of wilt incidence ranged from 15% to 60%. During survey, different stages of symptom development was observed viz., initially yellowing of older leaves, drooping and epinasty of leaves, loss of leaf turgidity, lateral wilting on one side of the plant. Under severe circumstances, even stunted growth, vascular discoloration and death of the whole plants were observed. Furthermore, positive correlation was noticed between disease severity and weather temperature which would have aggravated the wilt incidence. Survey concluded that the need of management practices to reduce the *Fusarium* wilt, which depends on weather parameters.

**Keywords:** *Fusarium* wilt, survey, per cent disease incidence, tomato, Andhra Pradesh

### Introduction

Tomato (*Lycopersicon esculentum* Mill.) also called as poor man's orange, belongs to the family Solanaceae. Tomato is intensively cultivated in India, with an area of about 852 thousand hectares corresponding with an annual production of 20389 thousand MT (NHB, 2021-22). India ranks second in tomato production after China with majority of its produce from states like Madhya Pradesh, Andhra Pradesh, Karnataka, Bihar, West Bengal, Maharashtra and Orissa. Andhra Pradesh shares about 10.92% of all India produce with an annual production of 2,217 thousand MT (NHB, 2021-22). Kurnool, Chittoor, Vishakhapatnam and Prakasham districts are the major producers of tomato in Andhra Pradesh. Tomato is a warm season crop and grows well in temperatures ranging from 18 °C-27 °C. Well drained sandy loam soil is best suited for tomato crop.

Tomato is referred as functional food having high nutritive value. It is cultivated for its ripe fruits, which can be used either fresh or in processed form and is a very excellent source of important vitamins and minerals. The high demand for fresh and processed tomato makes it as a valuable crop to generate high income for growers. Plant diseases are the most serious constraints limiting the tomato cultivation.

Tomato is tackled with great losses in production due to *Fusarium* wilt caused by the soil borne fungus, *Fusarium oxysporum* f. sp. *lycopersici* (Sacc.) W.C. Synder and H.N. Hans. This disease was first turned up and described by G.E. Massee in England during 1895. Since then, it is documented as one of the most overwhelming diseases in tomato growing countries globally (Abdel-Fattah *et al.*, 2012) [1]. It is one of the most destructive vascular diseases affecting tomato worldwide and continued to be as major challenging threat for tomato production in India. Disease symptoms develop initially by yellowing of leaves followed by clearing of veinlets and chlorosis of the leaves. The symptoms often occur on one side of the shoot or plant. At the younger stages, infected plant may wilt and die, but older plants may wilt and gradually die. As the disease progresses, growth of the plant is stunted and no fruit development is seen. The pathogen causes root and basal stem deterioration and results in wilting of the plant.

Disease is characterized by the browning of the vascular tissues and if main stem is cut, dark brown streaks may be seen running lengthwise throughout the stem.

FOL is an active saprophyte in field soils and it perpetuates on the infested crop debris. This fungus can invade directly through root tips or through wounds. There may be a 30 to 40% yield loss due to the disease and this may go upon 80% under favourable weather conditions (Nirmaladevi *et al.*, 2016) [2]. The objective of the present study is to estimate the severity of *Fusarium* wilt in tomato in hot spot areas of Andhra Pradesh.

## Materials and Methods

### Survey for the incidence of *Fusarium* wilt disease in tomato intensive areas of Andhra Pradesh

An extensive roving survey was carried out during Kharif 2021, in major tomato growing districts of Rayalaseema zone, Andhra Pradesh, to assess the percent disease incidence of *Fusarium* wilt disease in tomato. In this study, a total of 18 different locations in 7 mandals from 3 districts *viz.*, Chittoor, Kurnool and YSR Kadapa of A. P were covered and recorded the incidence of *Fusarium* wilt in tomato (Fig 1; Table 1). During survey, different stages of symptom development were noticed *viz.*, yellowing or chlorosis of older leaves,

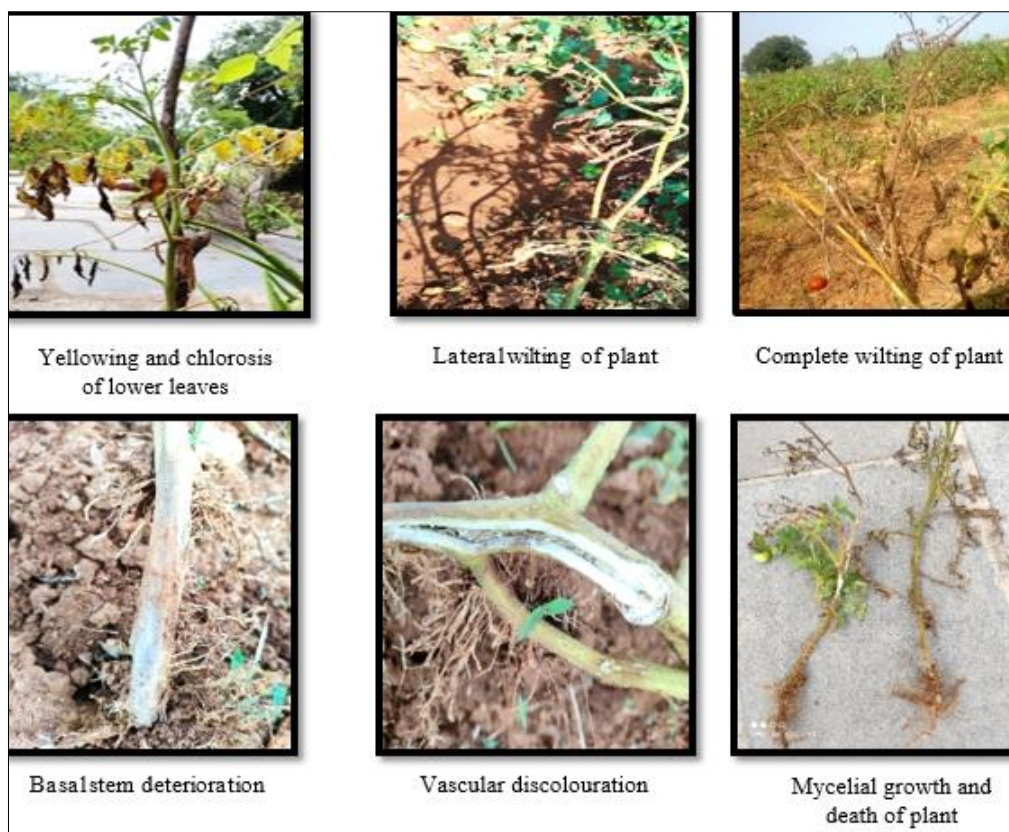
drooping and loss of turgidity of leaves, wilting on one side of the plant were observed and at advanced stage of infection even stunted growth, vascular discoloration and death of whole plant were also seen. The infected plant samples (root, stem and soil) were collected for further analyses.

In each district, one to three mandals were selected and in each mandal, three villages were surveyed and recorded the number of wilted plants in the selected area. The disease severity was recorded by 0-4 scale (Khan *et al.*, 2016) [6].

Categories of the symptoms with 0-4 scale is based on

0. No infection.
1. Slight infection which is about 25% of full scale, one or two leaves became yellow.
2. Moderate infection, two or three leaves became yellow, 50% of leaves became wilted.
3. Extensive infection, all plant leaves became yellow, 75% of leaves become wilted, and growth is inhibited.
4. Complete infection, the whole plant leaves become yellow, 100% of leaves become wilted, and the plants die.

$$\text{Disease incidence (\%)} = \frac{\text{Scale} \times \text{number of plants infected}}{\text{Highest scale} \times \text{Total number of plants}} \times 100$$



**Fig 1:** Field symptoms of *Fusarium* wilt of tomato

## Results and Discussion

The results of the survey revealed that the spread of *Fusarium* wilt incidence had its wide occurrence in almost all tomato growing areas of Andhra Pradesh ranging from 15% to 60%. The maximum PDI of 59.5% was recorded at chinnahuithy village in Kurnool district followed by settivaripalle with 48% in YSR Kadapa, whereas Anantharajupeta of YSR Kadapa recorded the minimum of 15% PDI. On an average, mean percent disease incidence ranged from Kurnool district

followed by Kadapa and Chittoor district. Furthermore, there was a positive correlation between wilt incidence and influence of temperature. Various locations recorded various percentages of wilt severity which might have been impelled by weather parameters. The wilt disease incidence and intensity varied from region to region and within a region depending upon the variation of the pathogen or due to environmental factors (Bharat *et al.*, 2014) [5].

Devi *et al.* (2021) [3] conducted a survey for *Fusarium* wilt disease incidence of tomato from 27 fields of three districts viz., East Godavari, West Godavari and Krishna of Andhra Pradesh. They reported similar results of *Fusarium* wilt incidence ranged from 7.48% to 29%. Manikandan and Raguchander (2014) [4] also recorded the wilt disease incidence that ranged from 19 to 45 per cent in almost all tomato growing areas of Tamil Nadu. Khan *et al.* (2016) [6]

carried out a survey for assessing *Fusarium* wilt disease incidence in selected districts of Uttar Pradesh and recorded highest incidence 80.34% from Barabanki district followed by 74.5% from Bulandshahr district and lowest disease incidence 10.67% at Jhansi district and noticed that wilt disease of tomato lead to low production and productivity in Uttar Pradesh, India.

**Table 1:** List of hotspot areas for tomato wilt incidence

S. NO	District	Mandal	Village	Farmer name	Variety	Per cent Disease Incidence (%)
1	Kurnool	Pathikonda	Peddahutthy	C. Ramesh	448	42.2
			Peddahutthy	M. Govinda	448	40
			Chinnahuithy	U. Jayaramudu	448	59.5
			Chinnahuithy	B. Chandra	448	47
		Mahanandi	Bollavaram	U. Jayaramudu	448	22
			Bollavaram	M. Ramana Babu	448	25
			Nandipalle	A. Sudhakar reddy	Local variety	33
		Kodumuru	Anugonda	S. Ramarao	Local variety	35
			Anugonda	Gopalam	Local variety	38
		Mean- 37.9				
2	Kadapa	Rayachoti	Rayachoti	B.Venkataramana	Nuziveedu Kaliya	20
		Mydukur	Settivaripalle	Bandi tirumalaiah	Rajini	48
			Bhoomaipalle	K. Mallikarjuna	Rajini	35
			Oniipenta	B.R. Ramana	Rajini	40
			Andhireddy palle	A.C. Raghu	Rajini	22
			Settivaripalle	S. Narayana swamy	Rajini	29
			Kesalingaya palle	K.P. Narayana	Rajini	19
		Anantharajupeta	Anantharajupeta	P. Govindharajulu	Nuziveedu Kaliya	15
Mean-28.5						
3	Chittoor	Madanapalle	Peddamandyam	A. Reddy	Local variety	25
Mean-25						
Over all Mean-30.4						

## Conclusion

The present study concluded that the disease incidence was more in Kurnool regions when compared with other regions. Monoculturing of the crop might have resulted in highest disease incidence that could have favoured by warm soil temperatures. Moreover, the absence of resistance in all well-known cultivars of tomato against *Fusarium* wilt could also have contributed for severe yield losses. Current scenario emphasises the need of integration of cultural, biological and chemical methods for successful management of *Fusarium* wilt that can be suggested for successful implementation by farmers.

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