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Survey, Identification and Growth Behaviour of *Fusarium oxysporum* f. sp. *psidii* in Guava

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Abstract

Guava (*Psidium guajava* L.) is an economically important fruit crop severely affected by wilt disease, which poses a major constraint to its productivity. The present investigation was undertaken to study the incidence, causal organism and its characteristics in Ahilyanagar district of Maharashtra. A roving survey conducted across major guava-growing areas revealed that wilt is a predominant disease with variable incidence across locations, ranging from low (around 2.27%) to comparatively higher levels (up to 7.14%), indicating its widespread occurrence and economic significance. Based on cultural, morphological and microscopic characteristics, the pathogen was identified as *Fusarium oxysporum* f. sp. *psidii*. The fungus exhibited white to pink mycelial growth on PDA, with abundant sporulation. Microscopic observations revealed the presence of both microconidia (aseptate, oval to elliptical) and macroconidia (multicellular, sickle-shaped with 3–4 septa), confirming its identity. Further studies on morphological, cultural and physiological characteristics indicated that the pathogen showed variable growth on different culture media, with maximum growth observed on Richard's agar followed by PDA. The fungus produced hyaline, septate mycelium with characteristic conidial structures. Physiological studies revealed that the pathogen exhibited maximum mean mycelial growth at 25°C and pH 6.5 conditions, which play a crucial role in its survival and pathogenicity. These findings provide a better understanding of the biology and ecology of the pathogen, which is essential for developing effective management strategies against guava wilt.

Keywords: Guava, wilt, pH, temperature, *Fusarium*.

1. Introduction

cultivated widely in India due to its high nutritional value, adaptability and economic returns. It is a rich source of vitamin C, pectin and minerals, making it an essential component of human diet as well as the fruit processing industry. Despite its wide adaptability, guava production is significantly constrained by several biotic stresses, among which wilt disease is considered one of the most destructive and economically important (Gupta *et al.*, 2010) [6]. Guava wilt, primarily caused by *Fusarium oxysporum* f. sp. *psidii*, is a serious soil-borne disease affecting guava orchards in major growing regions. The disease is characterized by yellowing, drooping and eventual wilting of leaves, followed by complete plant death. Internally, the pathogen colonizes the vascular tissues, particularly xylem vessels, leading to blockage of water transport and subsequent plant mortality. The severity of the disease has been reported to cause substantial yield losses and, in severe cases, complete orchard decline, posing a major threat to sustainable guava cultivation. Understanding the distribution and incidence of the disease is essential for developing effective management strategies. Surveys conducted in different guava-growing regions have indicated that wilt disease is widely prevalent with varying intensity depending on agroclimatic conditions and orchard management practices. In Maharashtra, particularly in Ahilyanagar district, the disease has emerged as a significant constraint, necessitating systematic investigation into its occurrence and spread. Accurate identification of the causal pathogen is a prerequisite for devising appropriate control measures. Isolation of the pathogen from infected plant tissues using standard microbiological techniques, followed by its identification based on cultural, morphological and microscopic characteristics, remains a reliable approach. *Fusarium oxysporum* f. sp. *psidii* typically produces septate, hyaline mycelium along with two types of spores, viz., microconidia and macroconidia, which serve as key diagnostic features.

Further, studies on morphological, cultural and physiological characteristics of the pathogen provide valuable insights into its growth behavior, survival and pathogenic potential. Evaluation of growth on different culture media and under varying environmental conditions helps in understanding the biology of the pathogen, which is crucial for developing effective disease management strategies.

2. Survey for wilt of guava disease.

A roving survey was conducted during 2025 in Ahilyanagar district, Maharashtra, to assess the incidence of *Fusarium* wilt of guava. Diseased root samples showing typical symptoms such as vascular browning, root decay and plant wilting were collected from different locations. Disease

incidence was calculated based on the number of infected plants over the total plants observed.

The results indicated that wilt disease was prevalent across all surveyed talukas, with incidence ranging from 2.27 to 7.14 per cent. The lowest incidence was recorded in Rahuri taluka (2.27–2.97%), whereas the highest was observed in Rahata taluka (3.80–7.14%). In Newasa and Shrirampur talukas, disease incidence ranged from 2.85 to 4.37 per cent and 3.18 to 4.46 per cent, respectively. Overall, the survey revealed that guava wilt is a widespread and significant disease in the region. These findings are in agreement with earlier reports identifying wilt as a major constraint in guava cultivation. [Gupta and Misra (2012), Hussain *et al.* (2014) Madhu *et al.* (2019)]^[5, 7, 9]

Table 1. Per cent disease incidence of *Fusarium* wilt of guava in Ahilyanagar district

Sr. No.	Taluka	Village	Total number of plant observed	Number of wilted plants	Disease incidence (%)
1.	Rahuri	Digras	220	6	2.27
		Chinchvihire	168	5	2.97
		Bramhani	120	3	2.50
		Kolhar	170	4	2.35
2.	Rahata	Rahata	224	16	7.14
		Astagaon	120	6	5.00
		Loni(pravara)	160	7	4.30
		Ekrakhe	210	8	3.80
3.	Newasa	Shanishignapur	112	4	3.57
		Malichinchora	120	5	4.16
		Ghodegaon	210	6	2.85
		Jeur	160	7	4.37
4.	Shrirampur	Karegaon	120	5	4.16
		Shirasgaon	220	7	3.18
		Haregaon	170	6	3.35
		Bhokar	112	5	4.46

3. Isolation of pathogen causing wilt of Guava.

Samples of diseased guava plants according to their symptoms were collected during survey from different tahsil of Ahilyanagar district. Isolation was carried out by tissue segment method on potato dextrose medium. By using culture plates, the pathogen was cultured, purified and maintained on PDA petri plates for subsequent experiment. Identification of the pathogen was carried out based on symptomatology, cultural and morphological characteristics, microscopic observations and pathogenicity tests. The fungus exhibited white mycelial growth initially, which later turned pink on PDA. Microscopic examination revealed aseptate, elliptical microconidia and 3–4 septate, sickle-shaped macroconidia, confirming the pathogen as *Fusarium oxysporum* f. sp. *Psidii*. These findings align with those reported by Pandey and Dwivedi (1985)^[12] isolated and

identified *Fusarium oxysporum* f. sp. *psidii* from roots of guava plants.

4. Morphology of isolated pathogen

The pathogen *Fusarium oxysporum* f. sp. *psidii* produced septate, hyaline mycelium, initially white which later turned pink (Plate 1). Microscopic examination revealed abundant microconidia and macroconidia. Microconidia were mostly aseptate, oval to elliptical, measuring $4-9 \times 1-3 \mu\text{m}$ (Plate 2), while macroconidia were 3–4 septate, sickle-shaped, thin-walled and measured $15-24 \times 2-5 \mu\text{m}$ (Plate 3). Variations in conidial size were observed among different isolates (Table 2). The present findings on morphological characteristics of *Fusarium oxysporum* f. sp. *psidii* are in agreement with earlier reports by Dubey *et al.* (2010)^[2], Nikam *et al.* (2011)^[11] and Mamta *et al.* (2013)^[10].

Table 2: Morphology of isolated pathogen from various locations

Sr. No.	Name of Location	Isolate	Macro Conidia (μm)	Micro Conidia (μm)	Septation	Shape (Macro)	Shape (Micro)	Colour (Macro)	Colour (Micro)
1	Rahuri	Fs-1	15-17 X 3-4	5-7 X 2-3	2-4	Sickle shaped	Round to Oval	Hyaline	Hyaline
2	Rahata	Fs-2	20-23 X 3-5	7-9 X 2-3	3-4	Sickle shaped with blunt ends	Round to Oval	Hyaline	Hyaline
3	Newasa	Fs-3	19-20 X 3-4	4-5 X 1-2	2-3	Sickle shaped	Round to Oval	Hyaline	Hyaline
4	Shrirampur	Fs-4	21-24 X 2-4	6-7 X 2-3	2-4	Elongated with blunt ends	Round to Oval	Hyaline	Hyaline

5. Physiological Characteristics of Pathogen

5.1 Effect of temperature on growth of *Fusarium oxysporum* f. sp. *psidii*

The growth of *Fusarium oxysporum* f. sp. *psidii* was evaluated at different temperatures. Maximum growth was observed at 25°C (79.99 mm), followed by 30°C (76.53 mm), while minimum growth was recorded at 5°C (9.39 mm). Reduced growth was also observed at lower temperatures (10–15°C) (Table 3, Plate 4). These results indicate that 25–30°C is the optimum temperature range for pathogen growth and are in agreement with earlier findings. [Gaurav (2013) and Chavan (2007)]^[4, 11].

Table 3: Effect of temperature on growth of *Fusarium oxysporum* f. sp. *Psidii*

Tr. No.	Treatments	Colony diameter (mm)				Mean
		Fs-1	Fs-2	Fs-3	Fs-4	
T ₁	5	9.66	8.30	10.50	9.10	9.39
T ₂	10	12.40	10.70	12.36	11.80	11.81
T ₃	15	18.20	15.50	16.90	16.26	16.71
T ₄	20	51.32	52.70	52.78	51.50	52.07
T ₅	25	80.43	78.63	80.50	80.40	79.99
T ₆	30	78.20	75.60	76.33	76.00	76.53
	Mean B	41.69	40.23	41.54	40.86	-
	S.E.(m)±	0.23	0.31	0.39	0.40	-
	C.D. at 1 %	1.02	1.37	1.70	1.73	-

5.2 Effect of pH on growth of *Fusarium oxysporum* f. sp. *Psidii*

The growth of *Fusarium oxysporum* f. sp. *psidii* was studied under different pH levels. Maximum growth was observed at pH 6.5 (85.69 mm), followed by pH 6.0 and 7.0, while minimum growth was recorded at pH 8.5 (75.35 mm). Growth decreased under alkaline conditions, indicating that slightly acidic to neutral pH (6.0–7.0) is optimum for pathogen growth. Among isolates, higher growth was recorded in Fs-1, Fs-2 and Fs-3, whereas Fs-4 showed the least growth at higher pH (Table 4, Plate 5). These results are in agreement with earlier findings. [Farooq *et al.* (2005), Chavan (2007)]^[1].

Table 4: Effect of pH on growth of *Fusarium oxysporum* f. sp. *psidii*

Tr. No.	Treatments	Colony diameter (mm)				Mean
		Fs-1	Fs-2	Fs-3	Fs-4	
T ₁	5.5	80.87	80.13	79.00	79.40	79.85
T ₂	6.0	84.26	83.96	83.00	82.86	83.54
T ₃	6.5	86.32	86.20	85.70	84.56	85.69
T ₄	7.0	82.60	82.00	82.26	82.16	82.25
T ₅	7.5	79.88	79.80	80.53	80.10	80.00
T ₆	8.0	77.32	77.10	78.50	78.93	77.96
T ₇	8.5	75.56	75.40	75.33	75.13	75.35
	Mean B	80.97	80.65	80.61	80.44	-
	S.E.(m)±	0.42	0.35	0.40	0.40	-
	C.D. at 1 %	1.85	1.54	1.75	1.77	-

6. Cultural Characteristics of Isolated Pathogen.

The growth of *Fusarium oxysporum* f. sp. *psidii* varied significantly on different culture media (Table 5). Maximum growth was recorded on Richard's agar (86.79 mm), followed by Potato Dextrose Agar (85.63 mm), Nutrient Agar (83.00 mm) and Koon's agar (81.68 mm), while minimum growth was observed on Malt Extract Agar (76.69 mm) (Table 6).

Table 5: Effect of various culture media on growth of *Fusarium oxysporum* f. sp. *psidii*

Tr. No.	Media	Mean colony diameter (mm)	Colony texture	Sporulation (Grade)
T ₁	Potato dextrose agar	85.63	Cottony to floccose mycelial growth	++ ++
T ₂	Richard's agar	86.79	Whitish with pale pink shades	++ ++
T ₃	Koon's Agar	81.68	Fluffy and aerial mycelium	++
T ₄	Malt Extract Agar	76.69	Scanty, very thin growth	+
T ₅	Nutrient Agar	83.00	Fluffy, Profused growth	+++

Sporulation: Scanty (+), Moderate (++), Good (+++), Abundant (++++)

Colony characteristics also varied among media, with abundant sporulation on Richard's agar and PDA, and reduced growth on Malt Extract Agar. Among isolates, Fs-1 showed maximum growth, whereas Fs-3 recorded the least growth (Table 6, Plate 6). These findings are in agreement with earlier reports indicating Richard's agar as the most suitable medium for *Fusarium* growth. [Yogeswari (1948), Patel and Prasad (1964)]^[14, 13]

Table 6: Colony diameter (mm) of *Fusarium oxysporum* f. sp. *psidii* of different isolates

Tr. No.	Isolates Media	Colony diameter (mm)				Mean
		Fs-1	Fs-2	Fs-3	Fs-4	
T ₁	Potato dextrose agar	86.23	85.40	86.40	84.50	85.63
T ₂	Richard's agar	87.20	86.20	85.66	88.10	86.79
T ₃	Koon's Agar	81.63	80.00	83.00	82.10	81.68
T ₄	Malt Extract Agar	78.06	76.93	75.30	76.50	76.69
T ₅	Nutrient Agar	83.86	82.20	83.30	84.20	83.00
	Mean B	83.39	82.14	82.93	83.08	-

6. Conclusion

The present investigation revealed that guava wilt is a widespread and significant disease in Ahilyanagar district, with variable incidence across different locations. The pathogen associated with the disease was successfully isolated and identified as *Fusarium oxysporum* f. sp. *psidii* based on cultural, morphological and microscopic characteristics. Symptomatology studies confirmed typical vascular wilt symptoms leading to plant decline and death. Physiological studies indicated that the pathogen exhibited maximum growth at 25–30°C and at slightly acidic pH (around 6.5), while Richard's agar was found to be the most suitable medium for its growth and sporulation. These findings provide important insights into the biology and ecology of the pathogen, which can be useful for developing effective management strategies for guava wilt.

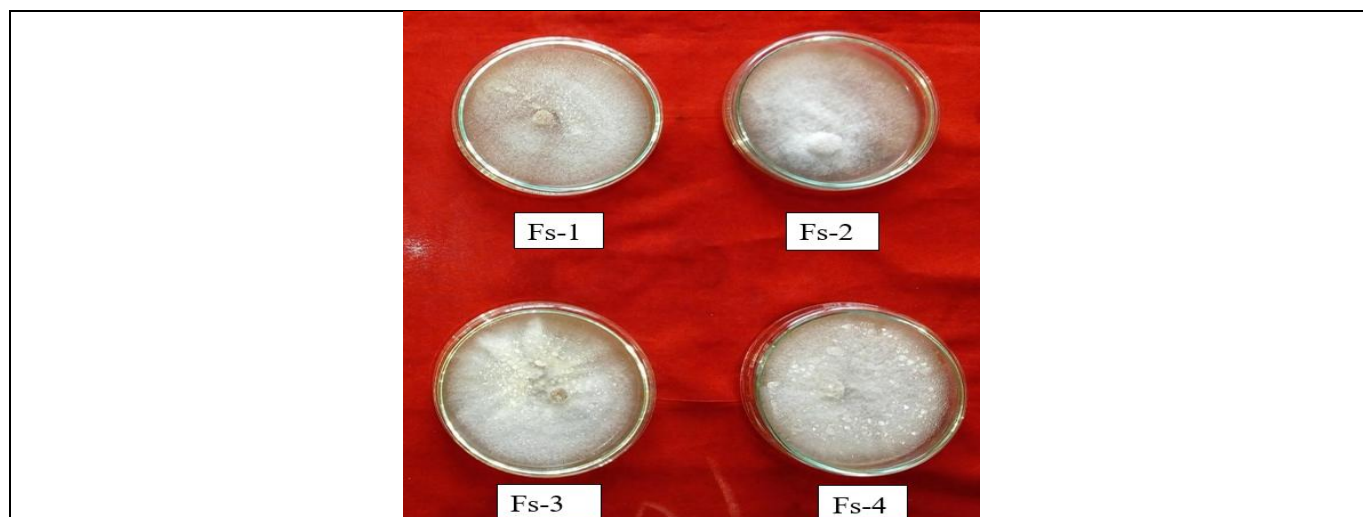


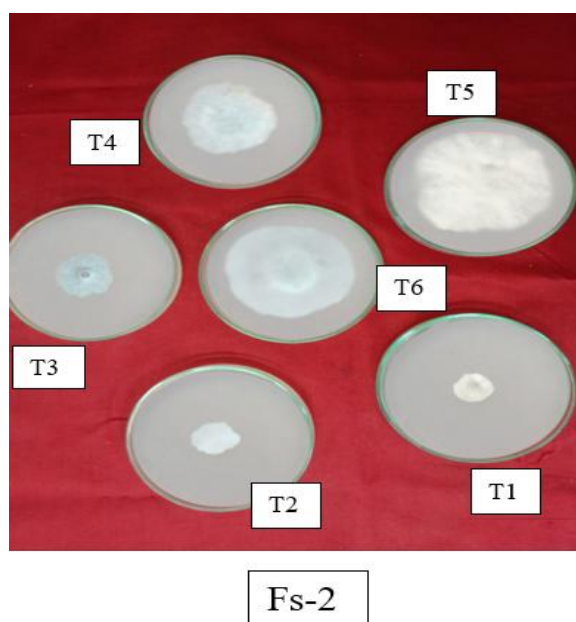
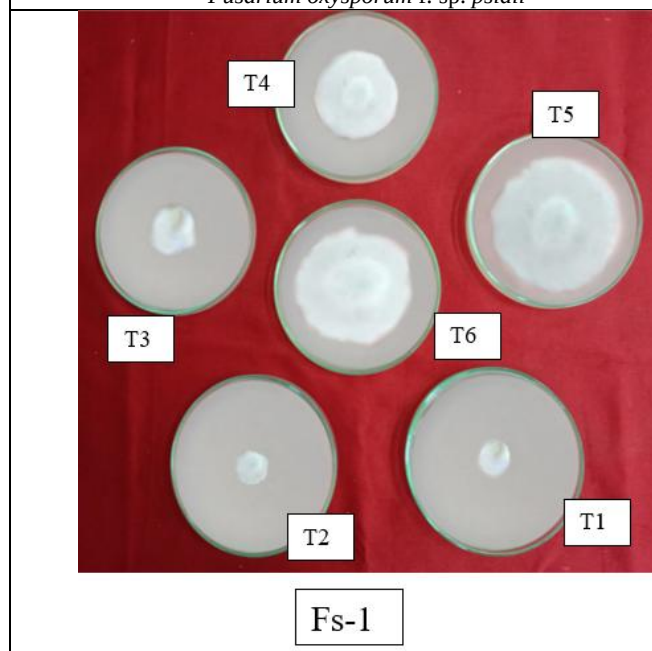
Plate 1: Pure culture plates of different isolates from Ahilyanagar district.



Plate 2: Microscopy showing micro-conidia of different isolates of *Fusarium oxysporum* f. sp. *psidii*



Plate 3 : Microscopy showing macro-conidia of *Fusarium oxysporum* f. sp. *psidii*



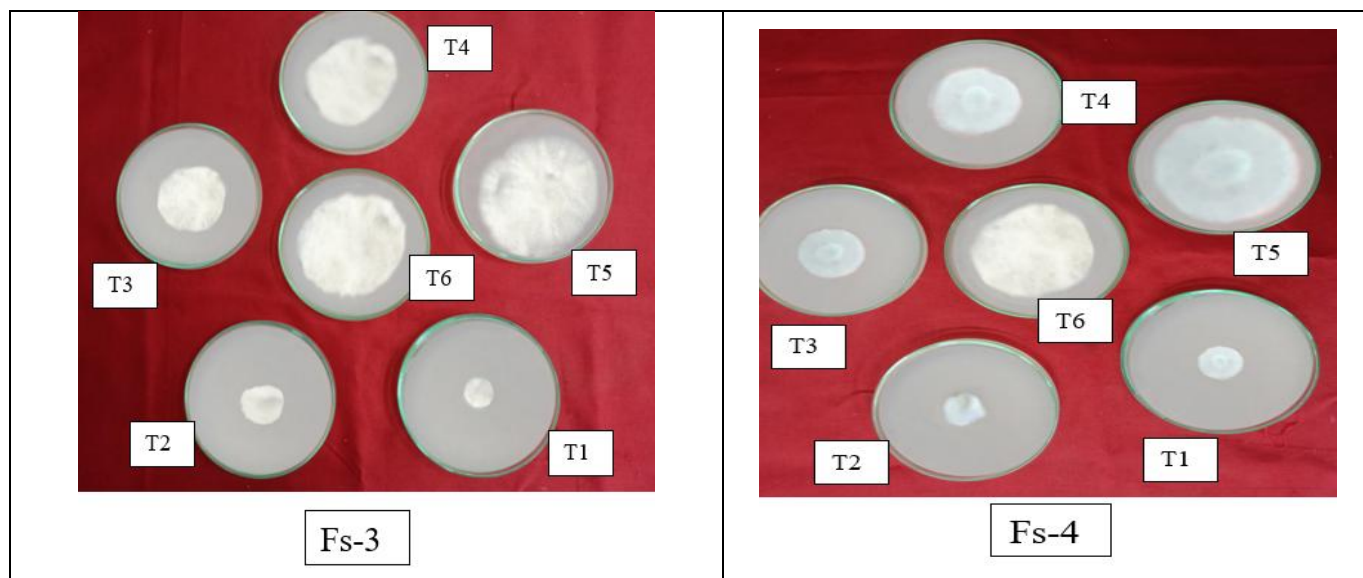


Plate 4: Effect of temperature on growth of *Fusarium oxysporum* f. sp. *psidii*

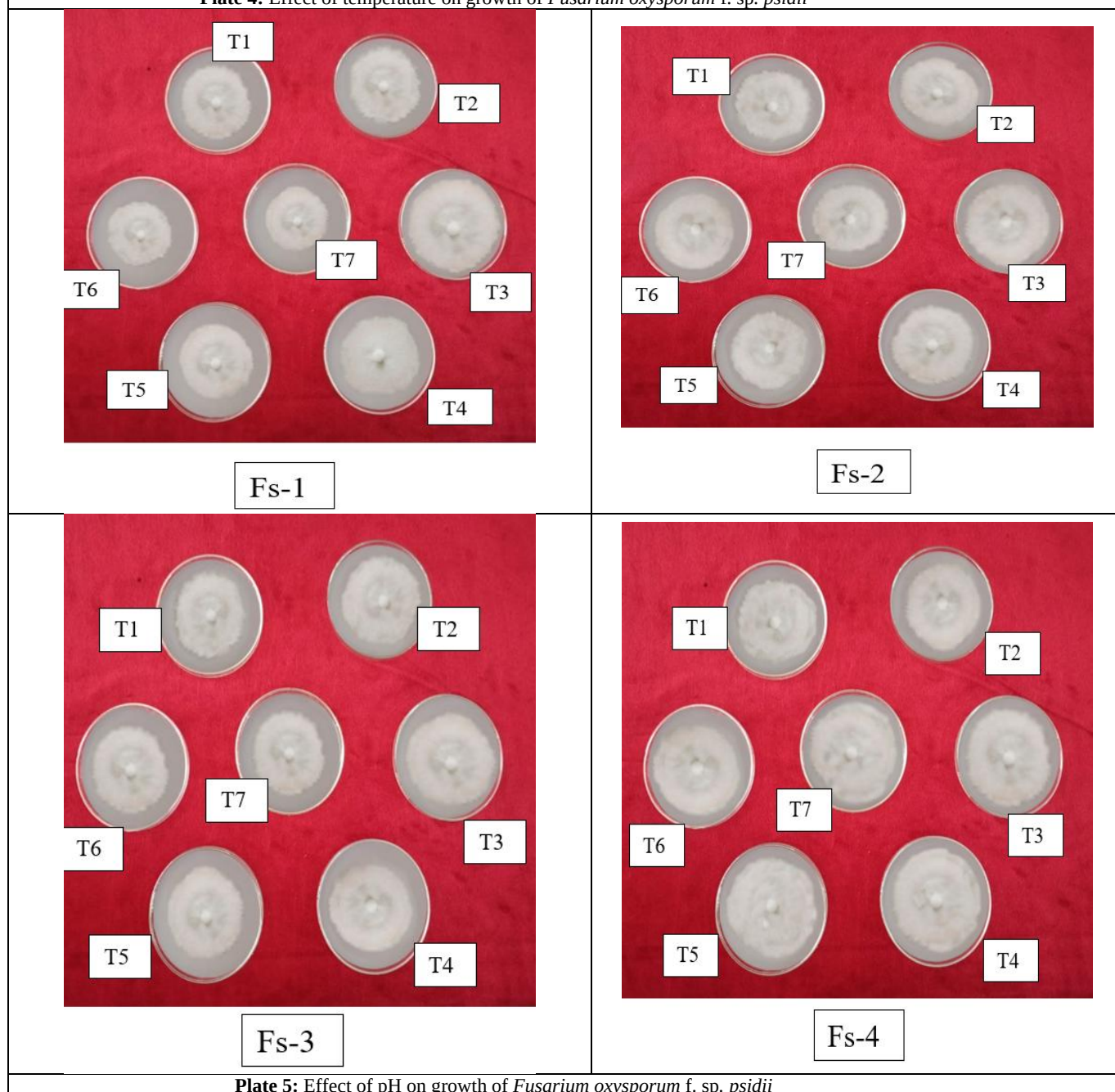


Plate 5: Effect of pH on growth of *Fusarium oxysporum* f. sp. *psidii*

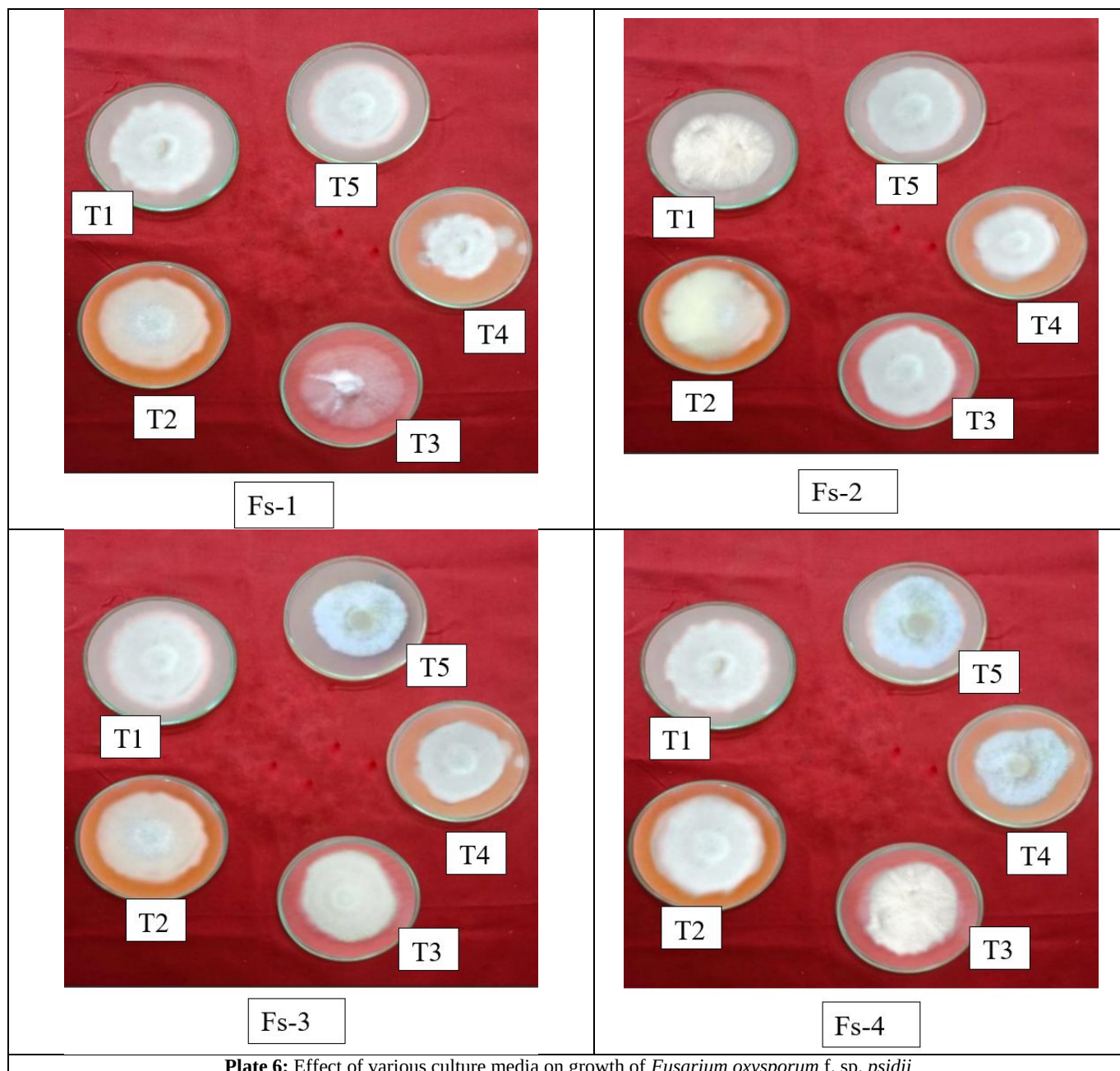


Plate 6: Effect of various culture media on growth of *Fusarium oxysporum* f. sp. *psidii*

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