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Prevalence of Fusarium Wilt in Tomato under Field Conditions in Jammu Region, J & K, India

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ABSTRACT

A survey was conducted in year 2023 and 2024 to assess the incidence of Fusarium wilt in major tomato growing areas across five districts of Jammu region— Udhampur, Jammu, Reasi, Samba and Kathua. The overall incidence of Fusarium wilt was recorded 22.08 per cent, 21.41 per cent and 21.69 per cent, respectively in year 2023,2024 and mean of both the years. Among the surveyed locations, the highest incidence was observed in Udhampur district followed by Reasi, Jammu, Samba district. Conversely, the lowest incidence was recorded in Kathua district. Pathogen isolation was performed using infected tissues from the root and collar regions on potato dextrose agar (PDA) medium. Based on morphological characteristics and microscopic observations, the pathogen was identified as Fusarium oxysporum f. sp. lycopersici (Sacc.) W.C. Snyder and H.N. Hans. Pathogenicity of the isolated fungus was confirmed through artificial inoculation of tomato seedlings under controlled conditions

Keywords: *Fusarium, District, Wilt, Disease, Tomato, Incidence*

1. Introduction

In India, approximately 25,000 hectares are used for protected cultivation, with around 2,000 hectares dedicated specifically to greenhouse vegetable farming (Sabir and Singh, 2013). Greenhouse technology has facilitated increased income generation for farmers in hilly regions such as Jammu and Kashmir, enabling them to cultivate high-value crops during the off-season, even on limited landholdings. Tomato (*Solanum lycopersicum* L.) is the predominant vegetable crop cultivated year-round under protected cultivation systems. However, the altered microclimatic conditions and continuous monocropping under polyhouse cultivation have contributed to the emergence of soil-borne plant diseases. In certain regions, this ailment has caused significant economic losses for the cultivators. Fusarium wilt, incited by *Fusarium oxysporum* f. sp. *lycopersici* (Sacc.) W.C. Snyder and H.N. Hans, is a major disease affecting tomato crops, particularly in warmer regions. The pathogen thrives and proliferates optimally at a soil temperature of approximately 28°C (Gupta and Thind, 2006). In Jammu region, Fusarium wilt was previously considered a minor concern but in recent years, its incidence has increasingly been reported in several polyhouse cultivation systems. The disease has the potential to cause yield losses ranging from 10% to as high as 80% (Kapoor, 1988). The causal fungus is soil-borne and is capable of surviving in the soil for extended periods. Disease initiation typically occurs through propagules of the pathogen present in the soil or through infected plant residues. Therefore, even healthy seedlings transplanted into infested soil are susceptible to infection (Ignjatov *et al*., 2012).

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Given the increasing impact of the disease on tomato cultivation under polyhouse conditions, the present study was undertaken to survey different districts of the state to assess the current status of Fusarium wilt and to facilitate its identification.

2. Material and Methods

2.1 Survey

A survey was conducted in various villages of tomato cultivation areas across the district of Udhampur, Jammu, Reasi, Samba and Kathua in Jammu region to document the incidence of Fusarium wilt which was undertaken in May 2023 and 2024.The locations which were surveyed included Champeri, Katwal, Mantlai, Challyar, Sudh Mahadev from Chenani block and Badhota, Meer, Sadhota, Latyar, Galiote from Panchrai block Amroh, Ladana, Keya, Chatrari, Balota from Kulwanta block Battal, Khallan, Sambal, Pathi, Badali from Udhampur block Bindla, Jagir Ghodi, Jandrore, Mallian, Sulghar from Ghordi block in Udhampur district; and Gho Manhasan, Ranjitpur, Gajansoo, Manihal Brahmana, Chak Kahna from Marh block, Hakkal, Mangu Chak, Makwal, Surya Chak, Haripur from Mandal Phallain, Badyal Brahmana, Langrial, Chohalla, Sunderpur, Chak Bala from R.S. Pura, Siderwan, Kalan, Sungal, Raja Chak, Akhnoor from Akhnoor block, Nandrol, Chak Suba, Deoli, Sultanpur, Ckack Bana from Bishnah block in Jammu district; Arnas, Dansal, Salal, Salalkotli, Kanthi from Arnas block, Sadoti, Talwara, Pouni, Kheral, Kothian from Pouni block, Kotli, Sujandhar, Kakrial, Panthal, Latori from Reasi block, Bathoie, Dubri, Larh, Mulass, Sarh from Mahore block, Aghar Jitto, Sarna, Kanjli, Garn, Daroor from Katra block in Reasi district; Nonath, Ghagwal, Jatwal, Balooni, Naran from Ghagwal block, Deon, Anandpur, Katwalta, Parmandal, Sandral from Purmandal block, Katli, Mandi Thalora, Supwal, Chak Chaban, Chak Mahanga from Samba block, Najwal, Patti, Rattanpur, Barotian, Sungwal from Vijaypur block, Kaink, Chak Bhagta, Chak Lala, Rajpura, Nadala from Rajpura block in Samba district; Barwal, Budhi, Sakte Chak, Jasrota, Baghial from Barnoti block, Belian, Chak Dayal,

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Jangi Chak, Chann Khatrian, Sherpur from Hiranagar block, Janglot, Changran, Kharote, Logate, Govindsar from Kathua block, Mathra Chak, Chakra, Chandwan, Chadwal, Marheen from Marheen block, Jarai, Kangrail, Majra, Barmora, Goond from Nagri block in Kathua district was conducted in order to document the prevalence of Fusarium wilt. At each location, data were collected from four to five districts, with an average sample of 100 tomato plants assessed in each district to evaluate the prevalence of disease. The percentage of disease incidence was determined using the following formula:

$$\text{Diseased Incidence (\%)} = \frac{\text{Number of diseased plants}}{\text{Total number of plants observed}} \times 100$$

2.2 Isolation and Identification of pathogen

The wilt pathogen was isolated from the roots and collar regions of plants exhibiting typical wilt symptoms collected during survey. Infected plant tissues were first rinsed with tap water to eliminate any adhering soil particles. Using a sterilized blade, small segments measuring 1 to 2 mm were excised from the interface between diseased and healthy tissues in the root and collar regions. The tissue segments were surface sterilized by using 0.1% mercuric chloride or sodium hypochlorite solution for 10 to 20 seconds, followed by three rinses with sterile distilled water under aseptic conditions. After sterilization, the segments were placed on sterile filter paper to eliminate excess moisture and then transferred onto sterilized Petri dishes containing potato dextrose agar (PDA) medium. The medium was sterilized by autoclaving at 121°C under a pressure of 15 psi for 20 minutes, and subsequently supplemented with streptocycline at a concentration of 30 mg l^{-1} before being poured into sterile Petri plates. The inoculated Petri plates were incubated at 27±1°C in a BOD incubator and monitored daily for any signs of mycelial growth. The fungal growth observed in the Petri plates was purified using the hyphal tip technique and subsequently cultured on slants containing PDA. The morphological and cultural characteristics of the fungus were examined in the culture grown on PDA.

2.3 Pathogenecity test

For the pathogenicity assay, a conidial suspension of the pathogen (1×10^6 cfu ml^{-1}) was prepared using cultures cultivated in potato dextrose broth in rotory shaker at 110 rpm and 28°C for seven days. Four-week-old seedlings of the susceptible cultivar 'Pusa ruby', characterized by the presence of three fully developed true leaves, had their roots individually submerged in the suspension for 10 minutes. Seedlings inoculated with the pathogen were transplanted into pots containing 1 kg of sterilized soil and maintained under greenhouse conditions for a period of five weeks. For control, seedling roots were immersed in sterile water for 10 minutes before being grown under identical conditions. Inoculated plants began to exhibit characteristic symptoms of Fusarium wilt—such as yellowing, vascular discoloration and wilting after inoculation of three weeks. All inoculated plants succumbed within 40 days, whereas control plants remained healthy and symptom-free throughout the experimental period.

3. Results

3.1 Prevalence of Fusarium Wilt in tomato growing districts of Jammu region

To assess the incidence of Fusarium wilt of tomato, random surveys were undertaken across major tomato growing regions of the Jammu division during the 2023 and 2024 cropping seasons.

Periodic field assessments were carried out in five key districts—Jammu, Udhampur, Reasi, Samba and Kathua—to determine the current status of the disease (Table 1 and Fig 1).

In the year 2023, the incidence of wilt disease ranged from 11.63 to 33.33 per cent with an overall mean of 20.08 ± 0.43%**.** In Jammu district, five administrative blocks *viz.,*Marh, Mandal Phallain, R.S. Pura, Akhnoor, and Bishnah were selected for the survey. Within each block, five villages were assessed for disease occurrence. The overall wilt incidence in the district varied between 21.11% and 25.61%**,** with a district-wide mean of 22.60 ± 0.21per cent**.** The highest disease incidence (25.61%) was observed in village Hakkal of Mandal Phallain block and the lowest incidence (21.11%) was recorded in village Sungal of Akhnoor block**.** In district Udhampur, the overall disease incidence ranged from 24.24 to 33.33 per cent with an overall mean of 28.32 ±0.49 per cent. The highest disease incidence of 33.33 per cent was observed in village Katwal of Chenani block and the lowest disease incidence of 24.24 per cent was recorded in village Sadhota of block Panchrai. In Kathua district, the overall disease incidence ranged from 11.63 to 20.00 per cent with an overall mean of 15.08±0.39 per cent. The highest disease incidence of 20.00 per cent was observed in village Sherpur of Hiranagar block and the lowest disease incidence of 11.63 per cent was observed in village Kharote of Kathua block. In Reasi district, the overall disease incidence ranged from 22.68 to 26.67 per cent with an overall mean of 24.61±0.23 per cent. The highest disease incidence of 26.67 per cent was observed in village Salal of Arnas block and the lowest disease incidence of 22.68 per cent was observed in village Kotli of Reasi block. In Samba district, the overall disease incidence ranged from 15.15 to 22.58 per cent with an overall mean of 19.21±0.36 per cent. The highest disease incidence of 22.58 per cent was observed in village Supwal of Samba block and the lowest disease incidence of 22.68 per cent was observed in village Kotli of Reasi block. A considerable variation in disease incidence was recorded during the 2024 cropping season, with a marginally higher disease incidence in comparison to the 2023 season. The overall disease incidence ranged from 12.20-32.56 per cent, with an overall mean value of 21.41 ± 0.42 per cent across the division. In Jammu district, the overall disease incidence ranged from 20.73 to 26.19 per cent with an overall mean of 23.32 ±0.29 per cent. The highest disease incidence of 26.19% was observed in village Chak Bana of Bishnah block and the lowest disease incidence of 20.73 per cent was observed in village Surya Chak of block Mandal Phallain. In district Udhampur, the overall disease incidence ranged from 23.81 to 32.56 per cent with an overall mean of 26.69 ±0.44 per cent. The highest disease incidence of 32.56 per cent was observed in village Ladana of Kulwanta block and the lowest disease incidence of 23.81 per cent was observed in village Sudh Mahadev of Chenani block, followed by 23.96 per cent incidence in village Challyar of same block. In Kathua district, the overall disease incidence ranged from 12.20 to 18.07 per cent with an overall mean of 14.98±0.27 per cent. The highest disease incidence of 18.07 per cent was observed in village Chann Khatrian of Hiranagar block and the lowest disease incidence of 12.20 per cent was observed in village Kharote of block Kathua. In Reasi district, the overall disease incidence ranged from 21.88 to 27.06 per cent with an overall mean of 24.36±0.27 per cent. The highest disease incidence of 26.06 per cent was observed in village Bathoie of block Mahore and the lowest disease incidence of 21.88 per cent was observed in village Sarna of block Katra. In Samba district, the overall disease incidence ranged from 14.29 to 21.59

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percent with an overall mean of 17.58±0.42 per cent. The highest disease incidence of 21.59 per cent was observed in village Katwalta of block Parmandal and the lowest disease incidence of 14.29 per cent was observed in village Rajpura of block Rajpura.

The mean data from both the year i.e., 2023 and 2024 indicated that an overall disease incidence in the Jammu division varied from 11.91 to 32.61 per cent, with a mean disease incidence of 21.69 ± 0.42 per cent. Within Jammu district, the highest disease incidence of 24.30 per cent was recorded in village Chak Suba village of block bishnah, whereas the lowest disease incidence 21.16 per cent was observed at village Surya Chak of block Mandal Phallain. An overall disease incidence ranged between 21.16 to 24.30 per cent, with an average of 22.96 ± 0.15 per cent in Jammu district. In Udhampur district, the highest disease incidence of 32.61 per cent was recorded in village Ladana of block Kulwanta, whereas the lowest disease incidence of 24.91 per cent was recorded in village Sadhota of block Panchrai. An overall disease incidence ranged between 32.61 to 24.91 per cent with overall mean of 27.54±0.41. In Kathua district, an overall disease incidence ranged between 11.91to 18.41 per cent with an overall mean of 15.05±0.31. The highest disease incidence of 18.41 per cent was recorded in village Chann Khatrian of block Hiranagar, whereas the lowest disease incidence of 11.91per cent was recorded in village Kharote of block Kathua.

In Reasi district, an overall disease incidence ranged between 22.77 to 26.18 per cent with an overall mean of 24.49±0.22. The highest disease incidence of 26.18 per cent was recorded in village Bathoie of block Mahore, whereas the lowest disease incidence of 22.77 per cent was recorded
in village Kothian of block Pouni. In Samba district, the highest disease incidence of 21.62 per cent was recorded in village Supwal of block Samba, whereas the lowest disease incidence of 15.28 per cent was recorded in village Rajpura of same block. An overall incidence ranged between 15.28 to 21.62 per cent with an overall mean of 18.42±0.35.

Fig:1 Showing tomato infected field with Fusarium wilt

Table 1: Prevalence and distribution of Fusarium wilt of tomato in Jammu region during cropping season 2023 and 2024

District	Block	Village	GPS		Disease Incidence (%)		
			Latitude	Longitude	2023	2024	Mean
Jammu	Marh	Gho Manhasan	32.72320	74.71585	22.50	22.22	22.36
		Ranjitpur	30.37189	77.33461	23.17	21.59	22.38
		Gajansoo	32.73940	74.64924	23.33	22.09	22.71
		Manihal Brahmana	32.75601	74.74690	22.08	22.73	22.40
		Chak Kahna	32.57417	74.66803	23.53	21.95	22.74
	Mandal Phallain	Hakkal	32.57656	74.71328	25.61	22.35	23.98
		Mangu Chak	32.70581	74.87354	21.59	23.38	22.48
		Makwal	32.64420	74.72338	23.26	23.33	23.29
		Surya Chak	32.68376	74.82439	21.59	20.73	21.16
		Haripur	32.57656	74.71328	22.22	25.00	23.61
	R.S. Pura	Badyal Brahmana	32.64460	74.73230	23.23	23.33	23.28
		Langrial	32.63339	74.69892	22.09	25.00	23.55
		Chohalla	32.60162	74.75996	21.65	25.93	23.79
		Sunderpur	32.57757	74.75145	22.58	22.89	22.74
		Chak Bala	32.24560	74.75600	24.21	23.53	23.87
	Akhnoor	Siderwan	32.83890	74.65862	21.69	21.11	21.40
		Kalan	32.53526	74.39472	23.60	23.26	23.43
		Sungal	32.90270	74.65760	21.11	23.96	22.53
		Raja Chak	32.93346	74.67960	22.50	24.49	23.49
		Akhnoor	32.89696	74.73549	22.22	21.98	22.10
	Bishnah	Nandrol	32.70581	74.87354	21.18	23.60	22.39
		Chak Suba	32.55082	74.88424	23.33	25.26	24.30
		Deoli	32.55434	74.78286	22.73	24.72	23.72
		Sultanpur	32.64582	74.86692	21.35	25.00	23.17
		Ckack Bana	33.03645	75.32398	23.96	26.19	25.07
		Mean			**22.6 ±0.21**	**23.32±0.29**	**22.96±0.15**
		Range			**25.61-21.11**	**26.19-20.73**	**24.30-21.16**
Udhampur	Chenani	Champeri	33.03645	75.32398	25.77	25.25	25.51
		Katwal	33.038678	75.349185	33.33	26.26	29.80
		Mantlai	33.005118	75.356333	28.87	24.74	26.80
		Challyar	32.870645	75.114499	30.30	23.96	27.13
		Sudh Mahadev	33.020746	75.36541	26.74	23.81	25.28
	Panchrai	Badhota	33.011177	75.107011	25.25	27.27	26.26
		Meer	33.0477443	75.11416465	27.84	24.24	26.04
		Sadhota	33.122654	75.150373	24.24	25.58	24.91
		Latyar	33.67899	75.8976336	26.04	26.25	26.15
		Galiote	33.10288	75.13821	28.13	26.19	27.16

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Udhampur	**Kulwanta**	Amroh	32.81096	75.34536	25.77	24.24	25.01
		Ladana	32.473287	75.2387567	32.65	32.56	32.61
		Keya	32.732998	75.3864273	30.21	29.79	30.00
		Chatrari	32.889245	75.378965	32.32	29.21	30.77
		Balota	32.993525	75.457754	30.61	30.34	30.47
	Udhampur	Battal	32.88380	75.126395	26.26	26.67	26.46
		Khallan	32.933793	75.37476	28.42	25.88	27.15
		Sambal	32.8837	75.12473	28.57	27.55	28.06
		Pathi	33.0264	75.1278	26.04	25.26	25.65
		Badali	32.74484	75.3853	31.31	30.12	30.72
	Ghordi	Bindla	56.035933	55.06793	27.08	26.97	27.02
		Jagir Ghodi	56.6784	55.3548	29.17	27.27	28.22
		Jandrore	52.67868	50.2948	28.28	27.37	27.83
		Mallian	40.322462	35.23464	26.26	25.26	25.76
		Sulghar	40.32466	35.235764	29.59	26.25	27.92
		Mean			**28.32±0.49**	**26.69±0.44**	**27.54±0.41**
		Range			**33.33-24.24**	**32.56-23.81**	**32.61-24.91**
Kathua	**Barnoti**	Barwal	32.44371	75.48209	15.56	15.63	15.59
		Budhi	32.44829	75.44753	12.37	15.29	13.83
		Sakte Chak	32.54996	75.06429	13.54	14.74	14.14
		Jasrota	32.45860	75.40702	14.14	14.94	14.54
		Baghial	32.48655	75.44405	15.46	15.00	15.23
	Hiranagar	Belian	32.43399	75.25865	18.37	17.05	17.71
		Chak Dayal	32.66987	74.93086	14.43	15.66	15.05
		Jangi Chak	32.43399	75.25865	17.89	17.72	17.81
		Chann Khatrian	32.4954347	75.2386	18.75	18.07	18.41
		Sherpur	32.42345	75.213245	20.00	15.48	17.74
	Kathua	Janglot	32.43631	75.52759	14.43	14.58	14.51
		Changran	32.37025	75.49538	13.25	14.46	13.86
		Kharote	35.80545	75.20564	11.63	12.20	11.91
		Logate	32.41079	75.56999	14.81	14.46	14.64
		Govindsar	32.39751	75.54566	15.29	14.89	15.09
	Marheen	Mathra Chak	32.43456	75.2877	13.75	13.33	13.54
		Chakra	32.39988	75.36689	15.19	15.66	15.43
		Chandwan	32.47162	75.33375	16.28	15.05	15.67
		Chadwal	32.46676	75.32737	14.29	13.54	13.91
		Marheen	32.42234	75.32118	15.00	16.25	15.63
	Nagri	Jarai	32.34120	75.48910	14.94	14.74	14.84
		Kangrail	32.32660	75.46540	16.47	15.63	16.05
		Majra	32.34120	75.48910	13.95	13.98	13.97
		Barmora	32.19360	75.24330	13.75	14.14	13.95
		Goond	32.33200	75.41000	13.64	12.79	13.21
		Mean			**15.08±0.39**	**14.98±0.27**	**15.05±0.31**
		Range			**20.00-11.63**	**18.07-12.20**	**18.41-11.91**
Reasi	**Arnas**	Arnas	33.17523	74.90864	25.58	24.39	24.99
		Dansal	33.18062	77.92992	24.14	24.10	24.12
		Salal	33.16391	74.81512	26.67	25.27	25.97
		Salalkotli	33.16244	74.83322	25.77	26.58	26.18
		Kanthi	33.18381	74.82064	23.75	22.50	23.13
	Pouni	Sadoti	33.04532	74.57727	24.24	25.00	24.62
		Talwara	33.10384	74.79655	23.66	24.44	24.05
		Pouni	33.14546	74.79269	26.04	25.26	25.65
		Kheral	33.07022	74.75401	25.81	26.37	26.09
		Kothian	33.08427	74.70975	23.08	22.47	22.77
	Reasi	Kotli	33.03033	74.88259	22.68	23.47	23.07
		Sujandhar	33.08846	74.86954	23.47	24.21	23.84
		Kakrial	33.04598	74.86182	24.49	23.16	23.82
		Panthal	33.07153	74.81647	25.58	24.71	25.14
		Latori	33.04945	74.88017	25.00	25.88	25.44
	Mahore	Bathoie	33.31326	74.91266	25.30	27.06	26.18
		Dubri	33.33103	74.87356	23.53	23.17	23.35
		Larh	33.32220	74.80562	23.71	22.11	22.91
		Mulass	33.99876	74.82081	22.92	24.21	23.56
		Sarh	33.31327	74.91265	25.77	25.00	25.39
	Katra	Aghar Jitto	33.01586	74.88318	25.25	25.26	25.26
		Sarna	33.00221	74.91316	23.71	21.88	22.79
		Kanjli	33.01486	74.81357	26.04	25.00	25.52
		Garn	33.00222	74.91375	25.81	23.16	24.48
		Daroor	33.00137	74.94736	23.26	24.71	23.98
		Mean			**24.61±0.23**	**24.36±0.27**	**24.49±0.22**

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Samba	Ghagwal	**Range**			**26.67-22.68**	**27.06-21.88**	**26.18-22.77**
		Nonath	32.52244	75.20683	20.69	20.00	20.34
		Ghagwal	32.518753	75.22274	18.37	16.84	17.60
		Jatwal	32.54363	75.15474	19.54	18.60	19.07
		Balooni	32.544504	75.15291	16.49	14.29	15.39
		Naran	32.51665	75.16832	22.09	20.93	21.51
	Parmandal	Deon	32.70148	75.04670	15.15	16.33	15.74
		Anandpur	32.64576	75.06774	18.60	15.48	17.04
		Katwalta	32.66748	74.99834	20.45	21.59	21.02
		Parmandal	32.69588	75.05486	20.00	19.35	19.68
		Sandral	32.64576	75.06774	19.15	17.20	18.18
	Samba	Katli	32.32288	75.08106	18.09	16.13	17.11
		Mandi Thalora	32.33296	75.07117	20.88	19.10	19.99
		Supwal	32.33018	75.03242	22.58	20.65	21.62
		Chak Chaban	32.32154	75.01302	18.60	18.89	18.75
		Chak Mahanga	32.33289	75.01438	18.07	16.25	17.16
	Vijaypur	Najwal	32.56736	74.98687	17.24	18.82	18.03
		Patti	32.61449	74.97556	21.11	17.44	19.28
		Rattanpur	32.53221	75.03939	18.28	16.85	17.57
		Barotian	32.53129	75.01822	20.00	16.67	18.33
		Sungwal	32.59926	75.00818	20.83	14.77	17.80
	Rajpura	Kaink	32.29292	75.12206	20.00	20.45	20.23
		Chak Bhagta	32.29292	75.12206	19.59	15.79	17.69
		Chak Lala	32.26592	75.09124	20.69	17.20	18.95
		Rajpura	32.45658	75.17011	16.28	14.29	15.28
		Nadala	32.26530	75.09124	17.98	16.30	17.14
		Mean			**19.21±0.36**	**17.58±0.42**	**18.42±0.35**
		Range			**22.58-15.15**	**21.59-14.29**	**21.62-15.28**
		Overall Mean			**22.08±0.43**	**21.41±0.42**	**21.69±0.42**
		Overall Range			**33.33-11.63**	**32.56-12.20**	**32.61-11.91**

3.2. Isolation and identification of the pathogen

During the survey, characteristic symptoms of Fusarium wilt were observed in various tomato growing areas. The disease initially manifested as yellowing of the lower leaves, vein clearing, stunted growth, necrosis, and wilting. As the infection progressed, symptoms advanced upward through the plant, leading to vascular discoloration in the roots and stem tissues. Ultimately, the entire plant became systemically affected and succumbed to the disease. Isolation of pathogens were carried out from infected root and collar regions using potato dextrose agar (PDA) medium. Cultures of *Fusarium oxysporum* f. sp. *lycopersici* (FOL) exhibited a pinkish-white to pink pigmentation on PDA, with full mycelial growth covering the Petri plate within seven days. Microscopic examination revealed two types of conidia i.e., microconidia and macroconidia. microconidia were hyaline, aseptate, oval to round whereas macroconidia were 3 to 5 septate, typically curved at the tapered apex, slightly thicker near the upper third. Based on morphological, microscopic characteristics and in comparison, with descriptions provided by Booth (1971) and Brayford (1992), the fungal isolate was identified as *Fusarium oxysporum* f. sp. *lycopersici* (Sacc.) W.C. Snyder and H.N. Hans.

4.Conclusion

The embracing of protected cultivation practices for tomato production is progressively increasing across diverse agro-ecological zones of the Jammu region. This intensification of cultivation, particularly under controlled environments, has been associated with the emergence and proliferation of soil-borne diseases. Among these, Fusarium wilt has been recognized as the predominant soil-borne disease occurring in the mid-hill zones under protected cultivation. The causal organism responsible for this disease has been identified as *Fusarium oxysporum* f. sp. *lycopersici* (Sacc.) W.C. Snyder & H.N. Hans.

Among the surveyed districts, Udhampur reported the highest incidence of the disease, followed by Reasi, Jammu, Samba and Kathua in the year 2023 and 2024.

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