

PREVALENCE OF FUSARIUM WILT INCIDENCE (*Fusarium oxysporum* f.sp. *MELONIS*) ON MUSKMELON UNDER PUNJAB CONDITIONS

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Melon Fusarium wilt caused by *Fusarium oxysporum* f. sp. *melonis*, is one of the most devastating seed-borne diseases all over the world. The pathogen, a Formae specialis of *F. oxysporum* Schlechtend.: Fr. (FOM) was first reported from Rajasthan as a fundamental causal agent (Mathur and Shekhawat, 1992) and later on from other parts of Northern India (Chattopadhyay and Sen, 1996; Sen, 1999). When this disease attacks at maturity stage, it causes yield loss as well as affects its marketable quality by affecting its shape and size. The disease is known to cause upto 100% disease losses worldwide (Alvarez *et al.*, 2005).

Fusarium oxysporum f.sp. *melonis* mainly attacks crop from flowering to the fruiting stage with a variable degree of infection. The spores of the pathogen, which were survived in the soil, germinated in the favorable environmental condition and entered roots through the root tips or also through passive entry by natural openings and wounds. As the pathogen grew in the xylem vessels and produced polysaccharides, it clogged the vascular system which led to typical wilt symptoms. Field transmission of disease mainly took place through water and by the use of infected equipment in the field (Kaur, 2005).

The pathogen showed different reactions on various hosts and variation among the different cultivars on the basis of virulence spectrum; this helps in assigning the pathotypes to pathogenic races within formae specialis. Several physiological races viz., 0,1,2 1-2y and 1-2w have been reported so far for their virulence on different melon cultivars (Daami-Remadi *et al.*, 2007). Identification of races prevalent in particular area is very important for development of resistant variety. Currently, no information is available on the pathogenic races of *Fusarium oxysporum* f.sp. *melonis* prevalent in Punjab. Thus, this study aimed on the current prevalence of the fusarium wilt problem under Punjab conditions by examining the distribution and disease incidence on various cultivars.

The survey was conducted during year 2017-18 and 2018-19 in different Muskmelon growing areas of Punjab, mainly in two districts of central zone of Punjab viz. Jalandhar and Kapurthala and two districts of Malwa

zone of Punjab i.e. Patiala and Sangrur. More than 55 farmer fields were surveyed in four districts for knowing the prevalence of wilt. During the survey, all important parameters like field history, field size, crop variety, cropping systems (sole or intercropping), planting date (early or late), fertilizer dosages, soil types, mulch crop, crop growth stage and previous crop were recorded.

Number of wilted plants from the total number of plants considered in a field was expressed as a disease incidence (DI) percentage in the field. In an area of one acre, three rows were chosen randomly. Each row was examined for the plants which showed wilting symptoms. Number of diseased plants was counted. DI was expressed as the percentage of affected plants counted in three rows by the total number of plants in three rows. Disease incidence was calculated by the formula given by Wheeler (1969)

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

Maximum area under muskmelon crop was found in Kapurthala district (110 acres) followed by Jalandhar district (95 acres) and Sangrur district (84 acres) of Punjab. The least area was found in Patiala district (55 acres) of Punjab during the year 2017-18 and 2018-19. Total 20 locations and 57 fields were surveyed in the above mentioned 4 districts of Punjab. Random surveys of these districts were conducted during month of April-May in 2017-18 and 2018 -19 to check incidence of disease (Table 1). Diseased plants were identified based on the symptoms. Typical symptoms on diseased plants appeared, as loss of turgidity of leaves and later on leaves become yellow in colour at the time of maturity. Wines were completely wilted, only mature fruit left behind on wines and rotted. It was reported that Fusarium wilt of muskmelon was present in all the surveyed locations with different disease intensity. Complete failure of crop was also observed at some of the surveyed locations. During these surveys, 5 locations of Jalandhar district, 6 locations of Kapurthala district, 4 locations of Patiala district and 5 locations of Sangrur district were surveyed to assess the disease incidence in these areas. Fusarium wilt incidence was found in range of 0.5 - 25% in the

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Table 1. Survey of different muskmelon growing districts of Punjab for isolation and purification of pathogen conducted during 2017-18 and 2018-19

Isolate number	Isolate name	District	Location
1.	1 (P)	Patiala (P)	Jangpura
2.	2 (P)		Dhingii
3.	3 (P)		Bhamarsi
4.	4 (P)		Boota singh wala
5.	1 (J)	Jalandhar (J)	Rupawali
6.	2 (J)		Chachowal
7.	3 (J)		Khurampur
8.	4 (J)		Sechewal
9.	5 (J)		Bdli
10.	1 (S)	Sangrur (S)	Sherwalankot
11.	2 (S)		Sheentan wala
12.	3 (S)		Jhoodan
13.	4 (S)		Burj Baghel Singh
14.	5 (S)		Mannawali
15.	1 (K)	Kapurthala (K)	Motipur
16.	2 (K)		Saidowal
17.	3 (K)		Biharpur
18.	4 (K)		Khus
19.	5 (K)		Barindpur
20.	6 (K)		Bhandal Dona

different villages of muskmelon growing districts (Table 2). Maximum disease incidence (%) was found in villages Sherwalankot (40%) of Sangrur district followed by Jangpura (33%) of Patiala district, Chachowal (31%) of district Jalandhar and village Khus (27%) of district Kapurthala. Minimum disease incidence (%) was found in villages Barindpur (1.5%) of Kapurthala district followed by Motipur (2%) and Sechewal (2%) of district Kapurthala and Jalandhar respectively during the year 2017-18 and 2018-19.

Mean disease incidence (%) was found maximum in Sangrur (18.5%) district of Punjab followed by Jalandhar (12.8%) and Patiala (12%) districts of Punjab. Minimum incidence was found in Kapurthala district (11.3%) of Punjab during the year 2017-18 and 2018-19. Survey of muskmelon crop also revealed that the private varieties and hybrids of muskmelon i.e. Bobby, Madhu 149, Farmer glory, Aroma were mainly cultivated in different muskmelon growing areas of Punjab namely Jalandhar, Kapurthala, Patiala and Sangrur. PAU hybrids and varieties viz. MH-27 and Hara Madhu were cultivated with very low frequency in these districts of Punjab. Maximum area was found under the Bobby hybrid followed by Madhu 149 and Farmer glory during

the year 2017-18 and 2018-19. Aroma, Rijkran and MH-27 were cultivated on very small area in different muskmelon growing districts of Punjab.

Mean disease incidence (%) per acre was found maximum on the Bobby hybrid (1.18%) followed by the Madhu 149 (0.82%) and Farmer Glory (0.61%) in different muskmelon growing areas of Punjab during the year 2017-18 and 2018-19. Minimum disease incidence (%) was found on the MH-27 (0.08%) and Aroma variety (0.18%). It was found that disease incidence was maximum in those areas in which muskmelon crop was cultivated on same piece of land for 2- 3 years regularly. Pathogen survived in soil for longer period of time even in the absence of host.

Similar study was conducted by Kaur *et al.* (2005), they surveyed the muskmelon crop in different muskmelon growing regions of Punjab namely Amritsar, Fatehgarh Sahib, Ludhiana and Ropar during the year 2001 and 2002. They had collected the diseased samples from partially and completely wilted plants and isolated 133 isolates of pathogen based on the disease symptoms. Out of these total 133 isolates, 57 isolates were found to be of *Fusarium oxysporum* of which 27 isolates were reported to be highly pathogenic in nature

Table 2. Fusarium wilt incidence (%) in different muskmelon growing districts of Punjab during 2017-18 and 2018-19

District	Village	Field No.	Area (acres)	Variety	Disease incidence (%)
Jalandhar	Rupawali	1	6	Madhu 149	2
		2	7	Madhu 149	2
		3	5	Guru	1.5
Jalandhar	Chachowal	1	4	Madhu 149	1
		2	2	Madhu 149	5
		3	5	Madhu 149	25
Jalandhar	Khurampur	1	3	Farmer glory	1
		2	4	Madhu	1.5
		3	4	Madhu	0.5
		4	2	Madhu	1
Jalandhar	Sechewal	1	4	Madhu	1
		2	5	Madhu	1
Jalandhar	Bdli	1	2	Bobby	10
		2	5	Bobby	9
		3	4	Madhu	2
		4	8	Bobby	11
Patiala	Bhamarsi	1	1	Muskaan	2
		2	2	Bobby	1
		3	1	Bobby	2
Patiala	Jangpura	1	3	Farm glory	0.5
		2	2	Farm glory	12
		3	4	Bobby	10
		4	2	Bobby	9
Patiala	Dhingii	1	3	Bobby	1
		2	5	Bobby	2
Patiala	Boota Singh Wala	1	3	Bobby	6
		2	3	Farm glory	3
		3	4	Bobby	2
Sangrur	Sherwalankot	1	3	Rijkran	15
		2	4	Bobby	5
		3	10	Bobby	15
		4	3	Bobby	5
Sangrur	Mannawali	1	7	Bobby	3
		2	5	Madhu	1
		3	3	Bobby	15
Sangrur	Jhoodan	1	3	Bobby	2
		2	2	Bobby	2.5
Sangrur	Burj Baghel Singh	1	7	Bobby	5
		2	10	Bobby	20
		3	6	Aroma 7	0.5
		4	5	MH-27	0.5
Sangrur	Sheetanwala	1	2	Bobby	1
		2	3	Bobby	1
Kapurthala	Motipur	1	7	Bobby	1
		2	9	Bobby	1
Kapurthala	Saidowal	1	5	Bobby	2
		2	7	Bobby	3
		1	4	Bobby	1
Kapurthala	Barindpur	2	6	Madhu	1
		1	4	Bobby	15
Kapurthala	Khus	2	8	Bobby	12
		1	8	Madhu	3
		2	3	Madhu	1
Kapurthala	Biharpur	3	6	Bobby	2
		1	4	Bobby	1
		2	8	Bobby	2
		3	3	Madhu	1

on the basis of their pathogenic ability. Kurt *et al.* (2002) obtained 34 isolates of *F.oxysporum* f.sp. *melonis* from 205 fields in melon producing areas in the South Eastern Anatolia region of Turkey. They investigated the prevalence of the disease by calculating the percentage of fields with plants exhibiting disease symptoms, the mean prevalence of wilt diseases was recorded to be 88.1% and the mean disease incidence was 47.5%.

The findings were further supported by work accomplished by Narinder *et al.* (2012) who surveyed the different muskmelon growing regions of Punjab viz., Kapurthala, Jalandhar and Ludhiana. The pathogen *F. oxysporum* f.sp. *melonis* was isolated from the soil and root sample collected from the infected melon plants. Strange (2003) also reported several strains of *F. oxysporum* which induces root rot and vascular wilts.

Therefore, based on this study it was concluded that Fusarium wilt of muskmelon caused by *F. oxysporum* f.sp. *melonis* was prevalent in all muskmelon growing districts namely Jalandhar, Kapurthala, Patiala and Sangrur of Punjab and is one of the major constraints for the production of muskmelon in Punjab. Furthermore, maximum mean Disease Incidence (%) was present in Sangrur district (18.5%) and minimum in Kapurthala district (11.3%) of Punjab. This study can be considerably important for exploring the further research work to select and integrate muskmelon wilt resistance gene into muskmelon breeding programmes for the management of Fusarium wilt.

Authors' contribution

Conceptualization of research work and designing of experiments (DSB), Execution of lab/field experiment and data collection (GS), Analysis of data and interpretation (GS, DSB, SKA), Preparation of manuscript (GS, DSB,SKA).

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