

Screening and Yield of Lentil (*Lens esculenta* Moench.) Germplasms as Influenced by *Fusarium* Wilt

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ABSTRACT

Investigations revealed that *Fusarium oxysporum* f.sp. *lentis* was associated with the severe outbreak of wilt in lentil crop. Almost 13 lentil accessions screened, none was found immune and only one (SKL-16) was highly resistant to the disease, which also gave highest yield. Accessions SKL-1, SKL-9 Shalimar and SKL-9 were moderately resistant and 5 accessions viz. SKL-3, SKL-8, SKL-12, SKL-13 and SKL-15 were moderately susceptible to the disease.

Key words : *Fusarium oxysporum* f.sp. *lentis*, *Lens esculenta*, Wilt

Wilt is one of the most important diseases of lentil (*Lens esculenta* Moench.), which causes plant mortality and reduction in its yield. For last few years, lentil crop in the farm of Faculty of Agriculture, SKUAST-K, Wadoora, (J&K) was observed to be adversely affected by wilt disease. As the disease is soil borne in nature, breeding for resistance is the most practical approach to control this disease. Therefore, present study was undertaken during *Rabi* 2001-2002 and 2002-2003 to find out the cause and screen the available germplasms for resistance against the disease.

Materials and Methods

Lentil plants showing symptoms of wilt were collected from severely affected lentil plots of the Faculty Farm and were used for the isolation of the pathogen on P.D.A. Pure culture of the fungus was prepared and maintained on Czapek dox agar. The fungus was characterized morphologically and identified as *Fusarium oxysporum* f.sp. *lentis*. Pathogenicity of the fungus was established under controlled conditions. The culture was deposited with "Indian Type Culture Collection, Division of Plant Pathology, IARI, New Delhi" and the identification was confirmed under reference No. 5215.02.

Field trials were laid during *rabi* 2001-2002 and 2002-2003 in R.B.D to screen for resistance against *Fusarium* wilt. The experiments were laid in sick soils brought under cultivation of lentil for last few years at the Faculty Farm. In all, 13 available lentil accessions of SKUAST-K were screened and were sown in plots of size 2.0 x 1.5 m with three replications each. Observations on % wilted plants were recorded from each plot at flowering time during both the years.

Periodical isolations were taken at random from the plots each year to compare the pathogen with that isolated at the beginning of the study. Plant mortality and yield in case of each plot was recorded at the time of harvesting.

Results and Discussion

Pooled data of two years 2001-2002 and 2002-2003 (Table 1) revealed that none of the lentil accessions was completely free from the disease. The accession SKL-16 exhibited least disease incidence of 5.5 % and gave highest pulse yield of 610.9 kg ha⁻¹. This was followed by accessions SKL-1, SKL-9 and SKL-9 Shalimar, which were at par with each other and exhibited wilt incidence of 15.8, 14.5 and 15.0 % with pulse yield of 528.9,

Table 1. Response of different accessions of lentil to *Fusarium* wilt under natural conditions

Accessions	Wilt incidence (%)	Plant mortality (%)	Yield (kg ha ⁻¹)
SKL-1	15.8 (23.39)*	6.3 (14.57)	528.9
SKL-3	37.5 (37.78)	22.5 (28.34)	408.6
SKL-3 Shalimar	65.6 (54.19)	42.6 (40.79)	297.0
SKL-4	62.5 (52.28)	40.6 (39.61)	307.4
SKL-6	63.3 (52.85)	41.1 (39.91)	307.3
SKL-8	34.4 (35.87)	20.6 (27.06)	403.6
SKL-9	14.5 (22.30)	5.8 (13.97)	540.9
SKL-9 Shalimar	15.07 (22.81)	6.0 (14.21)	533.3
SKL-11	62.4 (52.30)	40.5 (39.56)	297.7
SKL-12	35.8 (36.70)	21.5 (27.65)	409.2
SKL-13	33.6 (35.36)	20.1 (26.69)	410.0
SKL-15	32.0 (34.34)	19.2 (26.00)	410.1
SKL-16	5.5 (13.23)	1.1 (6.21)	610.9
SEM ±	(2.29)	(1.73)	13.07
CD (P-0.05)	(4.73)	(3.37)	26.98

* Figures in parenthesis are arc sine transformed values.

540.9 and 533.3 kg ha⁻¹, respectively. Others which followed in increasing order of wilt incidence were SKL-15, SKL-13, SKL-8, SKL-12 and SKL-3 recording 32.0, 33.6, 34.4, 35.8 and 37.5 % wilt incidence, respectively. The accessions SKL-3 Shalimar, SKL-4, SKL-6 and SKL-11 recorded highest disease incidence of 65.6, 62.5, 63.3 and 62.4 % and least pulse yield of 297.0, 307.4, 307.3 and 297.7 kg ha⁻¹, respectively. Variability in reaction of different lentil accessions to *Fusarium* wilt might probably be attributed to the presence or absence of some Quantitative Trait Loci (QTL's)

of resistance in their genomes. Such variability in reaction of different lentil varieties to this disease was reported by Kumar *et al.* (2003). It was also observed that most of the wilt-infected plants succumbed to the disease and only a small percentage of such plants survived till the harvesting time. Highest plant mortality of 42.6 % was recorded in case of SKL-3 Shalimar and least mortality of 1.1 % in case of SKL-16.

Analysis of data revealed that the wilt incidence was negatively correlated with the yield having coefficient of correlation $r = -0.97$ (Fig. 1) and positively correlated with plant mortality having coefficient of correlation $r = +0.99$ (Fig. 2). Highest yield of 610.9 kg ha⁻¹ was recorded in accession SKL-16, which exhibited least wilt incidence of 5.5 % and plant mortality of 1.1 % whereas, least pulse yield of 297.0 kg ha⁻¹ was recorded in case of SKL-3 Shalimar recording highest wilt incidence of 65.6 % and plant mortality of 42.6 %. Drastic reduction in grain yield in case of accessions showing highest wilt incidence might be due to the highest plant mortality. Sinha and Sinha (2004) also reported highest yield in case of varieties exhibiting least wilt incidence and least yield in case of varieties exhibiting least wilt incidence and least yield in case of varieties exhibiting highest disease incidence, which were controlled by the use of fungicides and botanicals like neem products (Singh *et al.*, 2003).

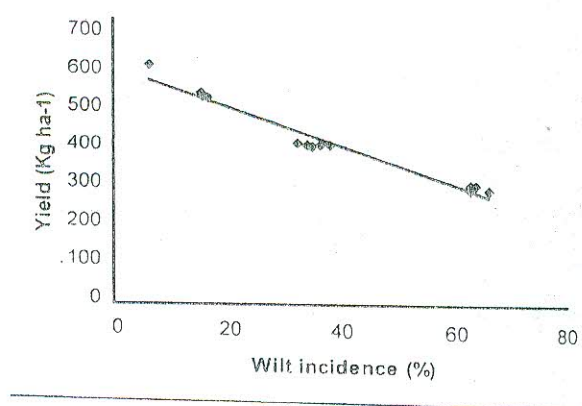


Fig. 1. Correlation between *Fusarium* wilt and yield of lentil accessions

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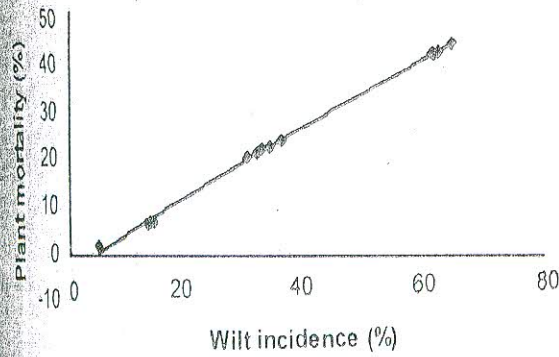


Fig. 2. Correlation between *Fusarium* wilt and plant mortality

The accessions used during present study were as such classified according to their reaction to the *Fusarium* wilt disease (Table 2). None of these was immune and only one accession (SKL-16) was highly resistant. Wani (2005) screened 12 lentil cultivars and two were found to be highly resistant against soil nematode. Pathogenic *Fusarium* spp. were mostly host specific and were influenced by nature of various accessions which primarily effect on chlamyospores germination. Thus different reactions to the varieties/accessions (Chattopadhyay et al., 2001). However, De et al. (2002) reported this association of *F. oxysporum* f. sp. *lentis* only with testa or seed cochin 4 varieties of lentil and furrows.

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Table 2. Source of resistance in lentil against *Fusarium* wilt

Disease reaction	Accessions
Immune	Nil
Highly resistant	SKL-16
Moderately resistant	SKL-1, SKL-9, SKL-9 Shalimar
Moderately susceptible	SKL-3, SKL-8, SKL-12, SKL-13 and SKL-15
Highly susceptible	SKL-3 Shalimar, SKL-4, SKL-6 and SKL-11

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