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Screening of lentil genotypes against *Fusarium oxysporum* f. sp. *lentis* in field condition

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Abstract
Lentil (*Lens culinaris* Medik) is a member of Leguminosae family and it is commonly known as poor man's meat. Lentil wilt is a very destructive disease caused by fungus *Fusariumoxysporum* f. sp. *Lentis*. In India, lentil crop suffers a great loss due to this disease. The use of resistant variety is one of the best methods of disease management. Therefore, studies were planned to search out the genotypes against *Fusarium* wilt through sick plot technique. Keeping this point in view, one hundred forty three genotypes of lentil were tested for the resistance against *Fusariumoxysporum* f. sp. *lentis* in field condition, out of which 53 genotypes were found highly resistant, 35 genotypes were found resistant, 16 genotypes were found moderately resistant, 18 genotypes were found susceptible and 21 genotypes highly susceptible. None of these genotypes was found free from infection.

Keywords: Lentil, *Fusarium*, genotypes, resistant

Introduction
Lentil *(Lens culinaris* Medik) is a member of Leguminosae family and it is commonly known as poor man's meat. It has a high nutritional value and major source of dietary proteins (25%) after soybeans (Zia *et al.*, 2011) [8]. Lentil (*Lens culinaris* Medik L.) is the most important pulse crop in India and mostly grown in north east plain zone & central part of India. It is a diploid and self-pollinated crop which is grown in winter season and belonging to Order- Rosales, suborder- Rosneae, Family- Leguminaceae (fabaceae), subfamily- papilionaceae, genus- *Lens* and species- *culinaris* with chromosome number 2n=14. Among *rabi* pulses, lentil is next to chickpea. The total area under lentil in India was 1.49 m ha with a total production of 1.61 MT and 1006 Kg/ha productivity (Anonymous, 2018) [1]. In Uttar Pradesh, it is grown on 4.78 lakh hac. area with 4.47 lakh tones production and productivity 936 kg/ha (Anonymous, 2018) [1].

Lentil suffers from attack of a number of diseases such as vascular wilt; collar rots, root rot, stem rot, rust, powdery mildew downy mildew and fusarium wilt which are caused by *Fusarium oxysporum* f. sp. *lentis*. Average yield of lentil is low due to various diseases. Among the disease, foot and root rot of lentil caused by *Fusarium oxysporum* and *Sclerotium rolfisii* are common and the most serious disease in India. The fusarium wilt of lentil caused by *Fusarium oxysporum* f. sp. *lentis* is one of the most important and destructive disease in India wilt pathogen minimize crop yield and deteriorate the seed quality (Khare, 1991) [5]. The disease was first reported from Hungary but in India it was first observed in 1941 from Delhi and Karnal. If infection takes place in early stage the plant do not produced seeds, formed few in number when infection occurred in later stage. Wilt causes more damage at flowering and

pod formation stage of the crop. *Fusarium oxysporum* f. sp. *lentis*. infection range from 25-95% depending on the cultivars tested. Lentil wilt caused by *Fusarium oxysporum* f. sp. *lentis* is a major disease in lentil growing areas in the country reported that the annual yield losses 10-15% due to this disease alone which valued approximately Rs. 2000-2500 crores by Grewal (1988) [4].

Materials and Methods

Seeds of one hundred forty three genotypes of lentil were obtained from the Department of Genetics and Plant Breeding, A.N.D. University of Agriculture and Technology, Kumarganj, Ayodhya (U.P.) and Indian Institute of Pulse Research, Kalyanpur, Kanpur (U.P.). The genotypes were screened under field condition (Sick plot technique) and two test entries after one line of susceptible check (L 9-12) are sown.After germination, observation, were recorded regularly up to 24 days for the appearance of wilt symptoms and severity. The disease was recorded using 1-9 scale for the wilt disease of lentil as described in (Table-1).

Table 1: Disease rating scale for *Fusarium* wilt (Nane *et al*., 1981) [7]

S. No.	Scale	Description	Disease reaction
1.	1	No symptoms on any plant	Resistant
2.	3	10% or less mortality	Moderately
3.	5	11-20% mortality	Tolerant
4.	7	20-50% mortality	Moderately susceptible
5.	9	51% or more mortality	Susceptible

Results and Discussion

Use of resistant genotypes is the best method of avoiding the occurrence of the disease. Keeping this point in view, out of one hundred forty three genotypes of lentil were tested for the resistance against *F.oxysporum* f. sp. *lentis* under natural field condition. Out of one hundred forty three genotypes of lentil were carried out under condition of wilt sick pot, out of which 53 genotypes were found highly resistant, 35 genotypes were found resistant, 16 genotypes were found moderately resistant, 18 genotypes were found susceptible and 21 genotypes highly susceptible. None of these genotypes was found free from infection. Kumar *et al.* (2003) [6] screened 48 lines for resistance to *Fusarium* wilt disease and found three lines *viz.* BR-25, pant L- 234 and pant l-639. A consistently resistant at various locations in Ranchi and Bihar. Resistant cultivars recorded that resistant with minimum of 5- 5.4 cm main root length and 4.6- 5 secondary root.

Chaudhary *et al.* (2008) [3] reported that flip 2006- 11L was highly resistant and seven lines (flip 2005-5l, flip- 2005-12L, flip 2008-sl, flip- 2008- 8l, Flip- 2007- 10L, Flip- 2007- 10L, and Flip- 2007-85L) were found resistant to *Fusarium* wilt. Arya and Kushwaha (2019) [2] ninety two germplasms were screened along with the local check (Sehore) under field conditions during the two consecutive years 2016-17 and 2017-18.

Table 2: Performance of lentil genotypes against *F. oxysporum* f. sp. *lentis* in pot condition during *Rabi*- 2018

Rating scale	Reaction	No. of genotype	Name of genotype's
1	Highly resistant	53	IPL 534, IPL 224, IPL 328, IPL 223, PL 141, SKUL 2-96, LL 1266, IPL 327,LL 1223, RKL 604-01, RKL 607-01, L 4147, VL 521, LL1114, PL 135, RKL 606-09, PL 117, L 4593, EC 1, PL 146, LH 84-8, LH 08-10, IPL 81, L 4708, VL 145, L 4592, L 4710, HUL 57, KLS 09-5, IPL 321, L 4711, IPL 219, IPL 215, L 4076, IPL 315, IPL 324, IPL 513, IPL 316, IPL 526, IPL 220, IPL 225, PL-129, LL-1231, RLS 113, L-4707, L-4588, VL-142, VL- 143, RLG 147, RLG 195,RVL 14-4,WBL 77,RLS 113.
3	Resistant	35	NDL 12-1, K-75, IPL 529, RLG-109, VL-138, LL-1136, IPL-319, LL-1187, KLB-104, L-4704, LL-1135, KLS-107, DPL-62, IPL-531, SL-28, KLS 122, L-4702, RLG-112, KLB 314 HPLC-649, PLO-097, LL-1161, L-4076, L-4688, VL-134, NDL7-402, VL- 516, IPL-314, VL-515, DL-11-5, DPL-15, KLS 113, PL 639, LH O7-27, RTCL-1.
5	Moderately resistant	16	NDL 12-1, KLB 343, IPL-533, NDL 11-2, NDL-7-401, NDL 6-1-10, RLG- 73, IPL-314, VL-133, LL-1020, L-4589, LH 07-27, L-4595, IPL-325, PLO-98, LL 1404.
7	Susceptible	18	LL 1161, RLG 156, DPL 15, LL1210, PL-101, PL-104, VL- 521, LH-484-8, LH 08-10, NDL-11-1, L-4591, DPL-62, L-4706, PL-122, IPL-221, LL-1203, KBL-314, DL-11-4.
9	Highly Susceptible	21	LL 1255, NDL 12-2, SKUL 9, RKL 604-5, L 9-12, KLS 113, RLG 147, RVL-48, L-4590, HUL-57, RLGF-109, DPL 62, L 4709, LL 1203, RVL -48, KLB-314, L- 4590, DL-11-4, L-4706, PL-122, PL-099.

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