



Development of High Yielding, Medium Maturity Lentil Variety LH 17-19 with Better Yield in Special Salinity Trial and Rust Resistance

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ABSTRACT

Lentils are possibly the first crop to be domesticated approximately 11,000 BC in the Fertile Crescent. The importance of lentil cultivation lies in its resistance to drought and its ability to grow in a wide range of soils, therefore, this legume production presents an encouraging panorama. Due to its low cultivation costs, it could become a magnificent option for the diversification of crops. An improved small seeded Lentil variety, "LH 17-19" was developed by pedigree method of breeding by Pulses Section, Department of Genetics and Plant Breeding, CCS Haryana Agricultural University, Hisar. The Objective was to develop high yielding, early maturing short duration and disease resistant variety of lentil. The Genotype LH 7-26 was crossed with variety PL 1 and Pedigree method was used to develop the variety. LH 17-19 yielded 1533 kg/ha and registered 13.65 and 17.86% increase over the checks Pant L 063 (1349 kg/ha) and L 4147 (1301 kg/ha), respectively, in North West Plain Zone of India in Coordinated trials conducted over three years. This variety is resistant to rust and moderately resistant to wilt in North West Plain Zone of India.

Key words: Coordinated trials, Lentil, Pedigree method, Small seeded.

Lentil (*Lens culinaris* Medik. ssp. *culinaris*) is a diploid ($2x=2n=14$ chromosomes) autogamous annual species with a large genome size of about 4063 bp (Arumuganathan and Earle, 1991). The genus *Lens* belongs to the family *Fabaceae*. The cultivated species *Lens culinaris* Medik. ssp. *culinaris* is classified into varietal types *microsperma* (small seeded with red cotyledon) and *macrosperma* (large seeded with green cotyledon). In India, lentil is grown in Uttar Pradesh, Madhya Pradesh, Jharkhand, Bihar and West Bengal with an area of 1.74 million ha and the production of 1.79 million tonnes an average yield 1028 kg/ha during 2023-24 (INDIASTAT, 2023). Lentil plays a significant role in human and animal nutrition as well as improvement of soil fertility. The crop has great importance in crop rotation because of its ability to fix atmospheric nitrogen. More than one billion hectares of land globally are affected by salinity. Salt-affected soils currently impact about 20% of all cultivated land and 33% of irrigated agricultural land worldwide. Lentil is considered a very salt-sensitive legume. A study indicated that at an electrical conductivity (EC) of just 2 dS/m, yield reduction can be around 20% and at 3 dS/m, the yield loss can be as high as 90-100% compared to other, more tolerant crops like barley or wheat. Salinity negatively impacts every stage of the plant's life cycle, from germination to seed production. The current scenario involves extensive research to bridge this gap, including identifying existing salt-tolerant lentil accessions (e.g., PDL-1, Ustica, Pantelleria). Thus Soil salinity is a major abiotic stress, limiting lentil productivity worldwide (Dissanayake *et al.*, 2021).

Lentil can play a vital role in crop diversification on marginal land with low inputs, for selecting high yielding

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genotypes; the breeder should give more emphasis to the genotypes with higher seed yield per plant, higher number of pods per plant and plants with high biomass (Pilania, 2025).

CCS HAU, Hisar has earlier released three lentil varieties viz; Sapna, Garima and HM 1. Recently LH 17-19 is released for crop diversification in 2024 for NWPZ. Lentil variety LH 17-19 (Small seeded) was Released and Notified for cultivation in North West Plain Zone of India (Punjab, Haryana, Delhi, western Uttar Pradesh, Rajasthan and plains of Uttarakhand and Jammu region) vide S.O. No. 1560 (E) dated 26.3.2024. LH 17-19 is medium maturing (130-135 days), resistant to rust and moderately resistant to wilt. Average yield is 15-16 q/ha and potential yield is 25-26 q/ha. Total protein content in this genotype is 26.56%. LH 17-19 also performed better in special salinity trial of

Rabi 2020-21, it performed 22.38 and 26.31% better over salinity check PSL-9 and PDL -1. To obtain high yielding transgressive segregants, the genotypes LL 931, L 4717, IPL 316, LH 18-04, LH 17-19 and DPL 15 should be used in hybridization programmes to exploit genetic variability (Sharma, 2022). The Genotype LH 7-26 was crossed with variety PL 1 during *Rabi* 2011-12 and Pedigree method (George

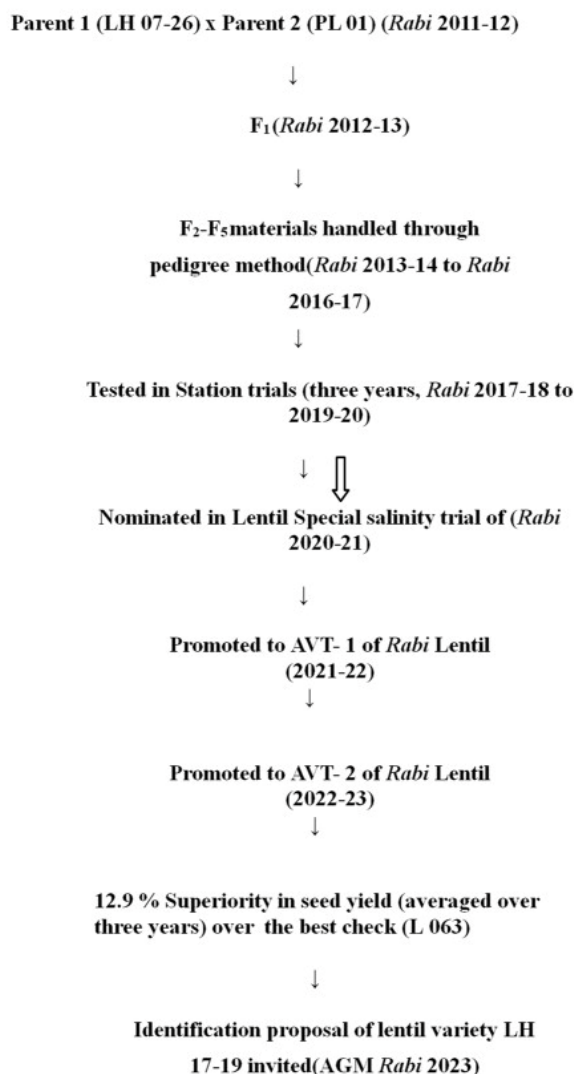


Fig 1: The flowchart of development of lentil variety LH 17-19.

Table 1: Centre wise performance of LH 17-19 in AVT- 1 (*Rabi* 2021-22): NWPZ.

Entries	Pantnagar	Ludhiana	Gurdaspur	Hisar	Jodhpur	Samba	Durgapura	Mean
LH 17-19 (PV)	1378	1424	1528	1385	2544	1165	1812	1605
2L 4147 (Check 1)	826	1128	899	1124	2627	1190	1265	1294
1PL 063 (Check 2)	688	1181	1215	1231	2419	1065	1453	1322
1PL 320 (QV 1)	1917	1424	1528	1488	2440	1407	1421	1661
1PL 342 (QV 2)	1764	1563	1233	1135	3181	1577	1500	1708
LL 1655 (QV 3)	1476	1493	1401	1457	2489	1183	1343	1549
CV (%)	8.2	8.7	7.1	7.7	7.4	10.8	7.9	-
CD at 5%	141.0	172.0	139.5	139.5	253.8	190.6	170.0	-
General mean of trial	1173	1361	1346	1241	2369	1226	1479	-
State Av. yield	751	598	598	795	1332	713	1332	-

Acquaah, 2020) was used to develop the variety. Single plant progenies were selected from F_2 to F_5 generation. The best performing progeny rows were bulked and evaluated in station trials viz; Small scale trial (SST), Large scale trial (LST) and Final yield trial (FYT) from *Rabi* 2017-18 to 2019-20. The genotype LH 17-19 was identified as best performing genotype and was nominated in Lentil Special salinity trial of (*Rabi* 2020-2). The entry was promoted to AVT- 1 of *Rabi* Lentil (2021-22) then promoted to AVT- 2 of *Rabi* Lentil (2022-23), 12.9 % Superiority in seed yield (averaged over three years) over the best check (L 063) was observed. Identification proposal of lentil

variety LH 17-19 was submitted in AGM *Rabi* 2023. Lentil variety LH 17-19 (Small seeded) was Released and Notified for cultivation in North West Plain Zone of India (Punjab, Haryana, Delhi, western Uttar Pradesh, Rajasthan and plains of Uttarakhand and Jammu region) vide S.O. No. 1560 (E) dated 26.3.2024.

The Genotype Flowchart of details of development of Lentil variety LH 17-19 is presented below in Fig 1.

LH 17-19 yielded 1533 kg/ha (average of three years in Coordinated trials) and registered 13.65 and 17.86 per cent increase over the checks Pant L 063 (1349 kg/ha) and L 4147 (1301 kg/ha), respectively, in North West Plain Zone

Table 2: Centre wise performance of LH 17-19 in AVT- 2 (*Rabi* 2022-23): NWPZ.

Entries	Pantnagar	Ludhiana	Gurdaspur	Hisar	IARI	Samba	Mean
LH 17-19 (PV)	1660	1320	1085	1488	1474	1092	1353
L 4147 (Check 1)	1320	1320	1123	1282	1531	1222	1300
PL 063 (Check 2)	1545	1563	1132	1269	1348	1274	1355
PL 320 (QV 1)	1983	1563	1026	1188	1850	1268	1480
PL 342 (QV 2)	1879	1215	1438	1112	1610	1047	1384
LL 1655 (QV 3)	1195	1389	1082	1136	1436	1194	1239
CV (%)	6.9	7.9	8.3	8.9	6.7	8.5	-
CD at 5%	147.6	168.8	146.4	155.6	151.4	150.9	-
General mean of trial	1451	1433	1187	1172	1524	1202	-
State Av. yield	843	588	588	783	-	661	-

Table 3: Summary yield data of lentil variety LH 17-19 in coordinated varietal trials in NWPZ (*Rabi*).

Year of testing		Proposed variety LH 17-19	Check 1 Pant L 063	Check 2 L 4147	Qualifying variety 1PL 320	Qualifying variety 2PL 342	Qualifying variety 3LL 1655
Mean yield	<i>Rabi</i> 2020-21	1727 (3)	1378 (5)	1312 (5)	1495 (5)	1559 (5)	1499 (5)
(kg/ha) Zonal	<i>Rabi</i> 2021-22	1605	1322	1294	1661	1708	1549
	<i>Rabi</i> 2022-23	1353	1355	1300	1480	1384	1239
Weighted mean	1533	1349	1301	1555	1559	1432	
Per cent	1 st year	-	25.33	31.63	15.52	10.78	15.21
increase or	2 nd year	-	21.41	24.03	-3.37	-6.03	3.62
decrease over	3 rd year	-	-0.29	4.08	-8.58	-2.24	9.20
checks and qualifying varieties	Weighted mean	-	13.98	17.86	-1.36	-1.62	7.10

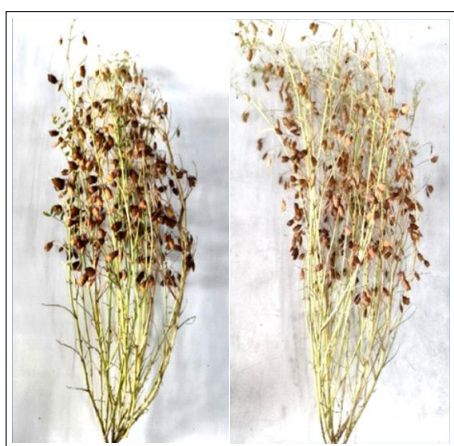
Figures in parenthesis during 1st year are number of trials/locations.

Table 4: Reaction of LH 17-19 to wilt in AICRP trials in NWPZ (*Rabi* 2021-22 and 2022-23).

Year	Genotype/ Location	Proposed variety LH 17-19	Check 1PL 063	Check 2L4 147	Susceptible checks		
					L 9-12	K 75	Sehore 74-3
2021-22	Pantnagar	17.14	31.43	14.29	-	11.43	-
	Durgapura	18.38	11.62	16.43	-	22.045	-
	Mean	17.76	21.53	15.36	-	16.74	-
2022-23	Pantnagar	13.92	27.85	-	73.42	67.09	77.22
	Mean	13.92	27.85	-	73.42	67.09	77.22
Overall mean	15.84	24.69	15.36	73.42	41.91	77.22	

Table 5: Reaction of LH 17-19 to Rust in AICRP Trials (*Rabi* 2021-22 and 2022-23).

Year	Genotype / Location	Reaction to Rust (1-9 Scale)							
		Proposed variety LH 17-19	Check 1PL 063	Check 2L 4147	Susceptible checks			Resistant checks	
					L 4076	L 830	K 75	PL 024	LL 931
2021-22	Pantnagar	7	7	8	9	-	8	-	-
	Kumarganj	1	1	5	3	-	1	-	-
	Shillongani	1	1	1	1	-	5	-	-
	Ludhiana	1	3	5	7	-	3	-	-
	Mean	2.5	3	4.8	5.0	-	4.3	-	-
2022-23	Shilongani	3	3	-	7	9	1	3	3
	Ayodhya	1	3	-	7	7	1	2	2
	Pantnagar	3	2	-	8	9	3	3	3
	Ludhaiana	5	5	-	9	9	6	7	7
	Mean	3.0	3.3	-	7.8	8.5	2.8	3.8	3.8
Overall mean		2.8	3.1	4.8	6.4	8.5	3.5	3.8	3.8

**Fig 2:** Seeds of LH 17-19.**Fig 3:** Single plant of LH 17-19.

of India in different Coordinated trials conducted over three years. Centre wise performance of LH 17-19 in AVT- 1 and AVT-2 (*Rabi* 2021-22 and *Rabi* 2022-23) is shown in Table 1 and 2 respectively. LH 17-19 also performed better in special salinity trial of *Rabi* 2020-21, it performed 22.38 and 26.31 % better over salinity check PSL-9 and PDL-1. Summary yield data of lentil variety LH 17-19 in Coordinated Varietal Trials is presented in Table 3. LH 17-19 was found moderately resistant to wilt in North West Plain Zone of India as wilt incidence was observed less in LH 17-19 in comparison to almost all the checks and qualifying varieties (Table 4). Rust incidence in LH 17-19 was less than all the checks, qualifying varieties and resistant checks (Table 5). Seeds and single plant of LH 17-19 is shown in Fig 2 and 3 below.

CONCLUSION

CCS HAU has developed the varieties viz; HM 1, Sapna and Garima. Recently small seeded variety "LH 17-19 has been released from CCS HAU, Hisar with average yield of 15-16q/ha. As far as economics is concerned, higher gross return, net return and BC ratio was recorded for small seeded lentil variety LH 17-19 (2.11) over check variety PL 063 and LL1373 (1.99 and 1.44 B:C ratio). "Higher return was obtained with sowing on 5 th November. Thus lentil variety LH 17-19 will play a vital role in crop diversification in Haryana as well as in north west plain zone of India.

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Conflict of interest

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