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Registration of Mersimoy Lentil Variety

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ABSTRACT

Mersimoy (EC837891) is a lentil (Lens culinaris Medik.) variety developed through a rigorous program of continuous phenotypic selection at the Sinana Agricultural Research Center (SARC). The genotype underwent comprehensive evaluation in multi-location variety trials conducted from 2017 to 2019 across representative highland agro-ecologies, alongside twelve advanced breeding lines. Across test environments, Mersimoy consistently demonstrated superior mean grain yield, stable performance, and favorable agronomic traits, including desirable plant architecture and early maturity. The variety also exhibited a notably good level of resistance to the major diseases prevalent in lentil-growing regions. Based on its yield advantage, agronomic stability, and disease-resistance profile, Mersimoy was officially released in 2022 for commercial production. It is specifically recommended for the highland lentil-producing zones of Ethiopia, where it is expected to contribute to enhanced productivity, improved resilience, and greater food and nutritional security.

Keywords: *Mersimoy, Variety Registration, Grain yield.*

1. INTRODUCTION

Lentil (*Lens culinaris* Medik.) is one of the oldest domesticated pulse crops and is widely cultivated in many parts of the world for its nutritional, economic, and ecological importance [2]. The crop is highly valued as a cheap source of dietary protein, carbohydrates, minerals, vitamins, and fiber, particularly in developing countries where animal protein is often limited [3, 7]. In addition to its nutritional value, lentil contributes to sustainable agriculture through biological nitrogen fixation, which improves soil fertility and reduces the requirement for inorganic fertilizers [4, 5]. The crop also plays an important role in crop rotation systems by improving soil health and breaking disease cycles in cereal-dominated farming systems [10].

Globally, lentil production has increased steadily over the last decades due to rising demand for plant-based protein and expansion of pulse production systems [3]. According to [3], lentil is cultivated on millions of hectares worldwide with a global average productivity of approximately 1.2 t ha^{-1}. [3]. Ethiopia is recognized as the largest lentil producer in Africa and ranks among the top ten lentil-producing countries in the world [5, 6]. The increasing global demand for lentil in international markets has also enhanced the importance of improving lentil productivity and quality in major producing countries, including Ethiopia [12].

According to the Central Statistical Agency (CSA, 2023) [2], lentil is cultivated on about 87,443 hectares of land in Ethiopia with a total production exceeding 119 thousand tons and an average productivity of approximately 1.36 t ha^{-1}. [3] similarly reported that Ethiopia achieved an average lentil productivity of about 1.46 t ha^{-1}, which is slightly above the global average. However, the current national productivity remains below the potential yield attainable under improved management conditions and improved varieties, where yields of more than 3–5 t ha^{-1} have been recorded in experimental fields [1, 11, 14]. The low productivity of lentil in Ethiopia is attributed to several biotic and abiotic constraints, including the use of low-yielding local cultivars, moisture stress, declining soil fertility, diseases Ascochyta blight (*Ascochyta lentis*), rust (*Uromyces viciae-fabae*), and root rot complexes significantly reduce yield and grain quality [8, 13], insect pests, and limited access to improved seed and agronomic technologies [12].

The development, evaluation, and registration of improved lentil varieties are therefore essential strategies for increasing lentil productivity and ensuring sustainable pulse production in Ethiopia [9]. The development of improved lentil varieties provides farmers with access to superior genetic materials that are high yielding, disease resistant, stress tolerant, and adaptable to diverse production environments [2]. Improved lentil varieties contribute significantly to increased agricultural productivity, enhanced food and nutritional security, improved income generation, and strengthened export competitiveness [10]. Furthermore, the use of improved varieties supports climate-resilient agriculture by enhancing adaptation to variable environmental conditions and production stresses [5].

Therefore, the objective of this study was to register stable, high-yielding, and disease resistant/tolerant Lentil variety for highlands Bale and other similar agro-ecologies in Ethiopia. Research on the registration of lentil varieties in Ethiopia is important for identifying and recommending adaptable and high-performing varieties that can address existing production constraints and improve national productivity.

2. Varietal Origin and Evaluation

The lentil genotype *EC837891*, later released as *Mersimoy*, together with 13 additional genotypes, was obtained from the Debre Zeit Agricultural Research Center under the Ethiopian Institute of Agricultural Research. These genotypes were evaluated alongside the standard check varieties, *Asano* and *Alemaya*, across two representative lentil-growing locations, Sinana and Agarfa, over three consecutive cropping seasons from 2017 to 2019.

Combined analysis of variance and mean performance comparisons identified two superior genotypes, *EC837891* and *EC837840*, as promising candidate varieties based on their agronomic performance, yield potential, and adaptability across environments. Subsequently, the selected candidate genotypes were advanced to variety verification trials and evaluated together with previously released and recently commercialized standard check varieties, namely *Debine*, *Furi*, *Asano*, and *Alemaya*.

The variety verification trial was conducted during the 2021/22 main cropping season under both on-station and farmers' field conditions at two representative locations. The candidate and check varieties were planted in 10 m × 10 m plots and evaluated by the National Variety Release Technical Committee for their yield performance, stability, adaptability, and disease reaction under farmers' management conditions. Based on its consistent superior performance, wider adaptability, and desirable agronomic traits, genotype *EC837891* was officially recommended for commercial production and subsequently released under the variety name *Mersimoy*.

3. Varietal Characteristics

The newly released lentil variety *Mersimoy* is characterized by an indeterminate growth habit. It produces light pink flowers, with seeds exhibiting a light brown seed coat and light red cotyledons. Phenologically, the variety reaches 50% flowering at an average of 59 days after emergence and attains physiological maturity at approximately 128 days. Morphologically, *Mersimoy* has an average plant height of about 45 cm and produces an average of 24 pods per plant, indicating its favorable yield component attributes. The detailed agronomic and phenological characteristics of the variety are presented in Tables 1 and 3.

4. Yield and Quality Performance

The newly released lentil variety, *Mersimoy*, demonstrated superior yield performance across the testing environments over three consecutive production years at the two experimental locations. The variety produced seed yields ranging from 1,352 to 3,883 kg ha^{-1}, whereas the standard check variety, *Asano*, recorded seed yields ranging from 1,091 to 2,361 kg ha^{-1} (Table 2). On average, *Mersimoy* attained a mean seed yield of 2,321 kg ha^{-1}, representing a yield advantage of approximately 39.99% over the standard check variety, *Asano*. Under research field conditions, *Mersimoy* achieved seed yields ranging from 2,100 to 3,800 kg ha^{-1}, while under farmers' field conditions, the variety yielded between 1,300 and 2,100 kg ha^{-1} (Table 1). The consistent yield superiority of *Mersimoy* across both research-managed and farmers' field conditions indicates its wide adaptability, yield stability, and potential for enhancing lentil productivity in the target production areas.

5. Reaction to Major Diseases

Among the major biotic constraints affecting lentil production in the testing environments, Ascochyta blight, rust, and root rot were the most prevalent and economically important diseases. Disease reactions were assessed using the standard 1–9 severity rating scale, where lower scores indicate greater resistance. The candidate variety, Mersimoy, exhibited a mean disease severity score of 3 for both Ascochyta blight and rust, and a score of 4 for root rot. These ratings indicate that the variety possesses a moderately resistant reaction against the major lentil diseases across the experimental locations. The comparative disease response of Mersimoy and the standard check varieties is summarized in Table 4.

6. Performance Stability and Adaptation Domain

Mersimoy was released for high altitude agro-ecologies of the country receiving 750-to-1000 mm average annual rainfall. It is well adapted to an altitude range of 1800 – 2600 meters above sea level such as Sinana, Goba, Agarfa, Gassera, Goro (Meliyu), Adaba, Dodola and other similar agro-ecologies (Table 1). Based on most stability parameters, 'Mersimoy' showed relatively comparable performance stability across a range of environments (Table 3).

7. Variety Maintenance

The breeder and foundation seed will be maintained by Sinana Agricultural Research Center/ Oromia Agricultural Research Institute.

Table 1: Agronomical and Morphological Characteristics and Agro-ecological Zones of Adaptation of Mersimoy, Lentil variety

No	Agronomical and Morphological Characteristics		
1	Adaptation area		Bale highland: Sinana, Goba, Agarfa, Gassera, Goro (Meliyu+), Adaba, Dodola and other similar agro-ecologies
2	Altitude (m.a.s.l.)		1800 – 2600
3	Rainfall (mm)		750 – 1000
4	Seed Rate (Kg/ha)		75
5	Planting date		End of July to Early August
6	Days to Flower		59
7	Days to Maturity		128
8	Plant Height (cm)		45
9	1000 Seed Weight (gm)		27
10	Seed Color		Light brown
11	Cotyledon Color		Light red
12	Seed size		Large
13	Flower Color		Light Pink
14	Yield (Qt/ha)	Research Field	21-38 on average=28
		On-farmer's field	13-26 on average=18
15	Yield advantage over Asano		33.99%
16	Disease reaction		Tolerant to Aschochyta blight, Rust and Root Rot
17	Yield advantage over Asano (%)		39.99
18	Year of Release		2022
19	Breeder and Maintainer		SARC(OARI)

Table 2: Mean grain yield (kg/ha) of 14 Lentil genotypes across locations and years

Entry	Sinana			Agarfa			Mean	Yield Adv. over St. check
	2017	2018	2019	2017	2018	2019		
PBA BLITZ	1368	2335	1752	1947	1461	1159	1670	
07H212L-07HG1003-08HS2003	1515	1955	1773	469	576	1218	1251	
CIPAL1304	2598	2432	2005	1267	2849	1388	2090	
EC837891(Mersimoy)	**2195**	**3883**	**2409**	**1352**	**2652**	**1437**	**2321**	
CIPAL 1306	2550	3135	2782	963	2606	1486	2254	
CIPAL 1204	2378	3468	1802	1054	2018	1247	1995	
06H122L-07HS2003	1690	2595	1568	304	1188	611	1326	
PBA BOLT	1968	1948	2148	447	830	957	1383	
07H071L-08HS2009	2161	1979	2305	1099	966	868	1563	
EC837840	**2345**	**3194**	**2412**	**1478**	**1734**	**1345**	**2085**	
03-1 06LX1-07H4008	1708	2485	1805	570	2202	803	1596	
07H029L-08HS2021	1158	1649	1671	626	1566	448	1186	
Asano	1679	2361	1935	1310	1574	1091	1658	39.99%
Alemaya	1599	1169	1809	1431	2823	725	1593	
Local check	1288	1405	1475	478	1504	1148	1216	
MEANS	1880	2400	1977	986	1770	1062	1679	
5% LSD	2570.0	867.9	474.7	973.4	343.0	541.4	1670	
C.V.	24.1	25.0	17.0	23.9	24.1	22.7	21.3	

Table 3: Mean Seed yield and other agronomic traits for 14 lentil genotypes tested in regional Variety Trial combined over two locations (Sinana and Agarfa) over three years (2017-2019)

Entry	DF	DM	Stand %	PH (cm)	Disease score (1-9 scale)			NPP	NSPP	HSW (g)	SY (kg/ha)
					ASB	Rust	RR				
PBA BLITZ	58	126	79	44	7	5	5	27	1	3.2	1670
07H212L-07HG1003-08HS2003	59	127	79	46	8	5	5	28	1	3.0	1251
CIPAL1304	61	128	80	46	7	4	4	25	1	3.0	2090
EC837891(Mersimoy)	**60**	**127**	**80**	**48**	4	3	3	**24**	**1**	**3.0**	**2321**
CIPAL 1306	63	127	82	46	7	4	4	26	2	2.9	2254
CIPAL 1204	61	128	79	45	5	5	4	25	1	2.9	1995
06H122L-07HS2003	60	129	80	47	7	4	5	27	1	2.6	1326
PBA BOLT	61	128	79	47	8	5	5	24	1	2.6	1383
07H071L-08HS2009	62	130	80	47	7	5	5	31	1	2.6	1563
EC837840	**59**	**128**	**79**	**45**	4	4	4	**26**	**1**	**2.7**	**2085**
03-1 06LX1-07H4008	63	130	81	45	6	5	4	26	1	2.6	1596
07H029L-08HS2021	61	128	79	46	7	5	4	25	1	2.4	1186
Asano	59	126	80	43	5	4	5	27	1	2.9	1658
Alemaya	59	124	80	43	7	4	5	28	1	2.6	1593
Local check	60	123	78	44	7	5	5	31	1	1.9	1216
MEANS	60	127	80	46				27	1	2.7	1679
5% LSD	2.08	3.38	2.08	6.46				5.06	0.34	0.10	1670
C.V.	4.7	24	6.1	23.4				24.4	4.6	8.8	21.3

Table 4: Mean seed yield, agronomic traits and disease reaction of 'Mersimoy' along with standard and local checks tested in two environments at varietal verification levels during 2017-2019cropping seasons

Entry	Agronomic traits								Disease Reaction (1-9)		
	DF	DM	Stand %	PH (cm)	NPP	NSPP	HSW (g)	SY (kg/ha)	AsB	Rust	RR
EC837891(Mersimoy)	**60**	**127**	**80**	**48**	**24**	**1**	**3.0**	**2321**	4	3	3
EC837840	**59**	**128**	**79**	**45**	**26**	**1**	**2.7**	**2085**	4	4	4
Asano	59	126	80	43	27	1	2.9	1658	5	4	5
Alemaya	59	124	80	43	28	1	2.6	1593	7	4	5
Local check	60	123	78	44	31	1	1.9	1216	7	5	5

Note: DF = days to 50% maturity, DM, days to 90% maturity, PH = plant height (cm), AsB= Aschochyta Blight, RR= Root Rot, NPP= Number of pods per plant, NSPP= Number of seed per pod, HSW= Hundred seed weight (g), SY = Seed yield (kg).

8. CONCLUSION

Mersimoy was the best-yielding lentil variety. It is stable in seed yield performance over locations and years. It was resistant to major diseases of Lentil that prevailed in the growing areas. The new variety, 'Mersimoy' has a mean seed yield of 2321 kg ha^{-1} which was higher by about 39.99% than the seed yields obtained from Asano (the check variety). Farmers also preferred the variety for its overall superior performance over the existing variety, which is manifested by high uniformity, good plant height, better pods load and number of branches per plant. Therefore, wide cultivation of the Mersimoy variety will boost productivity and marketability of the crop and improve farmers' income.

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