Austin Journal of Plant Biology

Open Access

Austin Publishing Group

Research Article

Registration of *Gabisa* Food Barley (*Hordeum Vulgare L.*) Variety for Highland of Guji Zone, Southern Oromia

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Received: March 19, 2025
Accepted: April 11, 2025
Published: April 15, 2025

Abstract

Newly generated cultivars are essential for raising a crop's productivity and yield, which impacts national crop production and the livelihoods of farmer. The food barley variety with the lineage IBO-HI2017/07 was named Gabisa; it was released as a variety by Bore Agricultural Research Centre in 2022, primarily originating from Sinana ARC. 18 food barley genotypes, along with the checks "Wolashe and Adoshe," were assessed over a two-year period in three locations (2021-2022). Consequently, the genotype BO-HI2017/07 demonstrated improved grain yield, tolerance to diseases, and stability across time and over place with yielding a 23.2% advantage over the best standard check.. Finally, the genotype "BO-HI2017/07," which showed promise, was chosen and advanced to the variety verification trail. Gabisa (IBO-HI2017/07), which has a stable and high grain production and resistance to main diseases, is released for use in the highlands of the Guji Zone and other agro-ecologies of a similar.

Keywords: Food barley; Gabisa; Resistance; Stable; Yield performance

Introduction

Barley is one of Ethiopia's most important and commonly produced crops, grown primarily in the highlands. It is the fifth most significant cereal crop in Ethiopia in terms of area coverage, after tef, wheat, maize, and sorghum [1]. Barley grows between 1800 and 3400 meters above sea level in a variety of agro-ecological conditions. But the altitude range of 2300 to 3000 m above sea level is where it grows most effectively [2]. Barley accounted for 7.74% (23,391,098.8 quintals) of the total grain production, with cereal crops contributing 88.36% (about 302,054,260.58 quintals) [3,4]. Barley productivity and production in Ethiopia, including the Guji zone, are comparatively low in relation to our potential land. There are many factors that restrict Ethiopia's productivity and production of barley. There are many factors that restrict Ethiopia's productivity and production of barley, the main ones being the absence of improved varieties and seed. Development of improved food barley variety is one of the most important strategies for increasing production and productivity to improving the livelihood of farmers in the country. In Ethiopia several food barley varieties have been released for production over the past years. However, most of them were pushed out of production a few years after released, due to loss of soil fertility and climate fluctuation. Therefore, the ultimate goal of plant breeder in a crop improvement program is to generate cultivars that are resistant to diseases, adaptive to the current climate, and high yielders. Based on this concept, Bore Agricultural Research Centre has evaluated a number of barley genotypes over the past five years in an effort to develop a food barley variety that is high yielding, disease-resistant, and environment-adaptable, finally, the Gabisa variety was released for Guji and comparable ecosystems.

Therefore, the objective of this study was to release and register stable, high yielding and disease resistance bread wheat food barley variety for high land of Guji and similar agro-ecologies.

Material and Methods

GABISA (IBO-HI2017/07) along with 16 genotypes were obtained from Sinana Agriculture Research Center of the Oromia Agriculture Research Institute. The genotypes were evaluated along with the standard checks (Adoshe, Abdane and Robera), across five locations (Bore, Abayi Kuture, Dama and A/Sorra) for two consecutive years (2020/21-2021/22) in main cropping seasons. The three genotypes, GABISA (IBO-HI2017/07), IBO-HI2017/58 and IBO-HI2017/01 were selected as candidate varieties based on a combined data analysis of variance and mean performances comparison of genotypes. The three genotypes, GABISA (IBO-HI2017/07), IBO-HI2017/58 and IBO-HI2017/01 gave yield advantages of 23.17, 23.07 and 9.51 over best standard check (Adoshe), respectively. The three promising candidate varieties were eventually promoted to a variety verification trial. The three candidates along with standard check (Adoshe) were planted in plots with a size of 10 m x 10 and evaluated by the national variety release technical committee at 8 locations during the 2022/23 cropping season. However, Gabisa (IBO-HI2017/07) performed

Citation: Aliyi Kedir, Seyoum Alemu, Kuma Kebede. Registration of Gabisa Food Barley (*Hordeum Vulgare L.*) Variety for Highland of Guji Zone, Southern Oromia. Austin J Plant Biol. 2025; 11(1): 1061.

Table 1: Mean agronomic traits and disease reactions of 20 food barley genotypes tested in food barley regional variety trial for over all locations, 2020-2022.

NS	Genotypes	DH	DM	PLH	SL	TKW	Gy
1	IBO-HI2017/93	63.00	123.80	79.03	7.60	37.31	36.90
2	IBO-HI2017/20	69.33	123.70	100.71	7.75	38.90	36.93
3	IBO-HI2017/55	71.67	121.00	95.24	7.54	42.03	38.99
4	IBO-HI2017/79	68.33	119.40	96.92	6.93	42.37	37.28
5	IBO-HI2017/2	61.00	117.30	87.41	7.30	42.42	32.81
6	IBO-HI2017/18	64.67	119.80	95.81	7.68	44.98	38.69
7	IBO-HI2017/29	62.00	117.80	86.47	7.80	46.88	30.49
8	IBO-HI2017/12	68.00	122.70	89.55	7.94	46.24	34.49
9	Robera	67.56	119.20	92.29	6.94	41.62	37.20
10	IBO-HI2017/15	63.22	121.40	79.79	7.29	37.62	37.73
11	IBO-HI2017/8	66.22	123.30	82.59	8.04	41.93	37.95
12	IBO-HI2017/1	59.89	118.90	81.39	7.47	47.11	42.15
13	IBO-HI2017/07	68.11	121.00	91.82	7.54	38.44	47.41
14	IBO-HI2017/58	66.22	123.70	93.04	7.52	39.38	48.60
15	IBO-HI2017/64	64.22	121.60	85.44	7.96	38.83	42.36
16	Adoshe	70.78	125.20	86.59	7.74	37.72	38.49
17	IBO-HI2017/54	64.11	123.10	84.00	7.77	40.12	37.82
18	IBO-HI2017/4	64.44	118.80	87.57	6.90	40.20	33.17
19	Abdane	65.89	116.30	68.29	6.74	42.71	37.23
20	IBO-HI2017/90	66.78	116.60	103.74	7.42	40.12	28.88
Means		65.77	120.73	88.38	7.49	41.35	37.78
LSD (5%)		8.017	7.689	16.645	1.3425	8.565	12.75
CV (%)		7.5	3.9	11.6	11.1	13.4	21.65

DH: Days for Heading; DM: Days to Maturity; PLH: Plant Height (cm); SL: Spike Length; TKW: Thousand Kernel Weight (cm); Gy: Grain yield (q/ha); CV (%): Coefficient of Variations; LSD; Least Significant Difference.

Table 2: Summary of the description of agronomic and morphological characteristics of new Food Barley variety.
Variety name *'GABISA'(IBO-HI2017/7).*
Agronomic and Morphological Characteristics.

• Adaptation:	High lands of Guji and similar agro ecologies
• Altitude (m.a.s.l):	2600-2895
• Rain fail (mm):	> 875
• Fertilizer rate (kg/ha): o NPS:	100
• Seed rate (kg/ha):	130
• Planting date:	Mid July to early August in Guji high lands and similar agro ecologies
• Days to heading:	68.11
• Days to maturity:	121
• Plant height (cm):	91.82
• Growth habit:	erect
• Seed color:	White
• Hectoliter weight (kg/ha)	51-56
• Thousand kernel weight:	38.44
• Row type:	Six row
• Lodging tendency	Resistance (about 5% lodged)
• Crop pest reaction*:	
• Grain yield (Qt/ha): o Research field:	43-58
o Farmer's filed:	33-51
Year of release:	2023
Breeder/maintainer:	BoARC/OARI

*Relatively, resistance to major barley disease and pest.

better than another candidate in a variety verification study across sites. Finally, the national variety release technical committee and standing committee suggest "Gabisa (IBO-HI2017/07)" for release based on many characteristics such as DUS, VCU, disease response, yield, and farmers' preferences. Gabisa (IBO-HI2017/07) has better yield advantage, and good resistance to major diseases like scald, net blotch and leaf rust.

Therefore, As a result, GABISA was formally issued in July 2023 following the work shop held in Bishoftu for expanded production in the highlands of Guji zones and related agro-ecologies.

Result

Agronomic and Morphological Characteristics

The released variety, *GABISA* has white seed color, average plant height of 91.82 cm and average thousand seed weight 38.44 g. The detail agronomic and description of newly released variety are given in Table 1.

Yield Performance

Gabisa had better yields than other genotypes across multiple sites and years, with an average yield of 47.41 qtha^{-1} (Table 1 and Table 2). The yield of this variety ranged from 43 qtha^{-1} (quintal) to 58 qtha^{-1} in the research field and 33 qtha^{-1} to 51 qtha^{-1} in the farmers' field. According to multi-location and multi-year evaluation records, this newly released variety has a stable and high yield. Gabisa has a 23.17 percent yield gain over standard check. Gabisa could be tolerant to major barley diseases including scald and net blotch.

Conclusion and Recommendation

The newly produced food barley variety "GABISA" boasts superb productivity, consistency across years and locales, and resistance to common barley diseases. Smallholder farmers in Southern Oromia including highlands of Guji and other locations with similar agro-ecologies can grow the GABISA variety using the full package of recommended technologies.

Acknowledgment

The authors would like to acknowledge the financial support provided by Oromia Agricultural Research Institute for conducting the field trials. The authors also would like to acknowledge Bore Agricultural Research Centre for the support in facilitating the field work and allocating the required labor and materials for field work and Cereal research team staff for their hard work from the beginning to the release and registration of this new variety.

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