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# The Release and Registration of "Walashe" Barley (*Hordeum vulgare L.)* Variety

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**Abstract:** Walashe is a common name for six - rowed, hulled food barley (*Hordeum vulgare* L.) variety with a pedigree designation of IBON HI 14/15 P#116. The variety has been developed and released by Sinana agricultural research center for commercial production in the highlands of Bale. It has been tested at Sinana, Goba, Adaba, Dodola and Gassera areas during 2018-2019 main cropping seasons along with sixteen genotypes advanced from the ICARDA lines. The variety is well adapted to altitudes ranging between 2100-2500 m.a.s.l in the south eastern Ethiopia and similar agro ecology. Walashe is characterized by white seed color, large seed size, long spike and high yielder. This variety is a medium maturity & its mean grain yield performance ranged from 3.7 to 5.4 tonha$^{-1}$ on research field and 3.3 to 4.4 tonha$^{-1}$ on farmers' field and has average thousand-kernel weight of 38 g. Walashe showed 14% and 18% yield advantage over the standard check *Robera and Abdane* as well as 15% overthird standard check *EH1493*, respectively. Based on stability parameters, Walashe showed relatively better grain yield performance and stable adaptability across locations years than the standard checks. The variety showed tolerant to major barley disease and tolerant to barley shoot fly than checksand exhibit compensatory growth after shoot fly damage and it was released in 2021.

**Keywords:** Walashe, Barley (*Hordeum vulgare* L.), Yield Performance, Resistance

## 1. Introduction

Barley is a cool season crop which grows at altitudes of about 3000 meter above sea level and commonly cultivated in stressed areas where soil erosion occasional drought or frost limits the growth of other crops [1, 4, 8]. Ethiopia is the second largest barley producer in Africa, next to Morocco, accounting for about 25 percent of the total barley production in the continent [7]. Barley production and consumption has a longstanding tradition in Ethiopia where the country is considered the center of diversity or secondary origin of the crop with more than 15,000 accessions conserved in the gene bank [3, 10].

Barley improvement in Ethiopia was started in the 1950s through the introduction of exotic germplasem and collections of local landraces with an objective ofimproving grain yield potential, grain quality and resistance/ tolerant to biotic as well as abiotic stresses [2]. Despite the breeding endeavors, in the last decades varieties released by the federal and regional research center were limited in quantity and standard quality attributes [4, 5, 7]. Therefore, currently the barley research program carried out different breeding activities using landraces, foreigngermplasems and genetic variability created locally through hybridization. The objective of this paper is to present the result of a variety trial conducted at five locations in 2018 and 2019 cropping seasons with subsequent identification and released of one outstanding food barley variety, namely Walashe (IBON HI 14/15 P#116).

## 2. Varietal Origin and Evaluation

*Walashe* (IBON HI 14/15 P#116) barley (*Hordeum vulgare L.*) is food barley variety released in 2021 under Oromia Agricultural Research Institute by Sinana Agricultural Research Center. It was originally developed from ICARDA barley improvement research program lines through pure line

selection methods to develop stable high yielding and disease resistant. The material has been evaluated together with other genotypes in different breeding nurseries from 2018-2019 and then advanced to variety trial to see its varietal performance across locations and years in barley producing areas of Bale highland. The variety was evaluated by National Variety Release committee and officially released for wider production in the highlands of Bale and areas with similar agro-ecologies.

## 3. Morphological and Agronomical Characters

*Walashe* is six-rowed variety, erect growth habit with average days to heading and maturity date of 70 and 115 days, respectively (Table 1). The variety has short plant height (76.3cm) and this character is preferred by the local community for its tolerance to lodging problem in major barley growing areas. On the other hand, seed color is white and has average thousand-kernel weight of 38 g. It is also characterized by better resistance/tolerance to main biological insect pest (shoot fly) than specially the standard variety (*Robera, Abdane* and *EH1493)* and showed rapid compensatory growth after damage by the insect.

## 4. Yield Performance

*Walashe* (IBON HI 14/15 P#116) was tested together with 16 barley genotypes including checks in regional variety trial at 5 environments in major barley producing areas in Bale highlands during 2018- 2019 consecutive years. It was evaluated along with *Robera, Abdane* and *EH1493* as standard variety at altitudinal range of 2300-2600 meter above sea level at Sinana, Gasera, Goba, Adaba and Dodola locations in each year. During evaluation seasons, the overall location grain yield mean of this variety was better than all genotype means. Beside, *Walashe* showed 14% and 18% yield advantage over the standard check *Robera* and *Abdane* as well as 15% overthird standard check *EH1493,* respectively. On research field *Walashe* gave yield ranging from 3.7 to 5.4 tonsha$^{-1}$, whereas 3.3 to 4.4 tons ha$^{-1}$ on farmers' field.

***Table 1.*** *Agronomic and morphological characteristics of Walashe (IBON HI 14/15 P#116).*

| **Agronomic characters** | |
|---|---|
| Altitude (m.a.s.l) | 2100 -2500 |
| Rain fall (mm) | 650 -1600 |
| Fertilizer rate (DAP in kg/ha) | 100 |
| Seed rate (kg/ha) | 125 |
| Planting date | Mid-June to early August |
| Days to heading | 70 |
| Days to maturity | 115 |
| Plant height (cm) | 76.3 |
| Growth habit | Erect |
| 1000 seed weight (g) | 38 |
| Seed color | White |
| Row type | 6 row |
| Hectoliter weight (Kg/L) | 63.1 |
| Crop pest reaction | Moderately Resistance |
| Grain yield (t/ha) Research field | 3.7 -5.4 |
| Grain yield (t/ha) Farmer's field | 3.3 -4.4 |
| Year of released | 2021 |

## 5. Stability Performance

Stability analysis was done on grain yield using 16 food barley genotypes including checks were studied for two years across five locations. According to joint regression model, a variety with high mean yield, regression coefficient (bi) of unity and with deviation from regression (S2di) =0 is stable [6] and [14]. In this regard, *Walashe* is stable variety with high mean grain yield, regression coefficient (bi) of 0.95 which is nearly unity and deviation from regression of 0.06 which is equivalent to zero. Therefore, it has shown stable yield performance across locations of evaluation as well as higher mean grain yield over check varieties *Robera, Abdane* and *EH1493* and similar result reported [9] and [13].

***Table 2.*** *Results ofStability parameters of 16 Food barley genotypes over environments.*

| Genotype | Mean | IPCA 1 | IPCA 2 | ASV | rASV | YSI | bi | S2di |
|---|---|---|---|---|---|---|---|---|
| ICARDA-GP 45 | 2.3 | -0.71 | 0.29 | 0.94 | 14 | 21 | 0.10 | 0.05 |
| IBON HI 14/15 12 | 1.5 | -0.18 | -0.39 | 0.46 | 8 | 24 | 0.70 | 0.01 |
| IBON HI 14/15 18 | 1.7 | 0.03 | 0.26 | 0.26 | 6 | 21 | 1.11 | 0.03 |
| IBON HI 13/14 12 | 2.0 | -0.54 | 0.01 | 0.69 | 12 | 13 | 1.04 | -0.07 |
| ICARDA-GP 86 | 2.3 | 0.03 | -0.61 | 0.61 | 10 | 18 | 1.23 | -0.06 |
| ICARDA ND 218 | 2.1 | 0.00 | -0.28 | 0.28 | 7 | 18 | 1.49 | 0.19 |
| IBON HI 14/15 141 | 2.2 | 0.02 | 0.13 | 0.13 | 3 | 12 | 1.93 | 0.00 |
| ICARDA GP 35 | 2.8 | -0.15 | 0.02 | 0.19 | 5 | 10 | 1.87 | 0.08 |
| IBON HI 14/15 29 | 1.8 | -0.29 | 0.56 | 0.67 | 11 | 25 | 1.16 | 0.05 |
| IBON HI 13/14 15 | 2.0 | -0.21 | -0.46 | 0.53 | 9 | 22 | 1.05 | -0.05 |
| SBYT 19 | 2.7 | -0.04 | -0.09 | 0.10 | 2 | 8 | -0.03 | -0.05 |
| IBON HI 14/15116 | 3.6 | -0.03 | 0.00 | 0.03 | 1 | 2 | 0.95 | 0.06 |
| ICARDA-GP 109 | 2.1 | 0.08 | 0.11 | 0.15 | 4 | 14 | 0.70 | 0.02 |
| Robera | 2.6 | 0.57 | 0.70 | 1.00 | 16 | 18 | 1.08 | -0.06 |
| Abdane | 2.4 | 0.67 | -0.01 | 0.84 | 13 | 17 | 0.78 | -0.06 |
| EH1493 | 2.4 | 0.76 | -0.24 | 0.99 | 15 | 18 | 0.53 | 0.04 |

ASV= AMMI Stability Value, rASV=Rank of ASV, YSI=Yield Stability Index, bi= linear regression coefficient (slope), $S^2$di= Deviation from the regression component of interaction

## 6. Disease Reaction

Data recording was done for all genotypes including this variety for major barley diseases such as net blotch (*Pyrenophora teres* Drechs.), scald (*Rhynchosporium secalis* Oud.), stem rust *(Puccinia graminis* f. sp. *Tritici)* and barley leaf rust (*Puccinia hordei* Otth) at across all environments. Data was taken at 51-69% plant growth stages [15] across locations. Both net blotch and scald were scored using 00-99 double digit scale [12] in such a way that the first digit indicates the spreadof disease in a plot (% incidence) and the second digit indicate the percentage of leaf area infected (% severity). Whereas, barley leaf rust and stem rust data were collected based on [11] methodology. The net blotch response of the candidate variety (*Walashe*) was comparable with checks variety (Table 1) and it appears that *Walashe* was moderately resistant to these diseases. The variety *Walashe* less susceptible for stem rust *(Puccinia graminis* f. sp. *Tritici)* and barley leaf rust (*Puccinia hordei* Otth) than checks.

***Table 3.*** *Summary of pooled mean of yield and other data on Walashe and the checks across location and years.*

| Variety | DH | DM | PH | ST | YLD | TKW | HLW | NB | SR | LR | BSF | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Inf. | D.pla |
| Walashe | 70 | 115 | 76.3 | 69 | 3.6 | 37.8 | 63.1 | 86 | 5ms | 5s | 4.8 | 1.8 |
| Robera | 67 | 113 | 83 | 73.6 | 2.6 | 36.5 | 61.7 | 90 | 10s | 20s | 4.3 | 2 |
| Abdane | 67 | 114 | 89.1 | 76 | 2.4 | 35.9 | 62.5 | 85 | 15s | 15s | 5.5 | 1.8 |
| EH1493 | 74 | 116 | 86.9 | 71.3 | 2.4 | 36.1 | 63.6 | 85 | 10s | 10s | 4.6 | 1 |

Key: *DH=days to heading, DM= days to maturity, PH= plant height, YLD= grain yield t $ha^{-1}$, TKW= thousands kernel weight, HLW=hectoliter weight, NB= Net blotch, SR= stem rust, LR=leaf rust, SC= scald, BSF=barley shoot fly, Inf= infestation and D.pla=dead plant

*Walashe* variety is recommended for production in the highlands of Bale with annual rainfall of about 650 -1600mm and areas with similar agro-ecologies. On black soils, 100 kg DAP (diammonium phosphate) fertilizer is recommended to give good yield and with 125 kg seed rate. In addition, the variety can be planted early March for *Ganna* season and early August for *Bona* season.

## 7. Conclusion and Recommendation

*Walashe* is a stable variety in grain yield performance, has good agronomic traits and tolerant to shoot fly infestation. It is resistance for major barley attacking disease in the area. *Walashe* was released for major barley growing regions of Bale highlands and similar agroecology. The variety will be helpful for local farmers mainly due to its yield performance, productive tillers, resistance to lodging and relatively disease free than other varieties grown in the area. Therefore, smallholder farmers, privet and public seed enterprises and other barley producers in Bale highlands and similar agro ecology can produce Walashe with its full management recommendation.

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