Adaptability Study of Malt Barley Varieties at High Land of Guji Zone, Southern Oromia

Aliyi Kedir, Obsa Chimdesa, Siyoum Alemu,Yeared Tesfaye
Bore Agricultural Research Center, P O Box 21, Bore, Ethiopia

Abstract
Malt barley is the most important cereal crop grown in different parts of Ethiopia due to its nature of wide adaptation. However, access of this technology is highly limited in Guji Zone of Oromia. As a result this study was conducted to acquaint small holder farmers of the area with new technologies of malt barley production through selecting well performed, adaptable, high yielding ,diseases and insect resistance Malt barley varieties .The experiment was conducted during 2013 cropping season at Bore Agricultural Research Center at 3(three) locations(Bore on station, Alayo and Irba buliyo farmers field). For this purpose, 5(five) improved malt barley varieties were evaluated using RCBD design with three (3) replications on plot size of 3mx4m. In put application and agronomic practices were followed as per of national recommendation for malt barley. The study result revealed the presence of highly significant difference among varieties over the locations for the characters studied. The combined analyzed data show that Holker and Mascal-21 are high yielder than other varieties which is about 34 qt/ha and 33 qt/ha respectively. Therefore, based on the obtained study result three malt barley varieties i.e Holker and Mascal-21 are selected and recommended for areas having similar agro-ecologies with the study area.
Keywords: malt barley, brewery, Cereal crops, improved varieties

1. Introduction
Malt Barley (*Hordeum disticho*) is characterized as two-rowed and six rowed barley in which only the three middle spikelet of each three produces seed, the other two being sterile or male(Lakew *et al*., 1996). As the crop has been cultivated since ancient times many types of varieties are produced in our country and has double properties; it is used for food (bread, and several traditional dishes) and also for malting.

In Ethiopia, malt barley is the major (90%) raw material for beer production (MOARD, 2010). Modern malting in Ethiopia started in 1974 at st. George brewery. Currently, the demand for malt barley in brewery industry is very high. To address this demand, efforts has been made towards improving production and productivity of the crop through research. As a result, many varieties have been released by national and regional research centers. However, these technologies did not reach the smallholder farmers living in inaccessible parts of Oromia like Guji zone. Mainly, farmers in the area are majorly use this crop for home consumption in the form of roasted "senafe kolo". The importance of the crop in beer industry is not well known in this area. So to increase the awareness of farmers towards the usage of malt barley technologies, it's imperative to provide improved malt barley varieties that increase their production & accelerate food security through proper implementation.

Therefore, this study was conducted to acquaint small holder farmers with new improved malt barley technologies through selecting adaptable, high yielding, frost, diseases and insect resistant malt barley varieties.

2. Materials and methods
Five improved malt barley varieties were taken from Kulumsa Agricultural research center and evaluated at Bore agricultural research centre to select high yielding, disease, and insect tolerant varieties. The trial was done at three (3) locations of high land agro-ecologies of Guji Zone, namely; Bore on station ,Alayo & Ana Sora district at Irba Buliyo farmers field during 2013 cropping season. RCBD experimental design with three (3) replications was used on plot size of 3mx4m. Spacing of 30cm, 1m and 1.5m between plant, plot and block was used. Nationally recommended seed and fertilizer rate of 75kg/ha^{-1} and 100kg DAP/ha^{-1} was used.

2.1 Data collection and analysis
Data were collected on parameters like days to emergency, days to heading, Plant Height (cm), spike length (cm), days to maturity , thousand seed weight(kg), and grain yield(kg)/hec. The recorded data were subjected to analysis of variance (ANOVA)as suggested by Gomez and Gomez (1984) using SAS Software (Version 9.0). Mean separation was carried out using Least Significant Difference (LSD) at 5 percent levels of significance.

3.   Result and discussion
For this study, combined analysis of variance was done for the locations to evaluate the varieties using the selected characters. Accordingly, combined data analysis showed the presence of significant difference among the tested varieties for the characters evaluated.

Table 1. The combined analyzed data of different characters for malt barley varieties at multi locations of Guji highlands**.**

No	Varieties	DH	DM	PH	SL	TSW	GY
1	Holker	84.1667b	123.33b	91.93a	6.20ba	0.06a	34.2a
2	Mascal-21	81.3333c	122.33b	78.63b	7.18a	0.06a	33.63a
3	Bahati	82.3333c	122.67b	80.80b	6.71ba	0.063a	28.2ba
4	Bokoji	85.3333b	122.33b	88.43a	6.13b	0.056a	27.8b
5	Beka	91.1667a	129.67a	78.63b	7.17ba	0.033b	25.0c
Means		84.86	124.06	83.68	6.68	0.054	30.06
CV (5%)		1.60	1.108	6.17	13.01	12.08	19.83
LSD (5%)		1.62	1.64	6.18	1.04	0.0079	7.14

Keys: DE= days to emergency, DH= days to heading, PH=Plant Height (cm), SL=spike length (cm), DM=days to maturity , TSW=thousand seed weight(kg), GY = grain yield(kg)/hec.

Date of heading: significance differences was obtained among varieties for the character date of heading. Early heading was revealed by variety Mascal-21(81.33) and Bahati(82.33) followed by Holker(84.16). However, variety Beka exerts late heading followed by Bokoji. while selecting varieties for early maturing, considering early heading varieties could be imperative.

Plant height: Among the tested varieties, Holker shows the longest height followed by Bokoji where as variety Mascal-21 and Beka exerted the shortest height. Considering this character for variety evaluation is very crucial as it help for selecting varieties able to withstand lodging problems.

Days to maturity: As the study result indicates, no significant difference is observed among the tested variety for date of maturity across the location. But, considering this character for variety selection is very critical in order to select early maturing varieties for different agro ecologies.

Spike length: From the study result, significant difference was observed among the tested varieties for spike length across the study locations which was ranged from 6.17 to 7.19. Accordingly, variety Mascal-21 followed by Beka shows maximum spike length whereas variety Bokoji followed by Holker and Bahati shows minimum spike length.

Thousand seed weight(TSW): A significant difference was depicted among the varieties across the locations for TSW which was ranged from 0.5 to 0.6 . Maximum TSW was exerted by variety Bahati followed by Bokoji. Low TSW was revealed by variety Beka.

Grain yield(GY): significant variability was observed among the tested varieties across the testing locations for grain yield qt/ha, which was ranged from 34.2 to 25 qt/ha with the mean value of 30.06 qt/ha and coefficient of variation 19.83%. The highest grain yield (34.2) was recorded for Holker followed by Mascal-21 (33.6qt/ha).But, low yield of 25qt/ha was obtained from Beka followed by Bokoji (27.8qt/ha).Grain yield is an important character to be considered for variety selection to address the objective of the conducted activity. Based on this actuality, two varieties i.e Holker and Mascal-21 are the best performed varieties and selected for the studied purpose.

4. Conclusion and Recommendations

Based on the study result, each of the tested varieties showed significant variation for phenological, growth, yield and yield related characters. From the tested varieties, mascal-21 showed better performance for the evaluated characters. However, the highest grain yield (34.2) was recorded for Holker followed by Mascal-21 (33.6qt/ha).But, low yield 25qt/ha was obtained from Beka followed by Bokoji (27.8qt/ha). Therefore, to conclude the finding of the study, it's essential to select and recommend varieties that showed better performance through most of the characters studied. Accordingly, two varieties(Holker and Mascal-21) that showed better performance among the tested varieties were selected and recommended for study areas   and similar agro-ecologies.

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