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Evaluation of Seed Quality Parameters among Different Varieties of Barley (*Hordeum vulgare* L.) at Holeta Seed Research Laboratory

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Abstract: The study was conducted at Holetta Agricultural Research center of seed research laboratory in 2023. The experiment was laid out in four replication of completed randomized design under ambient temperature. Four varieties of food barley was tested with the objective of evaluation of different seed quality parameters among different food barley varieties produced under uniform condition and stored under ambient temperature for about six months. The results of analysis of variance revealed that, presence of considerable variation among the varieties all tested quality parameters. The main traits from physiological quality, the highest result (95.75) was recorded by one of the variety HB1307, whereas the lowest germination percentage (84.25) was recorded by HB1493. As it's known germination of the crop have parallel relationship with moisture content of seed, the results of this study also verified the logic. The variety with higher moisture was register the lower germination whereas, the lower moisture was register the higher germination rates. All physical and physiological qualities of all varieties was showed acceptance level results except HB1493 that register below recommended rate of germination.

Keywords: Vigor Index, Seed, Germination, Seedling Dry Weight, Seedling Fresh Weight.

RESEARCH PAPER

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1. INTRODUCTION

Barely (*Hordeum vulgare* L.) is the most important cereal in the world in terms of both quantities produced and cultivated areas, annually, harvested about 140 million tons, obtained from 50 million hectares. Barley (*Hordeum vulgare* L.) is most important cereals in the world in terms of both quantities produced and cultivated areas, annually, harvested area was about 140 million tons, obtained from 50 million hectares (FAOSTAT, 2018). It ranks the fourth most important cereal crop, after wheat, maize, and rice, belongs to family poaceae. Ethiopia is considered as a center of diversity for barely because of the presence of great diversity in ecology (Lakew *et al*., 1997). It was categorized among the top ten crop plants in the world (ICARDA, 2011). The production of barely in the world was around 15.87 million tons more than the previous years, compared to last year production, represent an increase of 15.87 million tons or 12.33% in barely production around the globe (USDA, 2019). The top five barely producing countries globally are, European Union, Russia, Canada, USA and Argentina; European Union produces the largest quantities of barely with an estimated production of 20.5 million tons followed by Russian Federations with a production of 8 million tons, whereas, Canada, USA and Argentina barely production was estimated 7.3, 3.1 and 2.8 million tons, respectively (USDA,2017).

In our country Ethiopia, barely is the most useful staple food from cereal crop next to tef, maize, wheat and sorghum (Csa, 2017). The cultivation of barely have started 5000 years ago in Ethiopia (Jamal *et al*., 2016) and probably first cultivated by Agew people in about 3,000 B.C. (Zemede, 1996). In highland area of Ethiopia, like, bale, wollo, North shewa, and some part of Arsi areas have bimodal pattern of rainfall allowing barely production twice a year in summer and winter season (Alemayehu, 2011). In Ethiopia, barely has big cultural and nutritional position, it can be used as food, fodder and beverages in 20 different (Shewayrga and Sopade, 2011; Abraha *et al*., 2013). It is mainly used for making, bread, porridge, soup, and roasted grain and for preparing alcoholic and non- alcoholic drinks. In addition, its straw conserves as animal feed especially during the dry season, thatching roofs, and bedding (Bekele *et al*., 2005).

Quality of seed is influenced by kind of crop management practices, storage conditions apart from

physical, biochemical and physiological factors of seeds (Doijoide, 1988). Among those factors, storage conditions play a major role as it is associated with attack of storage pests and diseases under variable influences of temperature, relative humidity and moisture.

Germination is the growth of plant contained within a seed; it results in the formation of seedling. The germination of seed depends on both external and internal conditions. The most useful internal factors are temperature, water, oxygen and sometimes light or darkness (Raven *et al*., 2005)

Early seedling vigor, speed of germination and dry matter production per plant were observed with decline in germination in germination level of rice (Backendam and Grab 1979). High variation and low reproducibility among seed vigor test causes hindrance to the reliability of vigor test. The seed vigor concept developed on the basis of observation of genotypes of lots with similar viability performed differently under stress condition (Delouche and Baskin, 1973). Seed quality refers to seed with high germination percentage, seed vigor and seed viability. Seed quality is better when the physical quality parameters of seed like, test weight, germination percentage (%), root length, shoot length, seedling length, speed of germination, vigor index. The experiment were consists of four stored barely varieties collected from different production fields of early seed production sites and stored for about six month in Holetta agricultural research center seed store. The objective of the present study was to evaluate different quality parameters in some barely varieties.

2. MATERIAL AND METHODS

The experiments were conducted at laboratory of seed science and technology in Holeta Agricultural Research Center. Four varieties of food barley produced under uniform condition and stored under ambient temperature for about six months was involved in the study. Sample was taken from each seed lot and mixed well. The sample were submitted to seed laboratory. Working sample was taken from submitted sample by using ISTA procedures. The experiment was laid out by using complete randomized design (CRD) with four replication. All physical and physiological quality traits was collected and subjected to analysis by using SAS software.

3. RESULT AND DISCUSSION

The present study was carried out to assess seed quality in four varieties of food barely under laboratory condition. Thousand seed weight ranged from 46.90 to 52.38 with grand mean value 49.47. The maximum thousand seed weight was depicted by variety HB1963 (52.38) followed by HB1307 (50.68), HB1493 (47.93), HB1966 (46.90). Hewson (1964) found that a lot of vegetable species almost in variably produce large seedling, when grown larger seeds and there was cloth relationship between seed weight. This may be due to the greater amount of food reserve and the greater embryo size (Wood *et al*., 1977). Sahoo (2009) reported similar results.

Root length was ranged from 5.93cm to 7.43cm with grand means of 6.63cm. The maximum root length was recorded from the variety HB1966 (7.43cm) and the minimum root length was recorded from the variety HB1493 (5.93cm).

Shoot length showed significant differences across the varieties a range of 5.75cm to 7.68cm. The highest value of shoot length was observed in HB1966 (7.68cm) which was significantly superior to all other varieties. The lowest shoot length was recorded from HB1963 (5.75cm). The overall means for the shoot length of the varieties were 6.92cm. Root length and shoot length increased with an increased seed weight, this may be due to greater amount of food reserve contained and the greater embryo size or both.

Table 1: Means performance of food barely varieties

Entries	SL	RL	SFW	SDW	SLL	GR%	VI-1	VI-2	TSW	MC
HB1307	7.56	6.96	0.63	0.30	7.26	95.75	695.15	28.73	50.68	11.65
HB1966	7.68	7.43	0.95	0.28	7.56	86.50	653.94	24.22	46.90	11.75
HB1963	5.75	6.21	0.45	0.40	5.98	85.50	511.29	34.20	52.38	11.48
HB1493	6.67	5.93	0.65	0.20	6.30	84.25	530.78	16.85	47.93	11.98
GM	6.92	6.63	0.67	0.30	6.78	88.00	597.79	26.00	49.47	11.71
SD	0.78	0.59	0.18	0.07	0.65	4.54	78.43	6.36	2.17	0.18
CV	11.24	8.97	26.78	24.15	9.65	5.16	13.12	24.44	4.39	1.54

***SL-** shoot length, **RL-** root length, **SFL-** seedling fresh weight, **SDW-** seedling dry weight, **SLL-** seedling length, **GR%-** Germination percentage, **VI-1-** vigor index-1, **VI-2-** vigor index-2, **TSW-** thousand seed weight, **MC-** moisture content.*

The Seedling fresh weight was ranged from 0.45g to 0.95g with its grand mean 0.67g. The maximum seedling fresh weight was recorded from variety HB1966 (0.95g) and the minimum fresh weight was recorded from HB1963 (0.45g). The seedling dry weight was ranged from 0.20 to 0.40g and its maximum dry weight was recorded from the variety HB1963 (0.40g). The minimum dry weight was recorded from variety HB1493 (0.20g). There was significance variation in varieties. Hossein *et al*., (2011) reported that the effect of seed size was significant on germination percentage and seedling dry weight, which is an important parameter for yield and highly affected by genotype and environment.

The seedling length is associated with earliness of the variety in respect of emergence, plant growth, and potential. In this study, the genotype exhibited a wide range of seedling length (5.98cm to 7.56cm) with significance differences. The maximum seedling length was observed from the genotype HB1966 (7.56cm) and the minimum was recorded from HB1963 (5.98cm) with its grand mean 6.78cm.

The mean performance of the variety for seedling vigor index I varied significantly and ranged from HB1307 (695.15cm) to HB1963 (511.29cm) and its maximum vigor recorded from variety HB1307 (695.15cm). The grand mean was 597.79cm. It had significant variation between them. In Vigor index II, the mean performance raged from HB1963 (34.20) to HB1493 (16.85), and its grand mean was 26.00.

Thousand seed weight of variety was ranged from 46.90 to 52.38 and its maximum weight was recorded from variety HB1963 (52.38). The minimum thousand weight was recorded from variety HB1966 (46.90) with its grand mean was 49.47. Similarly, Jan *et al*., (2000) who reported that seed weight decrease as the seed generations increased due environmental impacts. Ayaz *et al*., (1999) also reported that agronomic practices had significant effects on hundred-grain weight.

The highest moisture content was recorded from variety HB1493 (11.98) and the lowest was recorded from variety HB1963 (11.48). Its grand mean was 11.71. Germination ranged from 84.25% to 95.75% with Grand Mean 88.0. The maximum germination percentage was exhibited by HB1307 (95.75%). The minimum germination percentage was recorded from variety HB1493 (84.25%). Which were statistically at par with each other. All Genotypes was showed significant different. Higher germination of Large Seed could be attributed to the higher initial capital which conferred initial advantage. Wood *et al*., (1977) reportedly that the bigger sized seeds passes well developed embryo which could be the cause for greater seed viability against smaller seed. It is similar with the finding of Dronawall (1985)

4. CONCLUSION

Barely (*Hordeum vulgare* L.) is the most important cereal in the world in terms of both quantities produced and cultivated areas, annually, harvested about 140 million tons, obtained from 50 million hectares. Quality of seed is influenced by kind of crop management practices, storage conditions apart from physical, biochemical and physiological factors of seeds study was showed significance difference among varieties. Seed quality is better when the physical quality parameters of seed like, test weight, germination percentage (%), root length, shoot length, seedling length, speed of germination, vigor index.

The experiment were consists of four stored barely varieties collected from different production fields of early seed production sites and stored for about six month in Holetta agricultural research center seed store. The objective of the present study was to evaluate different quality parameters in some barely varieties. The mean performance of the variety HB1966 was best for the parameters like; shoot length, root length, seedling fresh weight, seedling length. Variety HB1963 was scored the highest mean in seedling dry weight, and HB1963 for the parameters vigor index II and thousand weights. As a recommendation, to keep the quality level of any crop seed, producing seed under by following all quality production procedures (internal and external) and favoring storage environment to obtain healthy seed as well as not storing seed for more than six month if it is so, rejuvenating seeds genetic makeup are very recommended.

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