International Journal of Agricultural and Life

ISSN: 2454-6127(Online) Journal homepage: http://www.skyfox.co

Adaptation Trial of Finger Millet (*Eleusine coracana* (L.) Gaertn) Varieties in East Hararghe Zone, Ethiopia Industry

Alemayehu Biri[1*], Zeleke Legesse[2] and Jifara Gudeta[2]

To cite this article : Biri, A., Legesse, Z., & Gudeta, J. (2023). Adaptation Trial of Finger Millet (Eleusine coracana (L.) Gaertn) Varieties in East Hararghe Zone, Ethiopia Industry. Int J Agric Life Sci, 9(4), 423-427. doi: 10.22573/spg.ijals.023.s122000118

To link to this article : https://doi.org/10.22573/spg.ijals.023.s122000118

Data Availability Statement : All relevant data are within the paper and its Supporting Information files.

Funding : The author(s) received no specific funding for this work.

Competing Interests : The authors have declared that no competing interests exist.

Published online: 31 Dec 2023.

International Journal of Agricultural and Life Sciences- IJALS (2023), Volume 9 (4) pp.423-427
http://dx.doi.org/10.22573/spg.ijals.023.s122000118
Available online at http://www.skyfox.co
ISSN: 2454-6127

RESEARCH ARTICLE

Adaptation Trial of Finger Millet (*Eleusine coracana* (L.) Gaertn) Varieties in East Hararghe Zone, Ethiopia Industry

Alemayehu Biri[1*], Zeleke Legesse[2] and Jifara Gudeta[2]
* [1]Fiche Agricultural Research Center
[2]Fadis Agricultural Research Center P.O. Box, 904 Harar, Ethiopia
*Author to whom correspondence should be addressed; E-Mail: alex2hny@gmail.com
Received: 11 Sep 2023/ Revised: 18 Oct 2023/ Accepted: 23 Nov 2023/ Published: 31 Dec 2023

Abstract: Developing improved varieties with high yield and wide adaptation is one of the major objectives. This indicates that there are some localities which are not fully addressed to satisfy the need for maximizing yield, using high yielder, disease resistant and early maturing variety of the crop is very important. Therefore, a field experiment was conducted during the main cropping season of 2018 and 2019 at Chelenko ATVET Collage and Boko Agricultural Research sites in Meta and Fadis Districts (Woredas), respectively, with an objective to select adaptable, high yielder, early maturing and disease resistant or tolerant varieties across moisture stressed areas of eastern Oromia, Ethiopia. The treatments consisted of eleven released finger millet varieties including standard check were used as planting materials. The experiment was laid out as a randomized complete block design and replicated three times. The combined mean analysis of variance revealed that highly significant difference ($P < 0.01$) for days to maturity, plant height, finger per plant, finger length and grain yield whereas, significant difference ($P < 0.05$) were observed for days to 50% flowering, effective tiller per plant and thousand seed weight. The earliest days to flowering were observed on Tesema variety with 84.33 days but there was no significantly different with other tested varieties. The results showed that Mereb was the earliest in terms of maturity taking only 126.9 days. The results of combined mean values indicated that, Aksum (3090 kgha^{-1}) followed by Gute (2807 kgha^{-1}) were found to be high yielding finger millet varieties whereas, Mereb (2103 kgha^{-1}) was identified as the least seed yielding variety as compared to all tested varieties. These results depicted that across location Aksum variety was significantly higher grain yield advantage by about 11.11% over standard check followed by Gute. Therefore, Aksum and Gute varieties were showed consistency over locations in this study and recommended to demonstrate with production packages in Meta and Fedis districts and similar agro ecologies.
Keywords: Finger millet; Varieties; yield.

INTRODUCTION

Finger millet (*Eleusine coracana* (L.) Gaertn) is one of the orphan crops indigenous to east Africa (Vavilov, 1951). In Ethiopia finger millet is one of the most important indigenous cereal crop grown largely by small holder farmers. It has wide agro-ecology adaptation (Mwikya *et al.* 2000). Finger millet has been mainly grown in Amhara, Benishangul-Gumuz, Oromia, Southern Nations, Nationalities and People's Region of Ethiopia, and Tigray. Finger millet covers about 453,909.38 ha of land with production of 915,314.518 tons (CSA, 2015). It had 3.62 and 3.39% share as compared to the national cereal crops area and production, respectively. Nutritionally, the crop is rich containing high ash, calcium and iron content, which is essential for strengthening bone and teeth and reduce incidence of anemia (Singh and Raghuvanshi, 2012).

Finger millet is an important crop grown in low input farming systems by resource poor farmers in eastern and western Oromia. It is valued for nutrition, preparation of culture food and brewing, source income which fetches more than double the price of maize and sorghum, livestock feed, thatch, and basket weaving. Some varieties contain high levels of methionine, an amino acid lacking in the diet of hundreds of millions of poor people who live on starch food of root crops such as sweet potato, cassava, etc. (NRC, 1996). It can be grown under condition of low rain fall and can with stand in drought, reviving again with a good shower of rain with remarkable vigor which is favorable agro- ecology for Hararghe condition. Among suitable areas for producing finger millet, Eastern Hararghe has the potential. While as compared to its genetic potential of 4-5ton ha^{-1} (Dida *et al.,* 2008), yield in Ethiopia is low, which is mainly due shortage of seed of improved variety, poor agronomic managements, high lodging, moisture stress, disease mainly blast and weeds (Fentie *et al*., 2013, Mulualem and Melak, 2013).

However, plant breeding has been instrumental in boosting crop production in the world. Increased crop yield is the preliminary aim of most plant breeding programs (Fentie *et al*., 2013). Similarly, several researchers reported that finger millet received less emphasis from research and development for generating improved new varieties, crop management practice and enhancement of adoption of improved technologies (Andualem, 2008; Degu et al., 2009; Molla, 2010; Altaye, 2012; Tafere and Melak, 2013). However, advantages of new varieties developed include adaptation of new agricultural technologies, greater resistance to diseases and insects, greater yield of useful parts. This indicates that, in eastern Hararghe there not fully addressed to satisfy the need for maximizing yield, using high yielder, disease resistant and early maturing variety of the crop is very important. Developing improved finger millet varieties with high yield and wide adaptation is one of the major objectives. Therefore, the main objective of this activity is to select adaptable, high yielder, early maturing, and disease resistant or tolerant of finger millet varieties across moisture stressed areas of eastern Hararghe, Oromia.

International Journal of Agricultural and Life Sciences- IJALS (2023), Volume 9 (4) pp.423-427
http://dx.doi.org/10.22573/spg.ijals.023.s122000118
Available online at http://www.skyfox.co
ISSN: 2454-6127

MATERIALS AND METHODS

DESCRIPTION OF EXPERIMENTAL SITE

Fadis and Meta districts were the testing sites found in Eastern Hararghe Zone, Ethiopia. Their geographical and edaphic (Table 1) characteristics are indicated in tabular form

Table1. Description of experimental sites in the two districts of Eastern Hararghe

Description	Parameters	Meta(Chelenko)	Fadis(Boko)
Edaphic factor	PH		7.97
	Class	Clay loam	Clay loam
	soil type	Vartisoil	Vartisoil
	%OM		1.64
	%total N		0.11
	available P		5.45
Geographical positioning	Altitude	2130	1200-1765
	Latitude	$9^0$35'N	9° 07'N
	Longitude	$41^0$51'E	42° 04'E
Weather conditions	Maximum	27C°	25^0
	Minimum	12c°	15^0
	Rainfall (mm)		710

TREATMENTS AND EXPERIMENTAL DESIGN

The experiment was conducted at Fadis and Meta districts. The treatments consisted of eight testing varieties (Addis-01, Aksum, Bako-09, Boneya, Gudetu, Gute, Meba, Padet and Mereb) and two standard checks (Tadese and Tesema) of finger millet were used for this study. The experiment was laid out as a Randomized Complete Block Design (RCBD) and each treatment receiving the same management. The seed of each variety was obtained from Melkasa, Bako and Aksum Agricultural Research Centers. Some of the major characteristics of the varieties are indicated below (Table 2). Each experimental plot had an area of 3.6 m2 with five rows of 1.8m length spaced at 0.40 m between rows and 0.15 m between plants as well with seed rate of 15 $kgha^{-1}$. Fertilizer was applied at the rate of 100/50 kg /ha NPS and N, respectively. The total required amount of NPS applied at basal, but from the total nitrogen applied half was used at planting and the remaining was top dressed at tillering stage. Sowing was done on June 23, 2019 and June 26, 2019 at Fadis and Chelenko experimental sites, respectively. At the same time the guard rows were planted at both end side of experimental area. Hand hoeing and weeding was made one and two times, respectively, over the growing season to put the experimental plots free of weeds. There was no major insect pest incidence in the season and hence plants were not sprayed with any agro-pesticide. Other agronomic management practices were done as per their recommendation.

AGRONOMIC DATA COLLECTED

Days to Flowering (DTF): This parameter was recorded as number of days from sowing to stage when ears emerged from 50% of the tillers per plot.
Days to Physiological Maturity (DPM): It was recorded as number of days from sowing to stage when 50% of the tillers per plot had matured ears (detected by yellowing of leaves). **Plant Height (PH) (cm):** It was recorded by measuring the height of plants from ground level to the tip of inflorescence (ear), at dough stage.
Number of effective Tillers per Plant (NET/p): The number of effective tillers per plant was number of basal tillers that bear mature fingers and recorded from five randomly taken plants of each plot at harvest.
Number of finger per Plant (NF/p): The number of finger per plant was recorded as the total number of finger produced from all tillers and recorded from five randomly taken plants of each plot at harvest.
Finger Length (FL) (cm): The finger length was recorded from the base of the ear to the tip of the finger at each five randomly taken plants of main tillers, at dough stage.
Seed Yield (SYD) (kg ha^{-1}): Seed yield was determined by harvesting all plants from the five rows of each plot, since there was no space between plots to remove the border effect. Seeds were weighed by sensitive balance and approximately adjusted to 10% moisture content by drying in the sun.
Thousand Seed Weight (TSW) (g): Thousand seeds were counted manually from a bulk of threshed seeds of each plot, their moisture were adjusted and weighed in the same way as seed yield data.

DATA ANALYSIS

Analysis of variance (ANOVA) was done for all the traits following procedures of Gomez and Gomez (1984) using statistical analysis system (Gen stat 15th edition). Combined data analysis was done on the measured parameters in the two districts, since the error variances were homogenous. The mean separation was done with Fisher unprotected Test method. The level of significance used in 'F' and't' test was P =0.05. When the treatment effects found to be significant, the means was separated using the least significant difference at 5% level of probability. Additionally, GGE Bi plot was analyzed to determine stability of tested varieties over location.

International Journal of Agricultural and Life Sciences- IJALS (2023), Volume 9 (4) pp.423-427
http://dx.doi.org/10.22573/spg.ijals.023.s122000118
Available online at http://www.skyfox.co
ISSN: 2454-6127

RESULTS AND DISCUSSIONS

PERFORMANCE OF TESTED FINGER MILLET VARIETIES IN TWO LOCATIONS

The analysis of variance (ANOVA) revealed that highly significant (P≤0.01) difference for the parameters studed of plant height, number of finger per plant, finger length per plant, and days to maturity. Similarly, significant (P≤0.05) difference for the effective tiller per plant and days to flowering (Table 2). However, the results of combined analysis for days to flowering ranged from 84.33 to 87.89 days, but there was no significance difference in days to reach flowering among tested varieties as compared to check (Tadese). The most prolonged duration (87.89 day) to reach 50% flowering was observed by Boneya variety whereas the minimum/earlier duration (84.33 day) to reach 50% flowering was observed by Tesema variety (Table 2**).** Days to physiological maturity ranged from126.9 to 154.7 days. Thus, Mereb variety was matured earlier than the rest varieties and recorded 126.9 days followed by Aksum (144.2days), Gute (146.1days), Addis-01(146.1days) and Tesema (146.3days) varieties whereas Tadese variety matured later (154.7 days) (Table 2)**.** The physiological maturity for the varieties Mereb and Aksum agreed with that of the observation by Molla (2012). The Tesema was the tallest (73.67 cm) variety, while Mereb was the shortest (71.8 cm) variety in the as compared to check (Tadese) (Table 2). As far as finger length is concerned, Gute had the longest (10 cm) followed by Tesema (9.4cm) and Aksum (9.3 cm); however, the varieties Padet (7.2cm) and Meba (7.2 cm) had the shortest lengths when as compared to check, Tadese (7.3cm) and other tested varieties (Table 2). The highest number of fingers was recorded by the varieties Bako-09 and Aksum followed by the variety Gudatu (7.23) and Boneya (7.17) whereas small number of were recorded for the varieties Mereb as compared to check, Tadese(6.4)and the rest varieties. The highest mean numbers of effective tillers were recorded by the varieties Padet (6.9) followed by Mereb (6.3) and Gudetu (6.3). Correspondingly, less numbers of fingers were recorded by the varieties of Aksum (5.3) and Gute (5.4) as compared to standard check (Tadese). The results and indicated the presence of sufficient variability, which could be attributed to the genetic potential of the varieties used among the evaluated varieties and for the traits under consideration (Molla (2012)

Previously Molla (2012) reported similar results with the current findings with reference to plant height, finger length and number of fingers tested under various environments. The varieties evaluated in the present study had a wide adaptation across the various agro-ecologies of the study areas. The differences in plant heights, finger lengths, and numbers of fingers and numbers of tillers among the finger millet varieties might be due to inherent characters of the varieties and the variability in the rainfall distribution in the study areas. Finger length, number of fingers and number of effective tillers per plant are important features of the crop in determining the yield potential, however, this result contradicts with the tested finger millet performance that illustrated maximum yield (i.e. Aksum and Gute varieties). Aksum and Gute varieties showed higher seed yield and long finger length with large number of seeds per finger. The present research results are consistent with the investigation by Molla (2012).

Table 2. Combined mean values for different traits of tested finger millet varieties in two districts of Eastern Hararghe Zone in 2018 and 2019 main cropping season

Varieties	Days to flowering	Days to maturity	Plant height	Number of tiller	Number of finger	Finger length
Addis-01	86.67^{ab}	146.1^{b}	85.28^{c}	5.89^{ab}	6.85^{bcd}	7.44^{d}
Aksum	86.00^{ab}	144.2^{b}	97.18^{ab}	5.33^{b}	8.04^{a}	9.29^{b}
Bako-09	87.56^{ab}	151.8^{c}	81.37^{cd}	6.07^{ab}	8.15^{a}	8.22^{c}
Boneya	87.89^{b}	152.9^{c}	92.66^{b}	6.11^{ab}	7.78^{ab}	7.86cd
Gudetu	86.33^{ab}	153.7^{c}	78.55^{d}	6.26^{ab}	7.82^{ab}	7.48^{d}
Gute	86.78^{ab}	146.1^{b}	94.85^{ab}	5.41^{b}	6.96^{bcd}	9.96^{a}
Meba	86.67^{ab}	151.7^{c}	92.63^{b}	5.78^{ab}	7.00^{bcd}	7.18^{d}
Mereb	85.22^{ab}	126.9^{a}	71.68^{e}	6.29^{ab}	6.11^{d}	7.56^{d}
Padet	85.78^{ab}	153.4^{c}	92.62^{b}	6.93^{a}	7.18^{abc}	7.18^{d}
Tadese	87.33^{ab}	154.7^{c}	97.28^{ab}	6.00^{ab}	6.44^{cd}	7.24^{d}
Tesema	84.33^{a}	146.3^{b}	99.42^{a}	5.41^{b}	7.04^{bcd}	9.44^{ab}
LSD (5%)	**3.5**	**4.1**	**6.6**	**1.3**	**1.0**	**0.6**
CV (%)	**4.3**	**2.9**	**7.9**	**23.2**	**14.7**	**8.3**

The analysis of variance (ANOVA) showed that highly significant (P≤0.01) difference for phenological and agronomic traits of plant height, days to flowering and days to maturity whereas not significant (P≤0.01) difference for the effective tiller, number of finger and finger length per plant between locations **(**Table 3).

Nevertheless, the results obtained from the experiment indicated that combined analysis for flowering was early (83.9 days) at Fadis, while it was late (87.92 days) at Meta. However, short duration (145.5 days) was required for physiological maturity at Fadis. On the contrary, plants required long duration (149.2 days) to mature at Meta (Table 3). Differences among varieties for phenological traits could be due to the inherent genetic ability of the varieties, altitude, and climate differences. Hence, the longest duration (days) to physiological maturity was suitable to areas having long production season, but the early maturing ones are suited to short crop production season (Molla, 2012).

International Journal of Agricultural and Life Sciences- IJALS (2023), Volume 9 (4) pp.423-427
http://dx.doi.org/10.22573/spg.ijals.023.s122000118
Available online at http://www.skyfox.co
ISSN: 2454-6127

Table.3 Combined mean values for phenological and agronomic traits of finger millet tested varieties across locations in 2018 and 2019 main cropping season.

Location	Days to flowering	Days to maturity	Plant height	Number of tiller	Number of finger	Finger length
Meta	87.92	149.21	94.9	6.17	7.48	8.15
Fadis	83.39	145.52	86.67	5.77	7.08	8.04
LSD (5%)	**3.5**	**4.1**	**6.6**	**1.3**	**1.0**	**0.6**
CV (%)	**4.3**	**2.9**	**7.9**	**23.2**	**14.7**	**8.3**

YIELD AND YIELD COMPONENT

The analysis of variance (ANOVA) revealed that highly significant ($P \leq 0.01$) difference in seed yield and significant ($P \leq 0.05$) difference in thousand seed weight among the tested finger millet varieties (Table 4).

However, the highest seed yield was recorded by Aksum (3090 kg ha^{-1}) followed by Gute (2807 kg ha^{-1}) kg as compared to all tested varieties. On the contrary, Mereb (2103 kg ha^{-1}) and Addis-01 (2121 kg ha^{-1}) were recorded low yielding varieties as compared standard check, Tadese (Table). Though, the high value of thousand seed weight was recorded for the varieties Addis-01(3.56g) followed by Boneya and Mereb (3.44 g) but there was no significant difference with that of Aksum(3.11g), which had large seed sizes, whereas, Gudetu(2.67g) had the low values of thousand seed weight (Table 4). Therefore, the significant seed yield and thousand seed weight variations among varieties could be due to inherent genetic characters of the varieties, uneven rainfall distribution and variation in altitudes. The variation for seed yield and thousand seed weight might be due to the inherent genetic difference of the tested finger millet varieties (Molla, 2012). Similar results in their investigations and stated the presence of significant difference among varieties in seed yield of finger millet (Andualem, 2008; Chrispus, 2008; Molla, 2012). The varieties Aksum and Gute showed consistent performance in Finger length, number of fingers per plant and seed yield, which in turn, contributed to their selection preferences by farmers and plant breeders.

The breeders showed that the higher yielding varieties were found to have both higher Finger length and number of fingers per plant than standard check. Therefore, Aksum and Gute had genetic differences in more than one preferred character, namely seed yield, higher Finger length and number of fingers per plant, could use as parent material in breeding program to improve finger millet.

Table.4: Combined mean values for yield and yield components of tested finger millet varieties in two districts of Eastern Hararghe Zone in 2018 and 2019 main cropping season

Variety	1000 seed weight (g)	Seed yield (kg ha^{-1})
Addis-01	3.56^{a}	2121^{d}
Aksum	3.11^{abc}	3090^{a}
Bako-09	3.11^{abc}	2554^{bcd}
Boneya	3.44^{ab}	2186^{cd}
Gudetu	2.67^{c}	2558^{bcd}
Gute	2.78^{bc}	2807^{ab}
Meba	3.11^{abc}	2603^{bc}
Mereb	3.44^{ab}	2103^{d}
Padet	2.89^{abc}	2542^{bcd}
Tadese	2.89^{abc}	2781^{ab}
Tesema	2.78^{bc}	2756^{ab}
LSD (5%)	**0.7**	**464.3**
CV (%)	**26.0**	**19.3**

The analysis of variance (ANOVA) revealed that highly significant ($p \leq 0.01$) difference in yield components between locations but there was not significant ($p \leq 0.01$) difference for thousand seed weight (Table 5), indicating the presence of sufficient genotypic differences in finger millet for the traits under consideration. The variability among the evaluated traits could be attributed to the genetic potential of the varieties used, which is in concurrence with the results of sorghum (Yalemtesfa *et al.*, 2014; Mihret, 2015). Highest seed yield was obtained at Meta (2797 kgha^{-1}) as compared to at Fadis (2434k gha^{-1}) (Table 5). Generally, the performance of tested finger millet varieties was recorded higher at Meta than at Fadis. This might be because of occurrence of favorable weather conditions throughout the growing season of the crop at Meta.

International Journal of Agricultural and Life Sciences- IJALS (2023), Volume 9 (4) pp.423-427
http://dx.doi.org/10.22573/spg.ijals.023.s122000118
Available online at http://www.skyfox.co
ISSN: 2454-6127

Table. 5 Combined mean values for yield and yield components of the varieties across locations in 2018 and 2019 main cropping season

Location	1000 seed weight (g)	Seed yield (kg ha^{-1})
Meta	3.06	2797
Fadis	3.08	2434
LSD (5%)	**0.7**	**464.3**
CV (%)	**26.0**	**19.3**

REFERENCES

1. Altaye Sisaye. 2012. Analysis of research-extensionfarmer linkage in finger millet technology development and delivery in Mecha District of Amhara Region, Ethiopia. Journal of Agricultural Economics and Development, 1(6): 121-129.
2. Andualem Wollie. 2008. Characterization, Evaluation and Variability for Grain Yield and Related Traits of Finger Millet [*Eleusine coracana* (L.) Gaertn.] Germplasm. M.Sc Thesis, Haramaya University, Haramaya, Ethiopia.
3. Biri, A., Tadesse, F., Mengistu, G., Meleta, T., Bogale, M., Balcha, U., & Dinsa, T. (2023). Response of Nitrogen Fertilizer and Seed Rates on Growth, Yield and Yield Components of Irrigated Bread Wheat in the lowlands of Eastern and South Eastern of Oromia, Ethiopia. Int J Agric Life Sci, 9(3), 403-413. doi: 10.22573/spg.ijals.023.s122000115.
4. Chrispus, O.A. 2008. Breeding Investigation of Finger millet Characteristics including blast disease and striga resistance in Western Kenya. PhD thesis, University of KwaZulu-Natal, Republic of South Africa.
5. CSA (Central Statistical Agency). 2015. Agricultural sample survey report on area and production for major crops (Private peasant holdings meher season). Central Statistical Agency, Statistical Bulletin, 1(578). Addis Ababa, Ethiopia.
6. Degu Erenso, Asfaw Adugna, Taye Tadesse and Tesfaye Tesso. 2009. Genetic resources, breeding and production of millets in Ethiopia. In: New approaches to plant breeding of orphan crops in Africa. Proceedings of an International Conference, 19-21 September 2007. Bern, Switzerland. Edition. John Wiley and Sons, New York. 680 pp.
7. Dida M.M., Srinivasachary, S. Ramakrishnan, J.L. Bennetzen, M.D. Gale and K. Devos (2008) Population structure and diversity in finger millet (*Eleusine coracana*) germplasm. Tropical Plant Biol. 1:131-141.
8. Fentie, M, A Assefa and K Belete. 2013. AMMI analysis of yield performance and stability of finger millet genotypes across different environments. World J of Agric. Sci. 9: 231-237.
9. Gomez, A.K. and Gomez, A.A. 1984. Statistical procedures for Agricultural Research, 2nd IBPGR (International Board for Plant Genetic Resources).1985. International Board for Plant Genetic Resources. pp. 1-20. Descriptors for Finger millet. IBPGR Secretariat. FAO, Rome, Italy.
10. Mihret Yirgu. 2015. Genetic gain in lowland sorghum [Sorghum bicolor (L.) Moench] varieties in Ethiopia. International Journal of Horticulture and Plant Breeding Sciences, 2(1): 1 -13
11. Molla Fentie. 2010. Genotype x Environment Interaction and Stability Analyses of Yield and Yield Related Traits of Finger Millet (*Eleusine coracana* (L) Gaertn) Varieties in Northwestern Ethiopia. M.Sc Thesis, Haramaya University, Haramaya, Ethiopia.
12. Molla Fentie. 2012. Participatory evaluation and selection of improved finger millet varieties in Northwestern Ethiopia. International Research Journal of Plant Science, 3: 141-146.
13. Mulualem T., Melak A. (2013). A survey on the status and constraints of finger millet (*Eleusine coracana* L.) production in Metekel Zone, North Western Ethiopia. Direct Research Journal of Agriculture and Food Science 1, 67-72.
14. S Mbithi-Mwikya, John Van Camp, Y Yiru and André Huyghebaert. 2000. Lebensmittel-Wissenschaft Und-Technologie-Food Science and Technology. 33(1). p.9-14
15. NSRC (National Soil Research Center). 2006. Soils of Adet Agricultural Research Center Testing Sites. Addis Abeba, Ethiopia.
16. Singh P. and R.S. Raghuvanshi (2012) Finger millet for food and security. African Journal of Food Science. 6:77-84. Available online at http://www.academicjournals.org/AJFS. Accessed June 2016.
17. Tafere Mulualem and Melak Adane. 2013. A survey on the status and constraints of finger millet (*Eleusine coracana* L.) production in Metekel Zone, Northwestern Ethiopia. Pawe Agricultural Research Center, Pawe, Ethiopia. Journal of Agriculture and Food Science, 1(5): 67-72.
18. Vavilov, N.I. 1951. The Origin, Variation, Immunity and Breeding of Cultivated Plants (Translated by S. K. Chestitee). Chronica Botonica, 13, 1-366.
19. Yalemtesfa Firew, Firew Mekbib and Asfaw Adugna. 2014. Performance and Farmers' Evaluation of Released Sorghum [Sorghum bicolor (L.) Moenech) Varieties in Benishangul-Gumuz Region of Ethiopia. MSc Thesis: Haramaya University, Haramaya, Ethiopia.

How to cite this article
Biri, A., Legesse, Z., & Gudeta, J. (2023). Adaptation Trial of Finger Millet (Eleusine coracana (L.) Gaertn) Varieties in East Hararghe Zone, Ethiopia Industry. Int J Agric Life Sci, 9(4), 423-427. doi: 10.22573/spg.ijals.023.s122000118.

CONFLICTS OF INTEREST

"The authors declare no conflict of interest".