ISSN: 2754-477X

Journal of Food Technology & Nutrition Sciences

SCIENTIFIC Research and Community

Research Article

Open Access

Growth Performance of Moringa Stenopetala Provenances at Adami Tulu Jido Kombolcha District, East Shewa Zone

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ABSTRACT

Moringa distribution is limited to mainly southern Ethiopia and its potential has not been taped. This study was carried out at Adami Tulu Agricultural research center with objective of to determine the appropriate provenance of Moringa. stenopetala in study areas. Treatment was arranged with RCBD design and consisted of four provenances, namely Arbaminch provenance, Konso provenances, Wolayta provenances and Bale provenances. Survival percent, height, stem diameter and RCD of the trees in each plot were recorded at three-month intervals. Height and stem diameter was measured with meter tap and Digital caliper respectively. stem diameter was measured outside the bark at 1.3 m above the ground. RCD was also measured with a digital caliper. As result indicates there is significant difference in survival rate ($p<0.05$) among the Moringa stenopetala provinces. The growth performance evaluation was suggested that there were promising Moringa stenopetala provenance adapted for Adami Tulu jido kombolch district conditions with potential for growth performance. according to the result obtained there is significant variation among provenances for all parameters except canopy width. From the result the two provenances namely Konso and Bale were well adapted to the study area. Specially, good performance in plant height, stem diameter and Root collar diameter were recorded for the two provenances. The growth variation may be occurred due to the rilative similarity and differences of the provenances. Therefore, the two good performing provenances should be propagated and multiplied for end users in the study areas and similar Argo ecology for further utilization.

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Received: February 13, 2024; **Accepted:** February 22, 2024; **Published:** March 20, 2024

Keywords: Adaptation, Firash Biomass, Survival Rate

Introduction

Moringa is a fast-growing tree native to India and largely spread across tropical and subtropical regions. Moringa tree cultivation has been greatly encouraged in order to increase food security and reduce undernourishment, particularly for infants and women of child-bearing age in developing regions. Besides its use in food and animal feed industry, moringa tree parts have been used in other relevant industries such as energy, bio renewables, agriculture and medical, In most developing countries like Ethiopia, where poverty and food insecurity are more pronounced, many people have depended on many wild species, particularly for food and medicine. Among the wild species, different wild edible plants (WEPs) have played significant roles in food and nutritional supplementation as a source of vitamins, fibers, minerals, and fatty acids in different geographical regions of the world throughout human history. The miraculous Moringa trees are commonly used and among high value plants that belongs to the monogenetic family called Moringaceae which consists of 13 species. Among 13 Moringa species, 5 of them were found in Ethiopia. The different parts of the tree are used for different purposes. The green leaf is consumed as a vegetable, dried leaf for tea, leaves and pods are used as fodder for animals, seeds are used to purify muddy water and as source of cooking oil or for other industrial applications, roots are used to clarify dirty water, and is a medicine to treat different ailments, wood is used for pulp production. The tree is also a drought resistant that provides shade in arid and semi-arid areas and nectar for honeybees, serves as a live fence and ornamental plant and conserves agricultural soils when intercropped in farmland [1-11].

Despites its multitudinous benefits and a wide range of adaptation from arid to humid climates with a prospect to be grown in a wide range of land use classes, its distribution is limited to mainly southern Ethiopia and its potential has not been taped. Recently, the production and marketing of the leaves and seeds of M. stenopetala have increased in other parts of the country owing to its perceived medicinal and nutritional values. Generally, there is limited scientific information on adaptation and growth performance of M. stenopetala provenance in study areas. Such scientific studies are important to determine the productivity levels of M. stenopetala as a cabbage tree for its leaf biomass in the arid and semi-arid areas of Ethiopia. Therefore, this study was initiated to screen the appropriate provenance of M. stenopetala in study areas [12,13].

Materials and Methods

Description of the Study Area

The study was conducted in Adami Tulu Jido kombolchai Districts. Adami Tulu Jido Kombolcha (ATJK) district is located between 7.58ºN and 38.43ºE longitudes Altitude ranges from 1500 to 2300 meter above sea level (Figure 1). The Woreda receives an average annual rainfall of 760mm. The mean monthly temperature varies

from 18.5°C to 21.6°C (Figure 2).

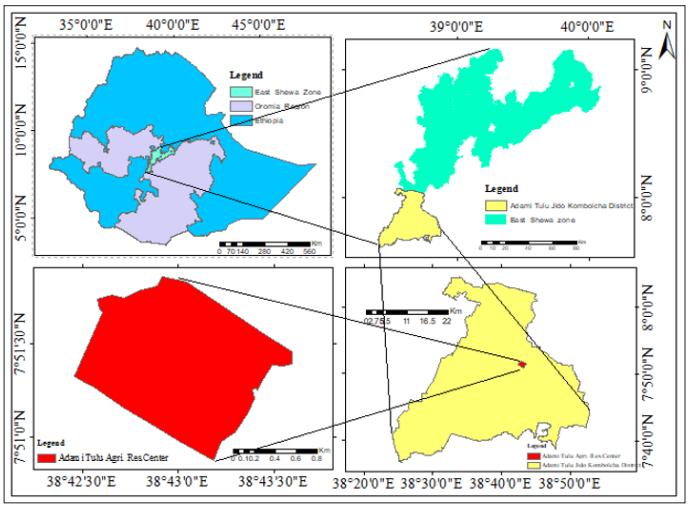

Figure 1: Map of Adami Tulu Agricultural Research Center

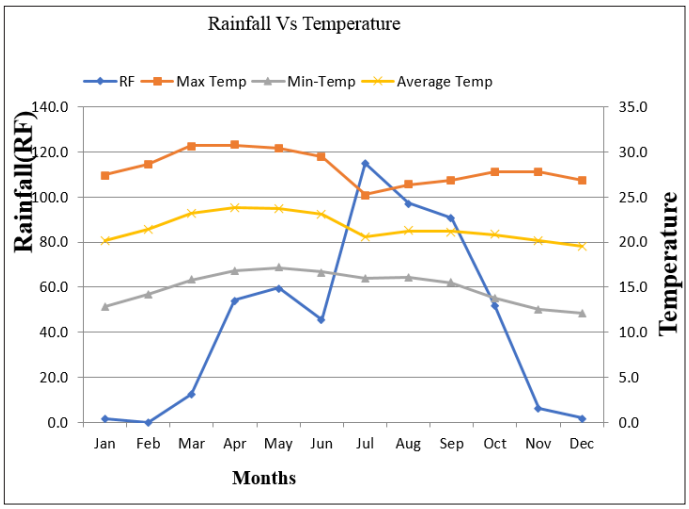

Figure 2: Meteorological data of Adami Tulu District (2019- 2021)

Experimental Design and Treatment

The experiment was arranged in a randomized complete block design (RCBD) with three replications. A land size of 638 m2 was divided into three blocks and four experimental plots per block. The treatments consisted of four provenances, namely Arbaminch provenance, Konso provenances, Wolayta provenances and Bale provenances. The four provenances were randomly distributed in each of the three blocks. The blocks and plots were separated from each other by 3.5 m and 3 m, respectively. Experimental seedlings were planted by 2.5 m spacing within plots and contain nine seedlings per plots.

Establishment and Management

The experimental site was cleared and ploughed to have a good planting site before planting seedlings. Seeds were collected from four locations namely Konso, Arbaminch, Wolayta and Bale site. Seedlings were raised with 10 cm diameter flat polythene tubes on station. Each seedling was planted in a pit that has a 30 cm depth. Initial root collar diameter (RCD) and height measurements were done before planting to select seedlings with almost similar size and minimize the influence of initial seedling size on the RCD and height growth performance after transplanting. After planting the seedlings, a thorough ramming of the fine earth was done to avoid air circulation. During the course of the study, the plots were well maintained by picking weeds and cultivated regularly to loosen the soil for aeration after the establishment of the experiment. All experimental plots received similar silvicultural practices.

Plant Measurement and Biomass Harvest

Four trees per plots were considered for the required data collection. Survival percent, height, stem diameter and RCD of the trees in each plot were recorded at three-month intervals. Height and stem diameter was measured with meter tape and Digital caliper respectively. Stem diameter was measured at 1.3 m above the ground. RCD was also measured with a digital caliper. The above ground biomass data was taken at the final stage of the experiment using the distractive method.

Data Analysis

Statistical analyses were carried out using General Linear Model (GLM) of GenStat version 15.1.0. All data was subjected to analysis of variance (ANOVA) using plot means. For means separation LSD was conducted at 5% probability level.

Results and Discussion

Seedling Survival Percentage

Table 1: Mean survival rate of Moringa provenance

Provenance	Survival rate %
Bale	85.19a
Konso	81.48a
A/Minch	62.96b
Wolayta	62.96b
Mean	73.15
CV (%)	11.60
LSD	14.68
p-value	*

As result indicates there is significant difference in survival rate ($p<0.05$) among the Moringa stenopetala provenances. Two provenances namely Bale and Konso has shown a relatively better mean survival rate than the rest two provenances (Table 1). The mean survival rate, in fact, has decreased with time until the end of experimental time due to external factors like wilde life attack and mall rate effect on planted seedling. The overall mean survival rate averaged 85.19% and 81.48%, for Bale and Konso provenances respectively, while 62.96% and 62.96 % were the average survival rate for Aarbaminch and Wolayta provenances. The study agree with finding reported by i.e. Konso provenance was showed good performance in survival rate and growth. This indicate that konso provenance could be grown in wider agroecolage compared to the restprovenances. There were no significant ($P < 0.05$) differences in survival percentage between planted seedlings among the provenances in the first two years [14].

Table 2: Mean Growth Performance of Moringa Provenances

Provenance	RCD(mm)	DBH(mm)	Height (cm)	Canopy Width(cm)	Above Ground Biomass (Kg)
Konso	90.61[a]	37.73[a]	261.80[a]	126.87	5.93[a]
Bale	85.37[a]	37.42[a]	265.42[a]	139.9	4.75[ab]
Wolayta	76.61[b]	28.41[ab]	178.70[b]	116.64	3.87[bc]
A/Minch	68.70[c]	22.06[b]	192.13[b]	108.2	2.57[c]
Mean	84.19	31.41	224.51	122.90	4.28
CV (%)	4.50	19.20	11.80	30.6	17.1
LSD	6.81	10.88	49.85	70.858	1.38
p-value	**	*	**	ns	**

Growth performance of Root Collar Diameter, Diameter at Breast Height and Height

The growth performance evaluation was suggested that there were promising Moringa stenopetala provenance adapted for Adami Tulu jido kombolch district conditions with potential for growth performance. Provenance of Konso and Bale possess desirable growth parameters compared to the rest two provenances. The study was demonstrated the variability of Moringa stenopetala provenance in terms of growth performance. Accordingly, Konso (261.80 cm) and Bale (265.42cm) provenances were varied significantly ($p<0.05$, Table 2) in plant height, stem diameter, and Root collar diameter from the rest two provenances. In line with this finding other result has showed at Dello-menna site, superior height growth reported for Abay provenance followed by Konso provenance. Wolayta provenance has no significant deferens with Bale and Konso provenance in diameter at breast height, while Arbaminch provenance showed the lowest performance in all parameters except canopy width, which is not significant statistically for all provenances (Table 2). Similar result was also reported bay mechar research center i.e. Konso provenance had the greatest mean DBH (32.67 mm) and height (2.3 m) compared to Arbaminch and Wolayta [14,15].

Canopy Width and Above Ground Fresh Biomass

According the result there is no statistically significant difference among the provenances ($p<0.05$) (Table 2). Eventhough it is not significan statistically there were numerical variation between canopies of the provenances with highest canopy width was recorded for Konso provenance and followed by Bale provenance. Also reported that there is no significant variation among provenances with regarding to canopy width. Above ground fresh weight has also significant difference ($p<0.05$) among provenances and the two provenances (Konso and Bale) were possess highest value of fresh weight. The lowest value of above ground biomass was recorded for Arbaminch provenance and followed by Wolayta provenances [15].

Conclusion

The research was carried out at Adami Tullu agricultural research center and four provenances of mooring steno petal were evaluated for it growth performancy. Accordingly, survival rate was showed significant variation and the two provenances i.e Konso and Bale were more survived than the two provenances. The two provenances were showed good performance in all parameters compered to the rest two provenances. The result was showed significant variation among provenances for all parameters except canopy width. From the result the two provenances namely Konso and Bale were well adapted to the study area. This may indicate the relative similarity of the three provenance and good performance in plant height, stem diameter and Root collar diameter were recorded for the two provenances. There for it can be concluded that Konso and Bale were the suitable provenances for further propagation in the study area

Recommendation

Therefore, the two good performing provenances should be propagated and multiplied for end users in the study areas and of similar agroecology. Identification its quality is also important for further utilization in the study are, as moringa steno petal provide multipurpose uses like food, medicine and environmental protection, as moriga can grow Fastly in dry areas like the study area it is important to popularize its uses and preparation methods

Acknowledgments

The author would like to acknowledge Adami Tullu Agricultural research center for their logistic and financial support.

Conflicts of Interest

The authors declare no conflict of interest.

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