International Journal of Life Science and Agriculture Research

ISSN (Print): Applied, ISSN (Online): Applied

Volume 01 Issue 01 April 2022

Page No : 01-05

Evaluation of Yield and Yield Components of Sesame (*Sesamum indicum* L.) Varieties under Irrigation in Lowland Area of South Omo Zone, Southern Ethiopia

[1]Awoke T, [2]Muhaba S

[1,2] Southern Agricultural Research Institute, Jinka Agricultural Research Center, Crop Research Directorate Jinka, Ethiopia

ABSTRACT: Sesame is major economically important oil crops in Ethiopia. However, the yield of this crop is limited due to shortage of improvedvarieties suited to specific area and others discourage factors. This field experiment was conducted during 2019/220 croppingseason to evaluate sesame varieties at Weyito and Omorate in South Omo Zone, Southern Ethiopia. The experiment was fourvarieties namely: Mehando-80, Hummera-1, T-85 and Adi**.** The experiment was conducted using randomized complete block designwith three replications. Data were collected on plant height, primer branch number per plant, Capsules per plant and grain yieldand subjected to analysis of variance using SAS software program. The combined value analysis of variance of the current studythe main factors of varieties showed significant ($P\leq0.05$ or $P\leq0.01$) effect while, the interaction of location and variety had non-significant effect in all recorded traits. Combined mean values indicated that, the highest (1107.1 kg ha^{-1}) grain yield was recordedfrom Mehando-80 variety, while the lowest (776.3kg ha^{-1}) grain yield was recorded from T-85 variety at study area. Therefore, useof Mehando-80 variety can be recommended for sesame producing farmers, investors and agro-pastoral at Weyito, Omorate andits vicinity.

KEY WORDS: evaluation, varieties, yield, yield components

Published Online:
13 April 2022

Corresponding Author:
Awoke T
Southern Agricultural Research Institute, Jinka Agricultural Research Center, Crop Research Directorate Jinka, Ethiopia

1. INTRODUCTION

Sesame *(Sesamum indicum L.)* otherwise known as sesamum, member of the family Pedaliaceae, is one of the ancient oilseed domesticated and cultivated in tropical and sub-tropical parts of the world by man for the edible oil and medicinal purposes for more than 5000 years (Khan *et al.,* 2009 and Umar *et al*., 2010). Though it is a controversy for the origin of sesame, it is believed to be originated in Ethiopia due to existence of both cultivated and wild types in the country (Wijnands *et al*., 2009). Ethiopia is one of the popular sesame producers in the world and the seed produced in western Tigray (Humera type) is highly competent in the world market by its desirable qualities in terms of color, taste and aroma (Taghouti *et al.,* 2017). Sesame is a crop of tropics and in some temperate areas. It grows best on the areas which have an altitude of 500 to 800 meter above sea level. It needs a growing period of 70 to 150 days. The optimum pH for growth ranges from 5.4 to 6.7 and good drainage is crucial. It is intolerant of very acidic or saline soils. The optimum temperature for growth varies with cultivar in the range 27°C to 35°C. Periods of high temperature above 40°C during flowering reduce capsule and seed development. It requires from 600 to 1000 mm amount of water (Nath *et al.,* 2000).

Sesame has a multiple uses. It is used as a source of food; eaten as raw, either roasted or parched, or as blended oil in the form of different sweets. The seeds are rich source of oil, protein, calcium, phosphorus and oxalic acid. Oplinger *et al*. (1990) indicated that part of the attraction for sesame is undoubtedly its high fat (50% oil) and protein content (up to 25% protein by weight). In Ethiopia, sesame is used as cash crop, export commodity, raw materials for industries and as source of employment opportunity. A sizable proportion of the population, therefore, generates income from oilseed farming, trade and processing (Getinet and Negusse, 1997).

*Cite this Article: Awoke T, Muhaba S (2022). Evaluation of Yield and Yield Components of Sesame *(Sesamum indicum L.)* Varieties under Irrigation in Lowland Area of South Omo Zone, Southern Ethiopia. International Journal of Life Science and Agriculture Research, 1(1), 01-05

The major production regions of sesame in the country are Setit Humera (Tgiry), Metema (Amhara), and West Welega (Oromo). Sesame was grown on about 294,819.49 ha in Ethiopia from which about 20,166.464 tons are produced in the year 2019, with the average regional yield of 0.68 t ha^{-1} (CSA, 2019) and the productivity of sesame (500-600.kg/ha) in lowland area of South Omo Zone, especially in study area (personal communication with office of agriculture). However, the grain yield is far less than the attainable yield (0.1 to 1.38 t ha^{-1}) under good management conditions (MOANR, 2016). The low productivity of sesame in the study area might be due to cultivation of low yielding varieties, poor crop management practices, low soil fertility, diseases and insect pests. Therefore, it is important to identify high yielding variety/ies for increase production and productivity of sesame. Thus, this study was carried out with the objective to select well performing and high yielder variety/ies for study areas.

2. MATERIALS AND METHODS

2.1. Description of the Study Area

Two experiments were conducted during 2019/2020 cropping season at Dasenech (Lobet kebele) at Benna Tsemay (weyito). Weyito which located South Omo Zone in Southern Nations, Nationalities and People's Regional State. It is situated between 54°37′–4°48′ N and 35°56′–36°20′ E with altitude of 365 above sea level. The rainfall distribution of the area is bimodal, with a primary rainy season between March to May and secondary small rain between Septembers to December. The monthly average minimum and maximum temperatures of 30 and 40 ° C, respectively. Weyito also located South Omo Zone in Southern Nations, Nationalities and People's Regional State. It is situated between 5°01' and 5°73' North latitude & 36°38' and 37°07' East longitude with altitude of 588 meter above sea level. The rainfall distribution of the area is bimodal with main rainy season extends from January to May and the second cropping season, from July to October. It receives annual average rainfall of 876.3 mm and the monthly average minimum and maximum temperatures of 18.2 and 37.3°C, respectively. All the metrological data a given above for the two location are long term averages.

2.2. Experimental Design and Treatments

Four sesame varieties namely: Mehando-80, Humera-1, T-85 and Adi were used for current study. This experiment was laid out using randomized complete block design (RCBD) with two replications at two locations in Dasenech (Frie-l farm) and Weyito (Nasa farm).

2.3. Experimental Procedure and Management

The land was ploughed twice, disked and harrowed once, and ridged with 0.6m by tractor, after which 0.6m interval of furrow was amended by human power. Seeds were sown on rows with manual drilling at a rate of 5kg ha^{-1} basis. Thinning by 15cm interval between plants was done two weeks after emergence. The plot size was 24.04m^2 (4.8 mx4.8m) and which accommodated eight furrow per plot. The spacing between replications and pots was 2 meter. Plots were furrow irrigated every 6-8 days from planting up to flowering and then every 9-11 days up to physiological maturity according weather condition at Omorate location while at Weyito location, 8-10 days from planting up to flowering and then every 11-13 days up to physiological maturity according weather condition. No any fertilizer and agro-chemicals were applied during growing period. The first, second and third weeding and hoeing were performed 20, 40 and 60 days after emergence, respectively. The net harvestable row was 6 (six) excluding the border two rows.

2.4. Data were collected

2.4.1. Growth parameters

Plant height was measured at the time of physiological maturity from central rows as the mean height of five randomly taken plants from the ground level to the apex of each plant. Number of primary branches per plant was determined by counting primary branches of the main stem from randomly taken five plants in the central rows and average value was considered.

2.4.2. Yield and yield components

Number of capsules per plant was determined from five randomly sampled plants at central row and the average value was considered. The harvesting central rows per plot were harvested, sun dried to constant weight and shattered. The seed yield of each net plot was then weighed using an electronic balance.

2.5. Statistical analysis

The various data collected were subjected to analysis of variance in randomized complete block design (RCBD) using SAS software version 9.2 (SAS, 2008) with a generalized linear model (GLM) procedure. Means were separated using least significant differences (LSD) test at 5% level of significance.

3. RESULTS AND DISCUSSION

3.1. Analysis of variance

The analysis of variance for the individual location was carried out first and significant differences ($P \leq 0.05$ or $P \leq 0.01$) among varieties were obtained for days to 90% of maturity, plant height (cm), primary branch, and capsules per plant and grain yield at both locations (Table 1).

Prior to the combined analysis of variance, homogeneity of error variances was tested and all of the traits showed homogeneous error variances (table 1). Having this confirmation, the data were pooled across locations and combined analysis of variance were performed and presented in Table 1. The mean squares obtained in combined analysis of variance were used to separate genotypic effects, location and their interactions. The mean squares from the combined analysis of variance over the two locations showed statistically significant ($P \leq 0.05$ or $P \leq 0.01$) difference between locations for all the traits studied. The combined analysis of variance over the two locations revealed significant differences ($P \leq 0.05$ or $P \leq 0.01$) among varieties for most of the studied traits. The presence of significant differences among the tested varieties might be due to the existence dissimilarity in genetic composition among them, for that fact characters may be differ in their genetic properties. Besides, environmental influences might be the possible causes of their significant differences or both.

3.2. Growth parameters

3. 2.1. Plant height at maturity

In this study, combined analysis of variance as shown in table 1 indicates the main effects of varieties and location had significantly ($P<0.05$) effects while their interactions no significantly effects on plant height. The tallest plant height (179.1cm) was observed for variety Mehando-80 variety (162.1cm) and the shortest (147.8cm) plant height was recorded from Humera-1 variety (Table 2). This variation ascribed to the differences in the growing environment climatic conditions and genetic make-up of the varieties. This result is in line with Fiseha and Muez (2019) who indicated that plant height significantly difference among sesame genotypes. Similarly, Tamer *et al.,* (2017) who reported that, significantly difference in plant height among sesame varieties.

3.2.2. Number of primary branches

Primary branches was highly significantly ($P<0.05$) affected by the main effects of variety and location. However, their interaction effect did not show significant effect. The highest number of primary branch (6.6) from Mehando-80 and the lowest (4.6) number of primary branch was recorded from T-85 variety (Table 2). The difference in number of primary branches among the varieties could be most probably due to the existence dissimilarity in genetic composition among them, for that fact characters may be differ in their genetic properties to response formation of branch. These results are in concordance with Ahadu (2010) who stated that the numbers of branches did change according to varieties type.

Table 1: Mean square values for yield and yield components of sesame varieties at Weyito and Omorate locations in (2019/2020)

Source	Degree of freedom	Plant height	Primary branches per plant	Campuses per plant	Grain Yield (kg/ha)
Replication	2	0.03 *	3.03*	742.20*	7818.23*
Varieties	3	1696.80*	6.34*	996.20*	12483.65**
Locations	1	1058.60*	2.16 *	73.50 *	4869.56**
Varieties x locations	3	187.80^{ns}	0.94^{ns}	0.019^{ns}	155.12^{ns}
Error	14	4001.40	0.66	449.2	3427.03
CV (%)		10.26	15.8	13.73	6.07
Mean Square of Error (MSE)					
Omorate	-	344.99	0.770	877.72	1063.9
Weyito	-	213.32	0.505	663.85	7282.3
F **max**	-	1.62^{ns}	1.53^{ns}	1.32^{ns}	0.15^{ns}

Ns= non-significant, *=significant, **= highly significant, ***= very highly significant at P<0.05CV=Coefficient of variance

Table 2: Means values of yield and yield component of sesame varieties tested at Woito and Dasenech in 2019/2020

Varieties	Plant height(cm)	Primary branch numbers per plant	Capsules per plant	Grain yield (kg/ha)
	Combined	**Combined**	**Combined**	**Combined**
Mehando -80	170.3ab	5.1b	176.67a	1095.1a
Adi	179.1a	4.3c	139.12b	835.0bc
Humera-1	147.8b	6.6a	150.22b	972.7ab
T-85	162.1ab	4.6c	145.77b	776.3c
LSD(0.05)	30.23	0.50	25.57	145.2

Means in columns and rows followed by the same letter(s) are not significantly different at 5% level of significant; LSD (0.05) = Least Significant Difference at 5% level

.

3.3. Yield and yield components

3.3.1. Number of capsules per plant

The combined analysis of variance as shown in table 1 indicates the main effects of varieties and location had high significantly ($P<0.05$) effects while their interactions no significantly effects on number of capsule per plant. The highest mean number of capsules per plant (176.67) was recorded for variety Mehndo-80 and the lowest number of capsule per plant (145.77) was recorded for variety T-85 (Table 3). The difference on number of capsules per plant might be due the fact that the number of capsules per plant regulated by the genotypes of sesame or existence of suitable climatic conditions. The result is also corroborated with Begum *et al*. (2001) who reported that, variation in number of capsules per plant evaluated for different sesame varieties due to the existence of suitable climatic conditions for the varieties in the tested area. Similarly, Weres (2020) who reported that, significant differences among sesame varieties in the number of capsules per plant due to the genetic difference of the varieties.

3.3.2. Grain yield (kg/ha)

Analysis of variance showed that highly significant difference ($p<0.01$) were found for the main effects of varieties and location, their interaction for grain yield was not statistically significant in Table 1. The highest grain yield (1095.1kg ha^{-1}) was recorded for varieties Mehando-80 and the lowest grain yield (776.3kg ha^{-1}) was recorded for variety T-85. The possible reason for the observed the yield difference might be due to existence dissimilarity in genetic composition among them, for that fact characters may be differ in their genetic properties. Moreover, environmental influences might be the possible causes of their significant differences or both. The result of this study is in agreement with the research finding of Tadesse and Misgana (2020) who observed a significantly difference among sesame varieties. Similarly, Fiseha and Muez **(**2019) who studied on evaluate of genotypes sesame found that, a significantly difference in grain yield of varieties.

4. CONCLUSION AND RECOMMENDATION

Sesame is major economically important oil crops in Ethiopia. However, the yield of this crop is limited mainly due to shortage of improved varieties suited to specific area. This field experiment was conducted to evaluate sesame varieties for grain yield production at Omorate and Weyito in South Omo Zone, Southern Ethiopia. The experiment contains four varieties namely Mehando-80, Adi, T-85 and Humera-1 and conducted using randomized complete block design with three replications. Data were collected on days to physiological maturity, plant height, primary branches per plant, and capsules per plant and grain yield and subjected to analysis of variance using SAS software program. The result of this study revealed that, there was significant difference among varieties in these parameters at study areas

Combined mean results showed that, the highest grain yield (1093.1 kg ha^{-1}) and (972.7kg ha^{-1}) were produced from Mehando-80 and Humera-1 varieties, respectively. Therefore, it can be concluded that variety Mehando-80 or Humera-1 well performed and can be recommended for the growers in the study area and its vicinity. Moreover, it can recommend from these findings that further investigation on different varieties along with other agronomic practice can be a step forward to identify more realistic effect of different varieties on the yield improvements of sesame.

Acknowledgment

Our special thanks go to Ethiopian Agricultural Research Council Secretariat (EARCS) for financial and technical support. Grateful acknowledgment is also go to Jinka Agricultural Research Center, Crop Research Directorate staff members for their moral and technical support**.**

REFERENCES

1. Ahadu Menzir .2008. Genetic variability and association of characters in sesame (*sesamum indicum* l.) genotypes. an m.sc. Thesis presented to haramaya university, Ethiopia.

2. Begum, R., Samad, M.A., Amin, M.R., Pandit, D.B. and Jahan, M.A. 2001. Effect of row spacing and population density on the growth and yield of sesame. Bangladesh Journal of Agricultural Sciences, 28(2), pp.311-316.
3. CSA (Central Statistical Agency). 2019. Report on area and production of crops (private peasant holdings '*Meher'* season) 2016/2017. Addis Ababa Ethiopia, the FDRE statistical bulletin, Statistical Bulletin 584, Addis Ababa Ethiopia, Volume l .Pp.1-122.
4. Fiseha Baraki and Muez Berhe .2019. Evaluating performance of sesame (*sesamum indicum* l.) genotypes in different growing seasons in northern Ethiopia. hindawi international journal of agronomy .volume 2. Pp: 1-7
5. Getinet Alemaw and Negusse Alemayehu. 1997. Highland oil crops: A three-decade research experiences in Ethiopia. Research report No. 30. IAR, Addis Abeba, Ethiopia.
6. Khan, M.H.A., Sultana, N.A., Islam, M.N. and Hasanuzzaman, M. (2009). Yield and yield contributing characters of sesame as affected by different management practices. American-Eurasian Journal of Scientific Research, 4(3), pp.195-197.
7. MOANR (Ministry of Agriculture and Natural Resources). 2017. Plant variety release, protection and seed quality control directorate. Addis Abeba, Ethiopia**.**
8. Nath,R, P. K. Chakraborty, A. Chakraborty, 2000. Effect of Microclimatic Parameters at Different Sowing Dates on Capsule Production of Sesame (Sesamum indicum L.). In: A Tropical Humid Region. Journal of Agronomy and Crop Science 184: 247–252.
9. Oplinger, E.S., D.H. Putnam, A.R. Kaminiski, C.V. Hanson, E.A. Oelke, E.E. Schulte and J.D. Doll, 1990. *Sesame*. Alternative Field Crop Manual. Pp. 25-36.
10. Tadesse and Misgana. 2017. Performance evaluation of sesame (*sesamum indicum l.*) varieties in lowland area of south omo zone, snnpr, ethiopia. International journal of research in agriculture and forestry. Volume 4, pp. 9.
11. Taghouti, M., Nsarellah, N., Gaboun, F. and Rochdi, A. 2017. Multi-environment assessment of the impact of genetic improvement on agronomic performance and on grain quality traits in Moroccan durum wheat varieties of 1949 to 2017. Global journal of plant breeding and. Genetics, 4, pp.394-404.
12. Tamer ERYIGIT, Ali Rahmi KAYA, Murat TUNCTURK, Resit ALDEMIR, Bunyamin YILDIRIM. 2017. Evaluation of some sesame (sesamum indicum l.) varieties performances under micro-climate conditions of igdir-turkey. International scientific agriculture symposium "agrosym 2016", jahorina, october .06.
13. Umar, H.S., Okoye, C.U. and Mamman, B.D. (2010). Resource use efficiency in sesame (Sesamum indicum L.) production under organic and inorganic fertilizers applications in Keana Local Government Area, NasarawaState, Nigeria. Research Journal of Agriculture and Biological Sciences, 6(4), pp.466-471.
14. Weres Negash, 2020. Yield performance of sesame (Sesamum indicum L.) varieties at different levels of plant population in optimum moisture areas of Western Tigray, Northern Ethiopia. Journal of Biology, Agriculture and Healthcare. Vol.10.Pp:1-.4. (Online) www.iiste.org
15. Wijnands, J.H.M., Biersteker, J. and Van Loo, E.N. (2009). Oilseeds business opportunities in Ethiopia November 2009, The Hague, Netherlands. pp. 1-62.