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Performance Evaluation of Sesame (*Sesamum indicum L.*) Varieties in Lowland Area of South Omo Zone, SNNPR, Ethiopia

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ABSTRACT

Sesame (Sesamum indicum L) belongs to the genus Sesamum, order Tubiflorae and family pedaliaceae.Sesame's seed chemical compositions are: oil (45-55%), protein (18-25%), vitamins E, A and B complex, carbohydrate, ash and minerals like calcium, phosphorus, iron, copper, magnesium, zinc, and potassium. A field experiment was conducted on farmer's field of Woito kebele of South Omo Zone of SouthernEthiopia using sevenimproved Sesame (Sesamum indicum L) varieties under irrigation (once per a week Conventional watering frequency) condition in 2016. The objective of the study was to select the best performing Sesamevarieties that will increase productivity and production of Sesame in the target areas. The treatments involved were seven improved varieties of Sesamenamely: E, Tate, Kelafo-74, Mehando-80, T-85, Adi, and Abasena. The experiment was carried out using a randomized complete block design (RCBD) with three replications at Woito in 2016. The result of analysis of variance showed that some of phenological parameters were significantly affected by varieties. In this study, significant variations were observed on days toflowering and days to maturity at (P <0.01) among testedSesame varieties.The effect of varieties on seed yield was not significant and the best performing varieties of Sesame varieties numerically were Mehando-80(11qt/ha), E (10.3qt/ha) and T-85(10qt/ha) andwould be recommended for the specific community and its vicinity even though further study should be carried out including a number of recently released varieties for improved Sesame production in the target area and also to put the recommendation on strong basis.

Keywords: *Sesame, Phenological Parameters, Yield Components, Varieties, Seed Yield*

INTRODUCTION

Sesame (*Sesamum indicum* L) belongs to the genus *Sesamum*, order Tubiflorae and family pedaliaceae and is a diploid species with 2n = 2x = 26 chromosomes.It is an annual self-pollinating plant with an erect, pubescent, branching stem, and 0.60 to 1.20 m tall. The leaves are ovate to lanceolate or oblong while the lower leaves are trilobed and sometimes ternate and the upper leaves are undivided, irregularly serrate and pointed (Felter and Lloyd, 1898: cited in Morris, 2002). The fruit is an oblong, mucronate, pubescent capsule containing numerous small, oval, and yellow, white, red, brown, or black seeds (Morris 2002; Geremew *et al*., 2012).

Sesame seeds are used whole or processed to produce oil and meal while in Africa sesame seeds are made into porridges and soups (Gooding *et al*., 2000). Sesame's seed chemical compositions are: oil (45-55%), protein (18-25%), vitamins E, A and B complex, carbohydrate, ash and minerals like calcium, phosphorus, iron, copper, magnesium, zinc, and potassium (Ceccarelli, *et al*., 2009). From the composition of sesame oil, oleic and linoleic fatty acids are 85% and they make the oil to have long shelf-life because these fatty acids have high degree of resistance against oxidative rancidity and the linoleic acid is known to lower cholesterol content in human blood (Khanna, 1991).The quality of oil is determined by the fatty acid compositions of the total oil. Its oil is used for salad and cooking dishes

The oil can be used cooking and salad oils and margarine, manufacture of soaps, paints, perfumes, pharmaceuticals and insecticides. Sesame meal, left after the oil is pressed from the seed is an excellent high protein (34 to 50%) and used as feed for poultry and livestock.

Sesame world production is estimated at 3.24 million metric tons in 2007 and increased to 3.84 million metric tons in 2010 and almost 90% of production area was in Asia and Africa. Ethiopia was the 7th major sesame producing country in the world in the year 2004 with area coverage 65,000 hectare, production about 49,000 tons and productivity about 479 kg ha-1 (IPMS-Ethiopia Farmers Project, 2005). Now, Ethiopia is the 4th with area coverage 384,682.79 hectare, production about 327,740.92 tons and productivity is estimated as 852 kg ha-1 (CSA, 2011/12).Also Ethiopia is among the top 5 world's producers of linseed and also an importantProducer of Niger seed (Wijnands *et al.*, 2007).

Next to coffee, sesame seed is the second largest export crop for Ethiopia and it is an important cash crop as it has an excellent demand in the international market and is utilized by domestic oil production. The export of sesame seeds was 43,131 tons in the year 2007 and it was almost doubled 82,201 tons in the year 2011 (CSA, 2011/12).

In the Southern Nation and nationality people region, 6,365.70 hectares of land was covered by sesame in the year 2014, production is 3165.097 tons (CSA, 2014). In South Omo Zone, sesame is grown mostly inter-copping with sorghum, but these environments are potential for sesame growing as sole crops.

Despite its superior economic importance and has great potential in improving farmers' income, sesame is grown almost exclusively by smallholders using unimproved sesame landraces and traditional management practices and its production and productivity in the lowland areas of South Omo zone still remains below the national average (4.75 qt ha-1).

So the experiments were done in 2016 cropping season with an objective of identifying, selecting and recommending, adaptable, high yielding and disease resistant /tolerant sesame varieties for immediate farmers and farming community of the area for improving farmers' income and improving sesame production and productivity in the lowland area of South Omo zone of SNNPR, Ethiopia.

Materials And Methods

Description of the Study Area

The experiment was conducted at Woito farmer's field located at 036^{o} 59' 58'' E longitude and 05^{o}21'47''N latitude and at an altitude of 566 meters above sea level (masl). Geographically, Woito is situated in South Ethiopia at about 649kms from the Addis Ababa. The long term weather data of the area revealed that the mean annual rainfall of the area is 51.74mm with a range of 32.52 to 74.33mm. The experiment was conducted during the main cropping season (April to July, 2015) under rain fed conditions.

Treatments and Experimental Design

Theseeds of theseSesame varieties were sown on August 10, 2016 main cropping season at Woito farmers' field.Varieties which were evaluated under the study were E, Tate, Kelafo-74, Mehando-80, T-85, Adi, and Abasena collected from Werer Agricultural Research Center (WARC).Randomized complete block design (RCBD) with three replications were used in this study. Experimental unit comprised five rows of 2 meters length with row-to-row spacing and plant-to-plant spacing of 40 x 10 cm respectively.100 kg/ha of DAP was applied at plating.

Fig1. *Field Performance of Sesame Varieties at Woito Farm.*

Data Collection

Phenological Parameters

Phenological parameters such as stand count at harvest, plant height, podplant^{-1}, days to flowering, branch number plant^{-1}and days to maturity were recorded from the studied varieties.

Seed Yield and Yield Components

Three central rows were harvested for determination of seed yield. Seed yield was adjusted to 14% moisture content. Five plants were randomly selected from the three central rows to determine yield and yield components, which consisted of number of pods plant^{-1} and Pod number plant^{-1} was determined by counting pods of the five randomly selected plants.

Statistical Analysis

All collected data were being subjected to analysis using the GLM procedure of SAS Statistical Software. Effects were considered significant in all statistical calculations if the P-values were < 0.05. Means were separated using Duncan's multiple rage tests.

RESULT AND DISCUSSION

The result of analysis of variance depicted that, days to flowering and days to maturitywere highly significantly different at (P <0.01) (Table 1). This indicates that there exists a linear response of the studied parameters to varieties. The result of analysis of variance for mean squares revealed that, Plant height, Seed yield, branch number plant^{-1} and stand count at harvest werenot significantly different (Table 1). The maximum and minimum number of pods plant^{-1} of (53) and (39) were recorded for the varieties Tate and T-85, respectively (Table 2).

The maximum and minimum number branch number plant^{-1}of (2.5) and (1.4) were noted for the varieties Kelafo-74 and Abasena, respectively (Table 2). The above findings revealed that the moderate number of pods per plant and the moderate number of branch number plant^{-1} resulted in the minimumseed yield of (11qt/ha) for the Sesame variety Mehando-80. In this experiment, seed yield of Sesamewas notsignificantly different at any probability level (Table1)

Table1. *Mean Square Values for Crop Phenology, Yield and Yield Components of Sesame as Influenced by Variety at Woito, in 2016.*

Source of Variation	Degree of Freedom	Means Squares						
		DF	DM	YLD(qt/ha)	PH(cm)	PPP	SCH	BNPP
Replication	2	0.76	0.76	0.9	767	103	404	0.04
Treatment	6	11.4**	11.4**	3.65^{ns}	35^{ns}	59^{ns}	209.7ns	0.4^{ns}
Error	12	0.76	0.76	1.75	178.9	113	88.8	0.27

*Ns-= none significant at 0.05 probability level, * = significant 0.05 probability level DF=Days to 50% flowering, DM= days to 95%maturity, PPP= Pod/plant, PH= plant height, SCH=stand count at harvesting, BNPP= branch number per plant, YLD=Yield, CV (%) = coefficient of variation in percent.*

Table2. *Means values of yield and yield component of sesame varieties tested at Woito farmer's field, in 2016*

Varieties	YLD(qt/ha)	PH (cm)	PPP	SCH	DTM	DF	BNPP
E	10.3a	137.13a	45.6a	91.8a	81b	41a	2.1a
Tate	7.9a	128.9a	53a	86.2a	78c	38c	2.2a
Kelafo-74	9.6a	136.7a	41.2a	90.5a	81b	41b	2.5a
Mehando-80	11a	137.7a	44.7a	104.5a	81b	41b	2.2a
T-85	10a	137.5a	39a	108.7a	85a	45a	1.7a
Adi	8.9a	135.3a	44.9a	91.7a	81b	41b	2.2a
Abasena	8.3a	139.5a	46a	90.2a	81b	41b	1.4a
LSD	2.4	23.8	18.9	16.8	1.7	1.6	0.9
CV (%)	14	9.8	23.8	9.9	1.1	2.1	25.9

**Means with the same letter are not significantly different. PH=plant height, PPP= pod per plant, SCH=stand count at harvest, DTM= days to 95% maturity YLD=yield, LSD= least significant difference, CV (%) = coefficient of variances in percent.*

SUMMARY AND CONCLUSION

Production of Sesame by introducing the improved and high yielding varieties could make an important contribution to increase agricultural production and productivity in lowland areasof South Omo zone like Woito where there is low practice of using improved varieties of Sesame. To this end, using the improved Sesame varieties could be one of the options to improve productivity by small farmers. However, production of Sesame using the improved varieties is not yet introduced and studied in the target area. Thus, this research work was initiated to examine the impact of improved varieties on the performance of Sesame. The Study was carried out at Woito kebele South Omo zone of SNNPR, Ethiopia under irrigation (once per a week Conventional watering frequency) condition in 2016. The objective of the study was to select the best performing varieties that will improve Sesame production in the studied area. The experiment was carriedout using the randomized complete block design (RCBD) with three replications at Woito kebele's in 2016.Treatments involved in this experiment were seven improved Sesame varieties.

The result of analysis of variance showed that some phenological parameters were significantly affected by varieties. In this study, there were significant variations observed among the Sesame varieties for days to flowering and days to maturity. The effect of varieties on seed yield was not significant and the best performing varieties of Sesamenumerically wereMehando-80(11qt/ha), E (10.3qt/ha) and T-85(10qt/ha) and would be recommended for the specific community and its vicinity even though further study should be carried out including a number of recently released varieties for improved Sesame production in the target area and also to put the recommendation on strong basis.

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