

# Participatory Variety Selection of Improved Sesame Varieties in Selected District of SNNPR, Ethiopia

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## ABSTRACT

Sesame is a major oil crop produced at different agro-ecologies of Ethiopia. However, an access of improved sesame variety is highly limited in country in general and southern Ethiopia in particular. The current experiment was conducted at two districts (Kucha and Humbo) to identify high yielding, early maturing, drought and diseases tolerant improved sesame varieties through participatory variety selection. Five improved sesame varieties with one local check were grown in randomized completed block design with four replications and farmers were considered as replication. The analysis of variance indicated presence of significant differences at ( $P \leq 0.05$ ) among the evaluated sesame varieties for days to flowering, days to maturity, plant height and grain yield. Significant variability was observed among the tested sesame varieties for seed yield qt/ha, which was ranged from 5.59 to 8.95 qt/ha with the mean value of 8.04 qt/ha and coefficient of variation 14.5 %. The highest grain yield (8.95 qt/ha) was recorded for Abasena followed by setiti-1 (8.92qt/ha). But, low yield of 5.59 qt/ha was obtained from local variety (control). In other cases, farmers were allowed to evaluate the varieties using their own criteria. Accordingly, variety setiti-1, Humera and Abasena were selected by farmers due to their best performance. Thereby, these three improved sesame varieties are selected based on agronomic data result and farmers preference and recommended for production to the study areas and similar agro ecology [1].

**Keywords:** Farmers' perception; Improved variety; Participatory variety selection; Sesame

## INTRODUCTION

Sesame is one of the oldest cultivated plants in the world. A total of 4.85 million tons of sesame seed was produced on 9.42 million ha worldwide. 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<sup>-1</sup>.

Ethiopia is one of the famous and major producers of sesame in sub-Saharan Africa, and Ethiopian sesame is among the highest quality in the world. It accounts 90% of the value of exported oil seeds, estimated at 379 million USD. Furthermore, sesame is the second major source of foreign currency for Ethiopia next to coffee from the agricultural products, and a 1.63% sesame export increment was recorded from 2002-2014.

In SNNPR, sesame is cultivated in some parts of the country occupies about 6,365.7 hectares of land annually with estimated production of 31,650 quintals. The National (6.87qt/ha) and regional (4.97 qt/ha) average yield of sesame has remained low [2].

The causes for low productivity are several and interdependent, in which the persistent use of traditional practices and unimproved

local cultivars are at the forefront. Most of the local cultivars are with a moderate yielding capacity but are less susceptible to bacterial blight disease and webworm attack. Participatory variety evaluation for identification of area specific adapted varieties that meet farmers need is key starting point in addressing low productivity. Therefore, the objectives were to identify high yielding, early maturing, drought, and diseases tolerant improved sesame varieties through participatory variety selection [3].

## MATERIALS AND METHODS

### Study Area Descriptions

An experiment was conducted in Abela Sipa village at Humbo district in Wolayta Zone and Wuzette village at Kucha district in Gamo Gofa Zone, in Ethiopia, in 2010 main cropping season. The kucha trial site is located at 06° 29.476'N latitude and 37° 28.281'E longitude with an altitude of 1,395 meters above sea level whereas Humbo trial site is located at 06° 39.583'N latitude and 37°48.403'E longitude with an altitude of 1,375 meters above sea level [4].

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## Experimental Design and Cultural Practices

Five released sesame varieties namely Mehado-80, Abasena, Tate, Humera, and Setiti-1 and local checks were grown on-farm in Randomized complete block design with three replications. One grandmother trial and three mother trials were grown in single plot on three farms (a farm was considered as replicate). The grandmother trial was used to generate breeder's data while the three mother trials were used for participatory varietal selection and to value farmers' preferences during evaluation [5].

The recommended fertilizer rate, 100 kg/ha DAP and 50 kg/ha UREA (25kg UREA at sowing and 25kg UREA before flowering), was applied at sowing and before flowering respectively. Weeding was also done three times; i.e. first, second and third was 14, 35 and 65 days after planting respectively.

## PARTICIPATORY VARIETAL SELECTION

### Farmers' Evaluation of Sesame Varieties

Farmers were set their own selection criteria which included grain yield, plant height, capsule length, seed color, earliness, drought tolerance, lodging resistance and disease resistance. A focus group discussion was under taken to collect the feedbacks of the test varieties. The evaluation was conducted at three developmental stages; namely vegetative, capsule filling and maturity stages using 32 farmers (25 male and 7 female) in Kucha and 62 farmers (56 male and 6 female) in Humbo. A matrix ranking and pairwise ranking were used to rank the tested varieties.

A direct matrix was prepared as per the selection criteria; for the sesame varieties listed in the column and criteria in the row. The ranking procedure was explained to participants and then each criterion was ranked from 1 to 5 (5 = excellent, 4 = very good, 3 = good, 2 = poor and 1 = very poor) for each variety, ranking was done on consensus where differences were solved by discussion [6].

Ranking farmers were given rating of importance (a relative weight) of a selection criterion ranked from 1 to 3 (3= very important, 2= important and 1= less important) and rating of performance of a variety for each traits of interest was given based on their level of importance on the basis of common agreement of evaluators'.

## DATA ANALYSIS

Agronomic data were subjected to statistical analysis using the SAS computer program, version 9.0. Mean separation was conducted using Least Significance Difference (LSD) at 0.05 probability level.

## RESULTS AND DISCUSSION

Analysis of variance revealed that there was significant variation among the tested sesame varieties ( $P < 0.05$ ). The results of the ANOVA for each location revealed significant ( $p < 0.05$ ) difference among sesame varieties for seed yield at kucha and at Humbo (Table 1). Similarly, the results of the ANOVA for the pooled data showed highly significant ( $p < 0.01$ ) differences among sesame varieties for seed yield (Table 1) indicating presence of adequate variability among the varieties. The study indicated that sesame variety of Abasena was the top performed with mean grain yield of 895.1 kg/ha & the local famers variety was the least performed with average grain yield of 559.7 kg/ha (Table 1). This result confirmed the results of prior studies done. They reported that varieties of sesame were significantly affected by phonological growth as well

as yield and yield related parameters.

The study indicated that four varieties Abasena, Setit-1, Humera and Tate yielded 895.1, 892.3, 883.1 and 821.8 kg/ha which are higher than grand mean 804.9kg/ha). Local check and mehado-80 were yielded below overall mean yield (Table 1).

### Participatory Variety Selection

A matrix ranking evaluation of sesame varieties indicated the total score ranged from 49 to 74 as indicated in Table 2. The highest score was given to the Abasena (score 74) followed by Humera (score 73) at Humbo whereas highest score was given setiti-1 (score 73) followed by Tate (score 70). Out of the six genotypes tested, Mehado (score 51) and local check (score 49) scored the minimum value to be the least preferred.

Eight selection criteria set by farmers were: grain yield, disease and pest resistance, earliness, seed color, plant height, lodging resistance, capsule number and capsule length as 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> etc. respectively.

Based on farmers matrix ranking results, grain yield, earliness and disease resistance were proposed as the three most important

**Table 1:** Combined analysis of performance of sesame varieties across locations.

Variety	Seed yield (kg)			Overall Rank
	Kucha	Humbo	Combined	
Local	858.8b	250.6c	559.68c	6
Abasena	1088.5a	701.6a	895.05a	1
Humara	1064.3a	712a	888.13ab	3
Tate	980.3ab	663.3ab	821.78ab	4
Setiti-1	1109.8a	974.8ab	892.28a	2
Mehado-80	1055.3a	490.6b	772.9b	5
Mean	1026.1	583.8	804.9	
LSD (5%)	146.9	201.7	119.6	
CV (%)	9.49	22.9	14.5	

**Table 2:** A matrix ranking evaluation of sesame varieties at Humbo.

Criteria	RW	Abasena	Setit-1	Humera	Tate	Mehado	Local
1.Grain yield	3	15(5)	15(5)	15(5)	9(3)	12(4)	6(2)
2.Disease resistance	3	12(4)	9(3)	12(4)	9(3)	9(3)	6(2)
3.Earliness	3	15(5)	15(5)	15(5)	9(3)	12(4)	15(5)
4.Seed color	2	8(4)	6(3)	6(3)	6(3)	10 (5)	6(3)
5.Plant height	2	6(3)	6(3)	8(4)	6(3)	6(3)	6(3)
6.Lodging resistance	1	4(4)	3(3)	5(5)	3(3)	3(3)	3(3)
7.Capsule number	2	10(5)	10(5)	10(5)	6(3)	10(5)	4(2)
8.Capsule length	1	4(4)	3(3)	4(4)	4(4)	3(3)	3(3)
Total score	17	74	67	73	52	65	49
Rank	-	1	3	2	5	4	6

**Note:** RW=relative weight, numbers in parenthesis indicated the performance rating value of each variety given from 1-5 (5= excellent, 4=very good, 3= good, 2= poor and 1=very poor) and numbers written outside parenthesis indicate total score of a variety as per each selection criteria, which was obtained by multiplying the relative weight of each selection criteria with that of the performance rating number in the parenthesis.

Table 3: A matrix ranking evaluation of sesame varieties at kucha.

Criteria	RW	Abasena	Setiti-1	Humera	Tate	Mehado	Local
1.Grain yield	3	15(5)	15(5)	12(4)	12(4)	9(3)	6(2)
2.disease resistance	3	12(4)	9(3)	9(3)	12(4)	9(3)	6(2)
3.Earliness	3	12(4)	15 (5)	12(4)	15(5)	9(3)	15(5)
4.Seed colour	2	6(3)	8(4)	10 (5)	6(3)	8(4)	6(3)
5.Plant height	2	6(3)	8(4)	6(3)	8(4)	6(3)	6(3)
6.lodging resistance	1	3(3)	4(4)	3(3)	5(5)	3(3)	3(3)
7.capsule number	2	10(5)	10(5)	10(5)	10(5)	6(3)	4(2)
8. capsule length	1	4(4)	4(4)	3(3)	4(4)	3(3)	3(3)
Total score	17	68	73	65	70	51	49
Rank	-	3	1	4	2	5	6

**Note:** RW=relative weight, numbers in parenthesis indicated the performance rating value of each variety given from 1-5 (5= excellent, 4=very good, 3= good, 2= poor and 1=very poor) and numbers written outside parenthesis indicate total score of a variety as per each selection criteria, which was obtained by multiplying the relative weight of each selection criteria with that of the performance rating number in the parenthesis.

criteria in descending order. On participatory varietal selection of intermediate altitude sorghum and participatory evaluation of malt barley reported similar selection criteria set by farmers. Furthermore, found also the same selection criteria while farmers' evaluated wheat varieties in Tigray region.

Similarly at kucha district sesame varieties were identified for their morphological performance and ranked as indicated in Table 3. Hence, in direct matrix ranking of sesame varieties Setiti-1 was considered as best varieties, whereas the local check as the least preferred by Kucha farmers (Table 3). In general farmers' responded positively to the improved varieties evaluated.

## CONCLUSIONS

Varieties Abasena, Setiti-1 and Humera, owing to their yield being significantly higher than that of local variety and being selected by the farmers as their first, second and third choice; respectively, were the most adapted varieties for the study areas, Kucha and Humbo, in south Ethiopia. This is further confirmed by the yields of the three varieties being more than 1.5 fold higher than yield reported by local check sesame variety in the study.

From this study, it can be recommended that:

1. Abasena, Setiti-1 and Humera were performed better compared to the other varieties at both test locations.
2. Abasena, Setiti-1 and Humera most acceptable varieties selected by farmers as 1<sup>st</sup> to 3<sup>rd</sup> rank at both districts.
3. Therefore, we recommend Abasena, Setiti-1 and Humera to include in Pre-extension and demonstration plan to be demonstrated and popularized in the study area and similar agro ecology.

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