Original Research Article||

Registration of "Hachalu" (EW006 x EW003 (1)-4-2-1) Sesame (Sesamum indicum L.) Variety

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Abstract

Hachalu is a name given to a newly released sesame variety developed by Bako Agricultural Research Center and released in June 2021. Selection of this variety was made among recombinant inbred lines of sesame developed through pedigree breeding method. The two parents of the selected variety were collected from western Oromia of Ethiopia. This variety was selected out of fifteen inbred lines that were tested along with standard check Walin at three locations for two consecutive years (2018 and 2019) main cropping seasons. Hachalu was the best high yielding variety and the most stable among all lines for its grain yield performance and has resistance to bacterial blight which is very challenging for sesame production in the country. In addition to this, hachalu's oil content is high (54.9%) and has white seed color which has a great role in the market class. For these reasons, the variety was released for commercial production in major sesame growing areas of western Oromia and other similar agro-ecologies.

Key words: Grain yield stability, Oil content, Recombinant inbred line, *Sesamum indicum*

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INTRODUCTION

Sesame is a self-pollinated crop (Zhang *et al*., 2013). However, 2-48% natural crossing was reported due to insect pollination (Daniel and Parzies, 2011). Domestication of the crop is about 5000 years old in Harappa region of India (Fuller, 2003). Sesame is an oilseed crop grown for its seed, oil for local and export markets, a great source of income for farmers, traders and processors and source of foreign exchange earnings. It is one of the important oilseed crops which is described as the queen of oil crops because of its high oil content. Sesame seed is consumed as a source of calcium, potassium, tryptophan and methionine (Soundharya *et al.*, 2017). In Ethiopia, the production of sesame is practiced at both by small- and large-scale farmers levels; serving as an important export commodity.

Ethiopia is the 3rd sesame exporter in the world next to Nigeria and India. Sesame is the first export (79%) from oil seeds and 2nd (20%) agricultural export next to coffee in Ethiopia (Zerihun, 2012). In spite of its wider importance and huge nutritional value, limited number of adaptable varieties with tolerance to biotic and abiotic factors is one of the major sesame production constraints in Ethiopia. In view of this, a study was conducted with the aim of developing adaptable, high yielding, oil content and stable as well as disease resistant sesame variety for commercial production across tested environments and similar agro-ecologies of the country.

Varietal Origin and Evaluation

Hachalu (EW006 x EW003 (1)-4-2-1) sesame variety was developed from parental materials collected from Western Oromia and developed through hybridization and subsequent pedigree selection at Bako Agricultural Research Center. The variety was tested at multi locations together with sixteen genotypes including one standard check Walin during 2018 & 2019 cropping season.

Agronomic and Morphological Characters

Hachalu variety has determinate growth type. It has erect plant growth habit and the stem and leaf are purple in color. The stem of *Hachalu* has branching habits. The average 1000 seeds weight of *Hachalu* was 2.7 grams, and its average plant height was 127.8 cm. More detailed agronomic features of this new variety are presented in the following Table 1:

Yield Performance

The released variety, *Hachalu* showed higher mean seed yield (634.22 kgh-[1]) with greater yield advantage of 12.88% over the standard check, *Walin.* Details of the compartative advantages of the newly released variety – *Hachalu* is presented in Table 2 below.

Table 1. Agro-morphological characteristics and oil content of Hachalu sesame variety

Descriptors	Detailed and specific discriptions
Variety Name	*Hachalu* (EW006 x EW003 (1)-4-2-1)
Adaption area	Well adapted to major sesame growing areas of western Oromia and other similar agro ecologies ✓ Altitude (m.a.s.l): 1250 - 1650 ✓ Rainfall (mm): 800 - 1100
Planting date	End of May to Early June
Seed rate ($kgha^{-1}$)	5 (for row planting)
Spacing (cm)	40 between rows and 10 between plants
Fertilizer rate ($kgha^{-1}$)	NPS: 100 and UREA: 50
Days to flowering	65.7-70.3
Days to maturity	115-131.7
Growth habit	Intermediate
1000 seed weight (g)	2.7
Plant height (cm)	109.3-146.3
Capsule per plant	69.2-91.9
Stem and branching character	Angular and branched
Growth pattern	Erect
Seed color	White
Crop pest reaction	Resistant to bacterial blight and other pests
Oil content (%)	54.9
Seed yield ($kgha^{-1}$)	Research field: 634-929 Farmer's field: 628-870
Year of release	2021
Breeder/ Maintainer	BARC/OARI*

**Bako Agricultural Research Center/ Oromia Agricultural Research Institute*

Table 2. Mean seed yield ($kgha^{-1}$) among 16 sesame genotypes across six testing environments

Genotypes	Yield/ha						Pooled mean	Yield adv.
	2018			2019				
	Bako	Uke	Ose	Bako	Uke	Ose		
EW00 x BG006-7-1-1	268.33	326.00	541.33	264.69	532.61	283.80	369.46	
EW002 x BG006-2-1-1	406.00	357.33	562.33	340.52	619.48	444.69	455.06	
EW006 x EW003 (1)-4-2-1	929.00	830.67	567.00	361.88	596.77	520.00	634.22	12.81
EW006 x EW003 (1)-3-1-1	392.67	747.00	630.67	321.98	398.23	274.17	460.79	
EW006 x EW003 (1)-7-1-1	517.33	631.67	611.00	319.48	698.96	502.97	546.90	
EW003 (1) x Wama -9-1-1	490.33	430.00	692.00	303.23	625.83	419.79	493.53	
Dicho x EW006-1-1-1	703.00	939.67	714.33	325.84	526.67	530.83	623.39	10.88
Dicho x EW006-9-1-1	549.00	480.00	760.00	256.77	378.54	657.08	513.57	
Dicho x Obsa -4-1-1	503.00	345.67	452.00	228.75	622.81	537.08	448.22	
Obsa x BG006-4-1-1	637.67	522.67	620.33	362.29	913.13	375.84	571.99	1.74
EW003(1) x EW002-4-2-1	829.67	529.67	353.00	386.36	541.25	434.06	512.33	
EW003(1) x EW002-5-2-1	632.67	551.67	556.33	394.59	603.34	988.64	621.21	10.50
EW023(2) x BG006-13-1-1	845.67	521.33	594.67	311.67	598.33	316.35	531.34	
Obsa x EW023(2)-3-3-1	495.00	492.67	650.67	318.54	723.75	370.21	508.47	

EW003(1) x EW019-4-2-1	441.00	366.00	694.00	290.42	849.59	619.90	543.48
Walin	510.33	687.33	681.33	387.71	713.13	393.33	562.20
Mean	571.92	547.46	605.06	323.42	621.40	479.30	524.76
CV%	12.52	9.15	12.43	21.46	14.93	9.75	28.08
P value	**	**	**	ns	**	**	**
LSD	119.38	83.52	125.41	115.71	154.73	77.94	96.75

*Key: *, ** indicate significant at 0.05 and 0.01 probability level, respectively; ns = non-significant*

Stability and Adaptability Performances

Based on the AMMI result, the new variety, *Hachalu* (G3) ranked first for its stability for seed yield performance (Fig 1) and the GGE biplot confirmed that *Hachalu* (G3) variety fell in the central circle, indicating its high yield potential and relative stability compared to the other genotypes (Fig 2). The new variety, *Hachalu* is adapted to major areas of sesame production in western Oromia and similar agro-ecologies in altitude ranging from 1250 to 1650 meters above sea level. This variety can be grown in high rainfall areas where bacterial blight is a problem for sesame production.

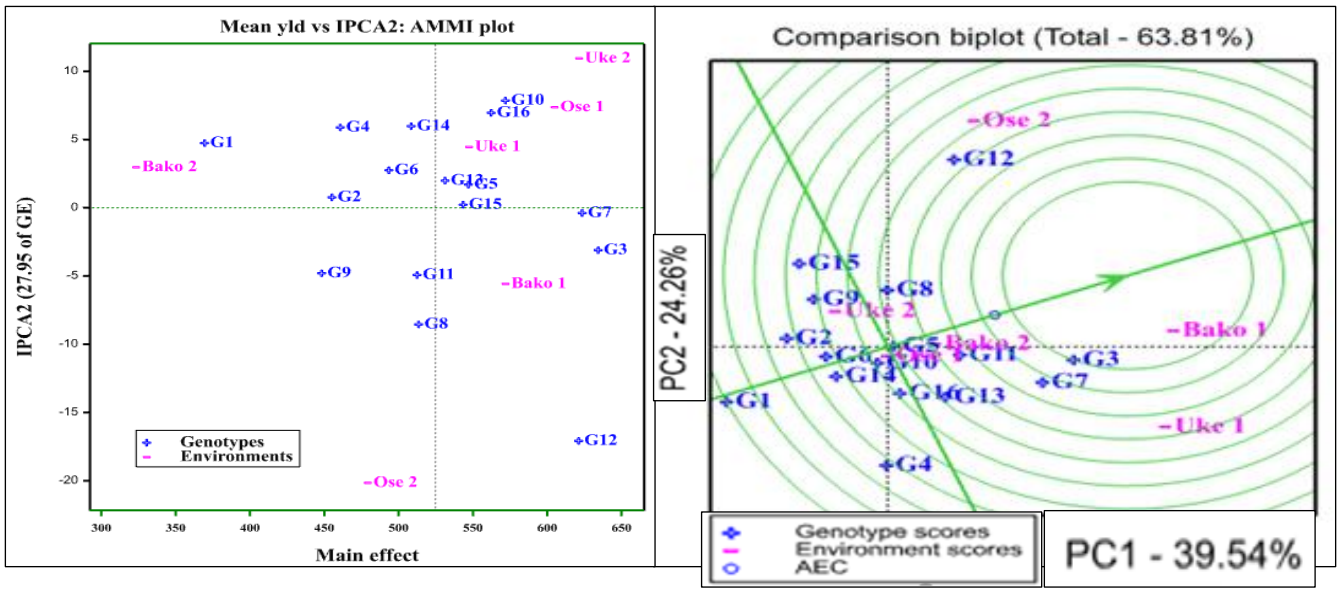

Figure 1. AMMI1 bi-plot showing Genotype and Environment means seed yield against IPCA2 (left) and GGE-bi-plot showing the "ideal" genotype (right)

Disease Reactions

Bacterial blight is the most yield limiting factor for sesame production in western Ethiopia as the disease is favored by the effect of high humidity and rainfall conditions in the area. In addition to higher yield, this variety showed better resistance to bacterial blight than the check (Fig 2).

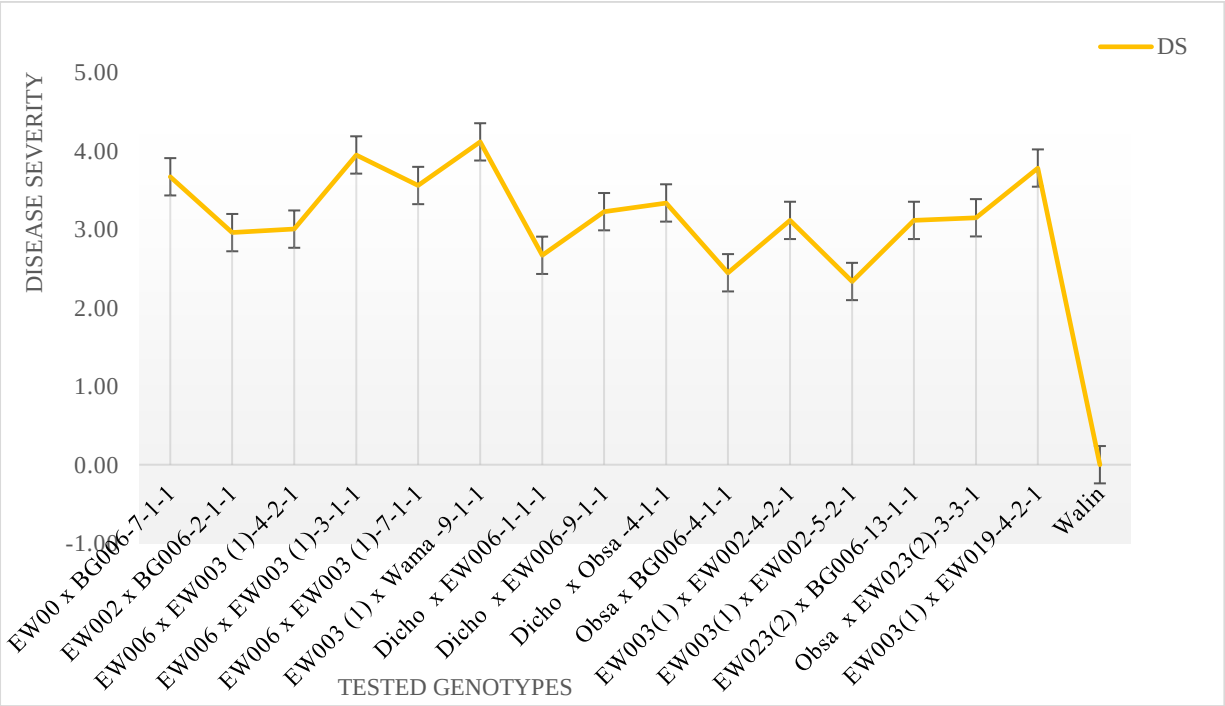

Figure 2. Performance of tested sesame genotypes against bacterial blight disease at Bako, Uke and Ose during trial cropping season

CONCLUSION

Hachalu variety was released in June 2021 for western Oromia and similar agro-ecologies due to its high grain yield and oil content, wider adaptability, better resistance to bacterial blight, white seed color and stable performance than the standard check and other tested genotypes. Therefore, smallholder farmers and other sesame commercial producers in western Oromia with similar agro-ecology can grow *Hachalu* variety with its full agronomic and other management recommendations.

Acknowledgement

The authors would like to thank Oromia Agricultural Research Institute for funding the research. Staff members of Bako Agricultural Research Center particularly, Pulse and Oil Crops Technology Generation Team members are highly acknowledged for their technical support during field research works.

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