



## Registration of “Fadis 01” Sorghum Variety

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### ABSTRACT

*Fadis 01 (36121 X P-9403)* sorghum variety was released for yield and *Striga* resistant/tolerant in 2019 in Eastern Oromia specifically for *Fadis*, *Babile*, *Harari*, and *Dire Dawa* and similar altitude areas. It has been verified at *Fadis*, *Babile*, *Harari*, and *Dire Dawa* areas during 2018 main cropping season. *Fadis01* showed 25% yield advantage over the standard check (*Hormat*), early maturing and stable across locations and years compared to the standard check and also good level of *Striga* reaction which are a major threat to sorghum production in the study areas and their vicinities.

**Keywords:** Genotypes, *Striga* reaction, Yield Performance

### INTRODUCTION

Sorghum is the main staple food in Ethiopia, ranking fourth after Tef, maize, and wheat, both in area coverage, and production (CSA, 2016). It is highly threatened by *Striga* and drought. Regardless of the enormous attempts made to adapt early maturing, high yielding and *Striga* resistant varieties, developing and providing new options of variety is very important due to high infestation of *Striga* and ongoing climate change demand for technology becoming very huge. The ability of the crop to withstand drought stress with early maturing and give reasonable yields under adverse environmental conditions has secured its importance as a food security crop in arid and semi-arid lowlands. Moisture stress contributes to poor crop performance and low yield. Inadequate, unequally distributed, and unpredictable rainfall are usually experienced in drier parts of Ethiopia.

Consequently, in almost all lowland areas, crops are prone to periodic *striga* weed and moisture stress in one way or another because of the above-mentioned realities (EIAR, 2011). The effect of moisture stress on crop yield is dependent on the stage of plant development. This dictates continued effort to develop and release new varieties with high yield potential, early maturing, good level of resistance to *Striga* and farmer's preferable variety. Therefore, the objective of this activity was to evaluate

and release high yielding striga resistant or tolerant variety for sorghum growing lowland areas of Eastern parts of the country.

### Variety origin and evaluation

Fadis01 (M-36121 X P-9403) was originally introduced from Melkassa sorghum improvement research program and developed through pure line selection methods. Six selected genotypes were evaluated at Regional Variety Trial (RVT) stage against standard check (Hormat) for three consecutive years (2014, 2015 and 2016) main cropping season at Fadis and Babile (Erer) sub sites. It has been verified at Fadis, Babile, Harari, and Dire Dawa areas during 2018 main cropping season. The variety was evaluated and officially released in 2019 for its best stable yield performance and striga resistant/tolerant for wider production in the lowlands of Eastern Hararghe and areas with similar agro-ecologies.

### Varietal Characteristics

Fadis01 (M-36121 X P-9403) is early maturing; semi compact head habit with average days to flowering and maturity date of 77 and 120 days, respectively (Appendix 1). The variety has medium plant height (160) and this character is preferred by the local community for biomass which they were used for multipurpose (livestock feed, for fire, for construction and etc). On the other hand, seed color is white and has average thousand-kernel weight of 30 g. It is also characterized by better resistant to *Striga* than the standard check Hormat.

### Yield Performance

Fadis01 (M-36121 X P-9403) was tested together with 7 sorghum genotypes including checks in regional variety trial at 6 environments in major sorghum

producing areas in lowlands of Hararghe during 2014-2016 consecutive years. It was evaluated along with *Hormat* as standard check at Fadis and Babile. The combined mean grain yield of this variety was better than all genotypes evaluated. Beside, *Fadis* showed 25% yield advantage over the standard check (*Hormat*). On research field *Fadis* gave yield ranging from 3.8 to 4.1 ton ha<sup>-1</sup>, whereas 3.5 to 4.0 tons ha<sup>-1</sup> on farmers' field.

### Striga Reaction

Data recording was done for all genotypes including this variety for *Striga* at field and laboratory for striga bioassay test across all environments. At field, data was taken at flowering and harvest stages across locations (Alemayehu et al., 2016). However, the result show that there were no significant ( $P < 0.05$ ) difference in number of *Striga* both at flowering and harvesting (Table 1 and 2). In the year 2016 at flowering there was no *Striga* weed observed in all genotypes plot at Babile and no *Striga* weed observed in both locations at sorghum harvest. However; higher grain yield was obtained from Fadis01 variety as compared to the standard check. This might be due the tolerance of genotypes to *Striga* infestation (Gebisa, 2007). In addition, from the bioassay laboratory data sorghum genotype 2006 MW 6031 recorded the least value of MGD and GR with 1.523 mm and 1.95% respectively followed by resistant check 'Hormat' and genotypes 2006 MW 6017 (Fadis 01 variety) and 2006 MW 6001 recorded higher value of maximum germination distance (MGD) and germination rate (GR) of *Striga* from and near host root (Table 3). This indicates, these genotypes had different characters to *Striga* reaction i.e. some had pre-attachment reaction and some of them had post-attachment reaction to *Striga*.

**Table 1 Mean performance of *Striga* weed in regional variety trial at sorghum flowering**

Genotype/Check	Fadis14	Babile14	Fadis 15	Babile 15	Fadis 16
2006 MW 6239	3(9.0)	3(8)	3(7) <sup>ab</sup>	28(812) <sup>b</sup>	0(0)
2006 MW 6031	5(22)	5(21)	3(14) <sup>bc</sup>	17(334) <sup>ab</sup>	0(0)
2006 MW 6044	2(4)	2(4)	3(10) <sup>abc</sup>	20(527) <sup>ab</sup>	0(1)
2006 MW 6001	4(13)	3(11)	2(4) <sup>a</sup>	14(258) <sup>ab</sup>	1(2)
2006 MW 6017(Fadis01)	5(30)	5(29)	2(6) <sup>ab</sup>	18(410) <sup>ab</sup>	1(2)
05 MW 6005	4(19)	4(18)	5(21) <sup>bc</sup>	12(165) <sup>a</sup>	1(3)
Hormat	3(7)	3(7)	2(6) <sup>ab</sup>	12(159) <sup>a</sup>	0(1)
LSD	NS	NS	10.2	545	NS
CV	28.1	19.9	34.4	46.6	31.3

**Table 2** Mean performance of *Striga* at sorghum at harvest in regional variety trial of *Striga* resistant/tolerant sorghum at harvest against genotypes and standard checks over locations and year.

Genotype/Check	Fadis14	Babile14	Fadis 15	Babile 15
2006 MW 6239	6(32)	1(2) <sup>a</sup>	4(13)	21(489)
2006 MW 6031	8(63)	6(33) <sup>d</sup>	4(18)	12(196)
2006 MW 6044	3(14)	3(7) <sup>c</sup>	3(12)	15(288)
2006 MW 6001	5(22)	2(3) <sup>ab</sup>	2(6)	10(134)
2006 MW 6017(Fadis01)	8(63)	2(5) <sup>bc</sup>	3(7)	13(252)
05 MW 6005	6(33)	2(4) <sup>abc</sup>	4(20)	10(128)
Hormat	5(20)	2(4) <sup>abc</sup>	3(7)	11(186)
LSD	NS	17.9	NS	NS
CV	18.2	22.5	35,1	47.8

Figures in the parenthesis are the original values; Numbers outside the parentheses are square root-transformed. - indicated no striga observed.

**Table 3.** Mean comparison of Sorghum Genotypes for pre-attachment to *Striga* tested at bioassay lab during 2017 (2\*2.5 cm near the host root)

Genotypes	Treats			
	MGD	GR	HIP	GI
2006 MW 6001	8.59 <sup>a</sup>	12.03 <sup>b</sup>	13.90 <sup>c</sup>	1.30 <sup>a</sup>
05 MW 6005	4.65 <sup>b</sup>	5.98 <sup>c</sup>	8.77 <sup>c</sup>	1.08 <sup>b</sup>
2006 MW 6017(Fadis01)	1.48 <sup>c</sup>	29.33 <sup>a</sup>	23.07 <sup>ab</sup>	1.18 <sup>ab</sup>
2006 MW 6031	1.52 <sup>c</sup>	1.94 <sup>c</sup>	26.53 <sup>a</sup>	1.07 <sup>b</sup>
Hormat	0.83 <sup>c</sup>	4.96 <sup>c</sup>	14.67 <sup>bc</sup>	1.27 <sup>a</sup>
LSD (5%)	1.15	4.13	8.48	0.16
CV%	10.20	20.20	25.90	7.20

MGD= Maximum Germination Distance of *Striga* from the host root; GR= Germination rate of *Striga*; HIP= Haustorial initiation percentage; GI= Germination index.

### Stability performance

The GGE biplot analysis revealed that the released variety Fadis01 (M-36121 X P-9403) fall relatively close to the concentric circle near to average environment axis, suggesting their potential for wider adaptability with better grain yield performance (Appendix 1 and 2).

### Adaptation

Fadis01 (M-36121 X P-9403) is released for the lowlands of eastern Hararghe and similar agro-ecology receiving sufficient amount rainfall (400mm-710mm) and altitude ranges of 1200-1710 m.a.s.l. The variety performs best with its full agronomic recommendations presented in (Appendix 3). The candidate varieties matures early and consequently have capable of escaping the recurrent terminal drought stress existent in lowland areas of Eastern

Ethiopia particularly, Fadis and Babile (Erer) and similar areas agro-ecology in the country

### Quality Analysis/Attributes

The Fadis01 sorghum variety with white (creamy color) was preferred by farmers and consumers due to its color and resistance to *Striga* weed.

### CONCLUSION

Fadis is stable in its grain yield, moderately well in *Striga* reaction and has good agronomic traits that make it suitable for production in its recommended domain of Eastern lowlands of Oromia when its agronomic recommendations maintained. The variety will be helpful for local farmers mainly due to its yield

performance, good plant height and relatively good striga resistant than other varieties grown in the area.

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### **Competing Interests**

Authors have declared that no competing interests exist.

### **Supplementary materials**

Available on journal website:

<http://www.ijlsci.in/abstract-7-4-7>

**Appendix 1:** Combined analysis of variance over seasons and locations

**Appendix 2:** GGE biplot for grain yield  $\text{kg ha}^{-1}$  of sorghum genotypes tested at two locations during 2006, 2007 and 2008 main cropping season.

**Appendix 3.** Agronomic and morphological characteristics of Fadis01 (M-36121 X P-9403)

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