

Registration of “Ebbisa” a Newly Released Fenugreek Variety for Bale Mid Lands, Ethiopia

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Abstract: Ethiopia has suitable environmental condition for fenugreek production. However, the productivity of fenugreek is very low as compared with world average due to lack of stable, high yielding, and disease resistant genotypes. Therefore, the objective of this study was to evaluate the promising genotypes and verify the most stable, high yielding and disease resistant fenugreek genotype for midlands of Bale. For the study, the experiment was carried out at three locations from 2009 to 2011 production season using 16 genotypes including local and standard checks. Randomized complete block design with three replications was used for the experiment. One of the experiments was conducted at the research farm of Sinana Agricultural Research Center, Oromia Agriculture Research Institute, Sinana and the others at the farmers' field, Goro and Ginnir. The study found that the Ebbisa (AC-TR-7) variety had above average yield performance in most test environments, out yielded the Chala and Hunda'ol varieties. The average seed yield of Ebbisa over locations and over years is about 13.8 qt/ha. It has also better yield stability than checks. Ebbisa is, therefore, released in 2012/13 for production for all fenugreek growing environments in the midlands of Bale and other similar agro-ecologies.

Keywords: Ebbisa, Variety Registration, Genotypes, Stability, Powdery Mildew

1. Introduction

Fenugreek (*Trigonella Foenum-graecum* L.), an annual herb of the legume family, is one of the earliest spices known to man. It is native to southern Europe and Asia (Rathore, 2001). Fenugreek is mainly cultivated in India, Argentina, Egypt, Morocco, Southern France, Algeria, Ethiopia and Lebanon (Kakani *et al.*, 2014). Fenugreek has been grown for food, spices, and medicinal purpose, as a fodder and as a green manuring and rotational crop for its high N fixing ability (Rathore, 2001). As a food crop the ground fenugreek seed makes up 5-10% of prepared curry powder (Smith, 1982). Roasted, olive-colored seeds are eaten in several African countries and are steeped in water to make a hot drink. Fenugreek oil is used in butterscotch, cheese, liquorices, pickle, rum, syrup and vanilla flavours. Powdered seeds or seed extracts are used as flavor and aroma agents in the food and cosmetic industries and dyes in the textile industry (Duke *et al.*, 1981). Industries that utilize the thickening and stabilizing properties of fenugreek galactomannan gum include mining, gas and oil exploration, textiles, paper manufactures

and human food and pet food production (Whistler, 1993). Seeds are used as condiments and for flavoring food preparation. It is aromatic, carminative, tonic and abscesses ulcers and internally as emollient for inflammation of intestinal tract (Rathore *et al.*, 2013, Meena *et al.*, 2010). In Ethiopia it is consumed by nursing mothers, who consume large quantities of pulses to maintain the supply of breast milk (Smart, 1976). Fenugreek seeds are ground to flour, cooked and sweetened with sugar or honey, to be given to infants after age 4-6 months (Engles *et al.*, 1991). Almost all farmers in some parts of Ethiopia like 'Hararghe' use fenugreek in the major food called 'Lafiso' which is either made from maize or sorghum 'Injera' served as baked in mixture of fenugreek flour boiled either with meat or alone. The 'Harari' people also use fenugreek as their best dish known as 'Hulbat Meraq' where they use fenugreek cooked with meat, mixed with 'Injera' (Jemal, 1998). Fenugreek is reported to have several medicinal properties including anti-inflammatory, contraceptive, digestion stimulant, lactation stimulant, pain relief, diuretic, hypoglycaemic, hypocholesterolaemic, tissue binding, and mucus dissolution (Al-Habori and Raman, 1998; Madar and

Stark, 2002).

Currently the major fenugreek growing regions are the Indian sub-continent, Northern Africa, Germany, France, Russia, Turkey and the Middle East (McCormick, 2004). In Ethiopia, fenugreek-growing regions are the high plateaus (1800-2300m a.s.l.) characterized by subtropical climate of wet and dry seasons. Out of the total cultivated land for private peasant holding in Ethiopia fenugreek occupies 15,050.50 ha with 100,265.85qt productions in 2001/2002 cropping season (CSA, 2003). Fenugreek is one of the seed spices, which peasant farmers as well as private investors in different parts of the country are eager to produce (David B., 2002) and is among the major seed spices grown in Bale. It is also one of the crops selected for specialization at the national level for their export potential. However, the evaluation of fenugreek genotypes in Ethiopia has been infant and on a small-scale. Only some variety development efforts have been reported from Sinana and Debreziet Agricultural Research Center in the country (DZARC, 2004; SARC, 2005). Farmers and researchers want successful fenugreek varieties that show high performance for yield and other essential agronomic traits. Lack of improved variety, even in the country as a whole, is one of the factors constraining farmers from exploiting the potential of this crop. Therefore, the objective of this study was to evaluate the promising genotypes and verify the most stable, high yielding and disease resistant potato genotype for highlands Bale and other similar agro-ecologies in the country.

2. Methodology

The experiment was carried out at three locations. One of the experiments was conducted at the research farm of Sinana Agricultural Research Center, Oromia Agriculture Research Institute, Sinana and the others at the farmers' field, Goro and Ginnir. Sinana Agricultural Research Center (7°N latitude and 40°E longitudes; and 2400 m.a.s.l) is located 463km south east of Addis Ababa and east of Robe, the capital of Bale zone. The other location ‘Goro’ is located 20 km from Sinana Agricultural Research Center in east direction; ‘Ginnir’ is located about 56 km from Sinana Agricultural Research Center in the south east direction.

The experiment was conducted from the screening nursery till verification trial (2007 to 2012/13) under rain fed conditions. In 2007, 50 genotypes were evaluated in observation nursery at main research center, Sinana. In 2008, 30 genotypes including local and previously released varieties were selected from the previous generation and evaluated in the yield trial again at main research center, Sinana for one season. At this time agronomic data such as days to flower, days to maturity, plant height, number of branch per plant, number of pods per plant, average thousand seed weight, and yield was collected on plant and plot basis. Finally the collected data was subjected to statistical analysis to select the genotypes as compared to the checks. In the multi-location trial, 16 genotypes retained from the yield trial were further evaluated at three locations for three years to see

its stability across location. The genotypes in multi-location trial were evaluated using randomized complete block design with three replications. Agronomic and yield data were collected and subjected to statistical analysis in order to identify the best genotype of the evaluated genotypes. After the multi-location trial had been conducted for the above three consecutive years, Ebbisa (AC-TR-7) was selected out of 16 genotypes to be verified for one more season at 9 locations and then evaluated by national variety releasing committee as per the guide line of the variety releasing and registration of the country.

3. Results and Discussion

3.1. Varietal Characters

Ebbisa (AC-TR-7) has medium plant size with deep yellow seed color and basal branching growth habit. On average this variety needs 51 days to flowering and 129 days to physiological maturity. It has about 22 pods per plant and plant height of 43cm. The variety gives seed yield of 10.59-15.65 qt/ha at Research field where as 11.8-18.62 qt/ha at farmers field.

3.2. Yield Performance

Highly significant variations among fenugreek genotypes in seed yield in all study years and locations were observed. The mean yield ranged from 9.6 to 13.8 qt/ha for seed yield. The highest overall mean seed yield over years and locations was recorded for the variety Ebbisa (13.8 qt/ha) followed by the genotype AC-DM-3 (13.3 qt/ha) and standard check Hunda’ol (12.9 qt/ha) whereas, the lowest seed yield was recorded for AC-DM-4 (9.6 qt/ha) among the test entries (Table 1). The variety has yield advantage 27.98%, and 6.18% over the two standard checks Chala and Hunda’ol respectively (Table 2)

3.3. Reaction to Disease

The major fenugreek diseases according their importance in the growing areas are powdery mildew and rust. In 1-9 rating scale, Ebbisa scored a mean of 5.3 and 1.26 for powdery mildew and rust respectively. The variety is characterized by moderately resistance types of reaction to these major diseases at all the sites. The disease score for the variety and the checks are summarized in Table 2.

3.4. Adaptation

Ebbisa is released for the midlands of Bale. It performs very well in areas having an altitude 1650-2400 m.a.s.l. and annual rainfall of 120-500 mm. It can also possibly extend the production of this variety to other areas having similar agro-ecologies.

3.5. Variety Maintenance

Breeder and foundation seed of the variety is maintained by Sinana Agricultural Research center.

Table 1. Combined Summary of Mean seed yield, other agronomic traits, and Disease of fenugreek variety trial over years and over three locations.

Treatment	DF	RU	PM	DM	PH	PB	SB	PPP	SPP	BMQH	GYQH
MAB-031	53	0.9	3.9	132.8	46.9	4.4	1.8	19.4	10	38.6	10.7
MAB-019	51.9	1.2	5.5	129.4	37.9	4	1.4	21.9	10.9	39.5	12.5
MAB-018	51.5	1.4	5.8	128.7	41.4	4.3	1.9	23.7	10.6	41.8	12.3
MAB-017	52.1	1.2	5.2	130.8	44.2	4.6	2.1	20.1	10.4	46.6	12.8
Local	49.9	1.1	5.4	129.1	42.8	3.9	1.5	22.5	11.3	39.3	12
Hunda'ol	52	1.3	5.1	133.7	41.6	4.5	2.1	23.7	10.3	46.5	12.9
FG-17/01	50.1	1	5.4	128.5	40.2	3.9	1.3	21.3	10.3	37.1	11.6
Chala	52.3	1.2	2.6	132.4	46.6	4	1.7	18.2	10.1	40.1	9.9
AC-TR-8	49.9	0.9	5.3	128.9	42.4	4.1	1.6	19	11	36	10
AC-TR-7 (Ebbisa)	50.9	1.3	5.3	129.5	42.9	4.1	1.6	22.7	11.2	45.5	13.8
AC-TR-5	50.8	1.2	5.3	130	43.3	4	1.6	23.6	10.3	42.4	12
AC-DM-9	50	1.1	5.4	128.6	42.6	3.9	1.5	19.7	10.8	40.5	12.8
AC-DM-6	50.5	1.1	5.4	128.9	38.7	4.1	1.7	21.9	10.7	34.6	11.1
AC-DM-4	52.1	1.2	4.7	130.8	41.1	4.5	2	25.2	12.8	35.9	9.6
AC-DM-3	49.6	1.3	5.4	129.1	39.6	3.8	1.3	21.7	11.1	37.8	13.3
AC-DM-2	49.8	1.1	5.3	128.7	41.8	4	1.6	22	10.5	39	11.7
MEANS	51	1.2	5.1	130	42.1	4.1	1.7		10.8	40.1	11.8
SE	1.3	0.4	0.5	1.5	3.1	0.4	0.4	4.3	2.2	5.3	2
LSD (5%)	3.6	1.1	1.5	4.2	8.6	1	1	11.9	6.1	14.7	5.6
CV	4.4	58.7	17.9	2	12.8	15	38	34.3	35.2	22.8	29.5

Note: DF=days to flower, PH=plant height, PB= primary branches/plant SB=secondary branches/plant, DM=days to Maturity, PPP=pod/plant, BMQH=biomass mass Quintal per hectare, and SY= seed yield Quintal per hectare, RU= Rust, PM= powdery Mildew, SPP=Seed per pod.

Table 2. Seed yield, other agronomic traits and Disease reaction of Ebbisa and other checks in multi- location test during 2009 to 2011.

Treatment	DF	RU	PM	DM	PH	PB	SB	PPP	SPP	BMQH	GYQH
Local	49.9	1.1	5.4	129.1	42.8	3.9	1.5	22.5	11.3	39.3	12
Hunda'oL	52	1.3	5.1	133.7	41.6	4.5	2.1	23.7	10.3	46.5	12.9
Chala	52.3	1.2	2.6	132.4	46.6	4	1.7	18.2	10.1	40.1	9.9
AC-TR-7 (Ebbisa)	50.9	1.3	5.3	129.5	42.9	4.1	1.6	22.7	11.2	45.5	13.8

Note: DF=days to flower, PH=plant height, PB= primary branches/plant SB=secondary branches/plant, DM=days to Maturity, PPP=pod/plant, BMQH=biomass mass Quintal per hectare, and SY= seed yield Quintal per hectare, RU= Rust, PM= powdery Mildew, SPP=Seed per pod.

4. Conclusion

The development of cultivars, which are adapted to a wide range of diversified environments, is ultimate aim of breeders in crop improvement program. The adaptability of a variety over diverse environments is commonly evaluated by the degree of its interaction with different environments in which it is grown. A variety is considered to be more stable if it has high mean yield but a low degree of fluctuation in yielding ability when planted over diverse environments (Becker, 1988). The Ebbisa variety had above average yield performance in most test environments, out yielded the Chala and Hunda'ol. The average seed yield of Ebbisa over locations and over years is about 15 qt/ha. It has also better yield stability than checks. The variety has yield advantage of 27.98%, and 6.18% over the two standard checks chala and hunda'ol respectively. The variety is characterized by moderate resistance types of reaction to the important diseases in the growing areas; powdery mildew and rust at all sites. Ebbisa is, therefore, released for production for all fenugreek growing environments in the midlands of Bale and other similar agro-ecologies.

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