

Full Length Research Paper

Release of fenugreek (*Trigonella foenum-graecum* L.) Variety “Bishoftu”

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Even if there are released Fenugreek varieties in Ethiopia, there is no variety specifically for color quality purpose. This study was conducted based on the objective of evaluation of different colored Fenugreek germplasm for yield and market preference in Ethiopia. Evaluation and preliminary variety trial were conducted at Debrezeit, Chefe donsosa and Akaki locations. While national variety trial was conducted at Debrezeit, Chefe donsosa, Akaki, Kulumsa, Sinana, Gonder, Sirinka, and Assosa having nine genotypes including check variety. The standard experimental procedures were used in the experiment. The result showed that, there is a significant difference among tested genotypes over locations; however, the objective of the experiment is to evaluate nine fenugreek genotypes including check variety considering both market seed color preference and yield. The study found FG-10(Bishoftu) variety had white seed color. This color is preferred color in international market. This variety therefore, was released for production for all fenugreek growing environments of East Shoa and similar environments.

Key words: Fenugreek, market seed color, quality, Bishoftu.

INTRODUCTION

Fenugreek (*Trigonella foenum-graecum* L) is an annual, self-pollinating, legume crop, believed to be native to the Mediterranean region but now, is widely cultivated in India and other parts of the world (Acharya et al., 2006). It originated from the countries bordering on the eastern shores of the Mediterranean and is widely cultivated in China, India, Egypt, Ethiopia, Morocco, Ukraine, Greece,

Turkey, etc. (Polhil and Raven, 1981; Petropoulos, 2002; Acharya et al., 2006; Davoud et al., 2010). Ethiopia is also known as the original homeland of fenugreek subspecies Mediterranean, ecotype Abyssinians with its distribution extending to Eritrea and Somalia (Sinskaya, 1950). The word fenugreek in Amharic is “Abish”, and the seed is often used in Ethiopia as a natural herbal

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Table 1. Summary of ecological and climate description of the testing location

Parameter	Kulumsa	Debrezeit	Sinana	Gondor (gorgora)	Sirinka (Jawi)	Assosa
Average annual temperature	15.1	18.7	14.4	20.8	23.2	21.6
Average annual rainfall	1147	892	930	1099	1513	1116
Altitude	2425	1850	2487	1879	2112	1570

medicine in the treatment of diabetes, as a spice in foods, in artificial flavoring of maple syrup, as a condiment and, in the production of steroid and other hormones for the pharmaceutical industry (Jorgensen, 1988). It is used both as an herb (the leaves) and as a spice (the seed).

Fenugreek seed is widely used as a galactagogue (milk producing agent) by nursing mothers to increase inadequate breast milk supply. Since the maple syrup-like flavor is strong and not always liked, the seeds are ground to a powder and administered in capsules. Studies have shown that fenugreek is a potent stimulator of breast milk production and its use was associated with increases in milk production as much as 90%. According to Central Statistics Agency 2013/2014 report (CSA, 2014), the total area under production was 24, 426.24 ha, and the production was estimated to be over 456, 266.15 quintal.

This is the only widely traded leguminous spice, and is useful in improving soil fertility by fixing nitrogen. It is used extensively for medicinal purposes. The fenugreek herb, seed, powders, and extracts are known to possess several pharmacological effects, like hypoglycemic, hypocholesterolemic, antinociceptive, antioxidative, laxative, and fungicidal effects, as well as appetite stimulation (Malhotra, 2011).

So far, the released fenugreek variety in the country is mainly focused on yield aspects and there is no variety released for the purpose of quality. Currently, the world market requires the variety with other quality aspects like seed color. In view of these, this study was conducted with the objective of evaluation of different colored Fenugreek germplasm for yield and market quality (color) for release in Ethiopia.

MATERIALS AND METHODS

Evaluation and preliminary variety trial were conducted at Debrezeit, Chefe donsa and Akaki locations. Eight genotypes which are promoted from preliminary variety trial with control check "Challa" were evaluated as a national variety trial during the season 2015/2016 G.C. This variety trial was conducted as a field trial at Debrezeit, Chefe donsa, Akaki, Kulumsa, Sinana, Gonder, Sirinka, and Assosa. Spacing between plants 10 cm and between raw 30 cm were kept, nine genotypes with recently released control check "Chala" with three replications in RCBD were used. The promoted genotypes are FG-12, FG-45, FG-10, FG-40, FG-48, 52062-01, 52062-02, FG48/01 and CHALA. Plot size of 4 m × 1.2 m (4 row/plot) was used. Spacing of 30 cm b/n row, 3 cm b/n seeds, 50 cm b/n plots and 1 m-1.5 b/n blocks were used for the experiment. Seed rate of 150 seeds/row were used for planting. Yield data will

be taken from harvest two central row of each plot (2.4 m²). Hand weeding was performed during the experiment to make the plot weed free. Data were collected on the following growth and harvest parameters: Days to flowering, days to maturity, thousand seed weight, total biomass, plant height, pod per plant, seed per pod, yield Q/ha and quality were taken. Visual observations were made for the disease reaction of the genotypes. Statistical analysis was carried out using SAS 9.2 version software (Table 1).

RESULTS AND DISCUSSION

Vegetative performance

From the Table 2 there is a significant different $P < 0.05$, among the genotypes over location in all vegetative parameters except seed per pod. The result showed that Genotype FG-48 showed significant and highest thousand seed weight with 2.6 g and FG-10 showed the least with 2.07 g. Number of pods per plant ranges from 3.63 to 4.34. The highest pod per plant was recorded by genotype FG-12 with 4.34 whereas genotype 52062-02 showed the least with 3.63. Table 2 also showed the highest plant height (47.7 cm) by genotype 52062-02 which exceeds the result reported by Issa et al. (2020) which is 34.9 cm.

Yield performance

Table 3 shows that there is a significant difference between genotypes across locations except Kulumsa and rank change observed. There is also significant difference on the genotypes combined location yield performance. Yield variation of different fenugreek varieties was also reported by Anitha et al. (2018) standard check CHALLA showed the highest yield (quintal/hectare) in all individual locations and also combined location. Genotype FG-10 showed the least yield in combined location performance. This result goes in line with results reported by Million (2012). The performance of the genotypes at Gondor location was poor, it is because of the soil type unfavored the crop at the location. From the tested locations, the genotypes performed better at Debrezeit, Chefe donsa and Akaki locations which have soil textural class of vertisol type. There is also a significant genotype by environment interaction. This is due to the genotypes respond in different manner across locations.

The quality of the genotypes in color aspects differ from

Table 2. Combined analysis for vegetative and quality (color) parameters over location.

Genotype	DF	DM	TSW	Biomass	PH	PPP	SPP	Color quality
CHALA	6.43 ^{bc}	10.80 ^{ba}	2.17 ^b	1066.7 ^{ba}	45.20 ^{ba}	3.79 ^{ba}	2.83	Green
FG-48/01	6.53 ^{ba}	10.79 ^{ba}	2.20 ^b	1066.7 ^{ba}	46.80 ^a	4.19 ^{ba}	1.96	Green
FG-48	6.56 ^a	10.39 ^b	2.60 ^a	866.7 ^{ba}	46.80 ^a	3.89 ^{ba}	2.86	Green
FG-12	6.53 ^{ba}	10.88 ^a	2.13 ^b	866.7 ^{ba}	42.07 ^{bc}	4.34 ^a	2.46	Grey
52062-01	6.38 ^c	10.51 ^{ba}	2.20 ^b	966.7 ^{ba}	47.00 ^a	3.82 ^{ba}	2.69	Green
FG-10	6.43 ^{bc}	10.86 ^a	2.07 ^b	866.7 ^{ba}	39.73 ^c	3.81 ^{ba}	2.86	White
52062-02	6.45 ^{bc}	10.72 ^{ba}	2.37 ^{ba}	1100.0 ^a	47.07 ^a	3.63 ^b	2.78	Green
FG-40	6.48 ^{ba}	10.82 ^{ba}	2.13 ^b	1000.0 ^{ba}	42.33 ^{bc}	4.26 ^{ba}	2.54	Grey
FG-45	6.40 ^c	10.67 ^{ba}	2.10 ^b	833.3 ^b	43.80 ^{ba}	4.19 ^{ba}	2.32	Green
Mean	6.47	10.72	2.22	959.28	44.53	3.99	2.59	-
LSD	0.11	0.45	0.33	247.04	4.19	0.63	ns	-
CV (%)	0.98	2.42	8.69	14.89	5.45	9.17	24.94	-

P<0.05. DF: Days to flowering, DM: days to maturity, TSW: thousand seed weight, PH: plant height, PPP: pod per plant, SPP: seed per pod.

Table 3. Fenugreek yield response by location and combined analysis for the year 2015/2016 G.C.

Genotype	Location						Combined analysis yield (quintal/ha)
	Debrezeit	Akaki	Chefe donsa	Kulumsa	Sinana	Gondor	
FG-12	10.207^{bcd}	9.317^b	17.549^{bcd}	8.458	10.806^{abc}	2.5101^{ab}	9.8077^{bcd}
FG-45	8.828 ^{cd}	9.496 ^{ab}	15.608 ^{cd}	7.542	10.340 ^{bc}	1.8652 ^{bc}	8.9465 ^{cd}
FG-10	5.811^d	11.789^{ab}	14.299^d	7.833	9.042^c	1.2892^c	8.3438^d
FG-40	9.928^{bcd}	11.033^{ab}	20.164^{ab}	9.792	15.104^a	2.0088^{bc}	11.3383^{ab}
FG-48	7.410 ^{cd}	12.644 ^{ab}	17.307 ^{bcd}	10.014	13.188 ^{abc}	1.2324 ^c	10.299 ^{abc}
52062-01	13.735 ^{ab}	14.583 ^{ab}	19.437 ^{abc}	11.111	11.972 ^{abc}	2.2479 ^b	12.1811 ^a
52062-02	14.900 ^a	12.472 ^{ab}	19.853 ^{ab}	10.528	11.132 ^{abc}	2.7040 ^{ab}	11.9315 ^a
FG48/01	11.069 ^{abc}	15.006 ^{ab}	15.603 ^{cd}	11.056	14.590 ^{ab}	1.9135 ^{bc}	11.5395 ^{ab}
CHALA	13.564 ^{ab}	15.969 ^a	23.264 ^a	12.458	12.236 ^{abc}	3.1958 ^a	13.448 ^a
Mean	10.6057	12.4788	18.1204	9.8657	12.0455	2.1074	10.54843
LSD	4.62	6.602	4.06	ns	4.663	0.84202	1.891
CV	25.17	30.56	12.94	29.25	22.36	23.08	25.78

one another. Genotype FG-10 have ceramic white color while FG-12 and FG-40 have grey color which is different from mostly consumed fenugreek. Since white colored fenugreek has a high market preference, it can be a good option for the producer. The remaining genotypes have normal green color. Genotype FG also have low pungency after drinking which is a good preference for consumer.

Hence, three candidate genotypes which are FG-10, FG-12 and FG-40 applied for registration as a new improved fenugreek variety. Based on the application, the National Variety Release Committee in Ethiopia investigated the performance of FG-10 and visited several locations where the new variety was grown for evaluation, however, the objective of the experiment is to evaluate white and brown seeded fenugreek genotype for quality, and our main focus is to see their response to

that of the released "Challa" variety. It is believed that yield can be increased up to some extent by best agronomic management, and due to their seed color quality and have huge potential for export, these three genotypes were selected for verification trial. Among the candidate genotypes FG-10 were selected and released as variety having variety name Bishoftu after it had been evaluated by variety releasing committee.

Recommended ecological zones of adaptation

Fenugreek is a cool season crop and is fairly tolerant to frost and very low (up to freezing) temperature. The plants need relatively cool and low temperature during early stages for better vegetative growth, while a dry and relatively high temperature favors better ripening and

high seed production. Thus, it is grown in tropical and temperate, regions owing to its wider adaptability. It is grown from sea level to an altitude of 2000 m. Fenugreek can be grown successfully over all soils (from loam to sandy) but the ideal one is well-drained loam. Soil pH should be between 6.0 and 7.0 for its better growth and development. The crop is fairly tolerant to salinity and can be grown on black vertisols with proper drainage.

Disease reaction

According to visual observation the tested genotype shows different reaction for the fungal major disease powdery mildew and Fusarium wilt at different environment and the diseases severity were not much for the selected candidate variety at high altitude.

Variety maintenance

Breeder and foundation seeds of the variety are maintained by Debre Zeit Agricultural Research Center.

Conclusion

The presence of a variety with good characters than yield is very important. Currently, the world market needs crops with other aspects like quality. The release of these varieties with its distinct color quality brings another choice for the producers as fenugreek is a high source of cash. It is also a variety with important character preferred by importing countries. This variety 'Bishoftu' is characterized by its white color and there is no variety of this kind in Ethiopia. This variety therefore, released for production for all fenugreek growing environments of East Shoa and similar environments. Proper promotion and seed multiplication should be done.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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