



Field Performance Evaluation of Different Fenugreek (*Trigonella foenum-graecum* L.) genotypes in Northern Ethiopia of Southern Tigray

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ABSTRACT

This research was conducted in 2019 during the rain feed cropping season. It was conducted in Northern Ethiopia of Ofla Woreda at the specific site of Awuligara testing site. Sixteen fenugreek genotypes and one standard check (Jamma) were tested. It was undertaken to evaluate the yield performance of the different fenugreek genotypes in the study area. The trial was laid out in Randomized Complete Block Design with three replications with a plot size of 1.2mx1.5m. The phenology (flowering and maturity days), growth performance, and yield, as well as yield component parameters, did not show significant variation. However, the two fenugreek accessions (Acc#234031 and Acc#234032) and one genotype collected from Lesalso were characterized under resistant for cercospora leaf spot severity. The standard check variety (Jamma) was also categorized in susceptible cercospora leaf spot severity scale. The minimum and maximum seed yield obtained from Acc#234027 (17.19Qt/ha) and the improved variety Jamma (33.97 Qt/ha) were not significantly influenced in the trial. To come in strong recommendation, further studies on the disease prevalence effect on yield and yield parameters performance should be conducted .

INTRODUCTION

The crop fenugreek (*Trigonella foenum-graecum* L.) is an annual legume crop that belongs to the family Fabaceae and is often cultivated in India, the Mediterranean region, and North Africa (Acharya *et al.*, 2011, 2010). It is an annual crop with autogamous flowers occasionally attracted to insects. It is indigenous to countries on the Eastern parts of the Mediterranean, although widely cultivated in India, Egypt, Ethiopia, Morocco, and England (Davoud *et al.*, 2010).

Fenugreek cultivation and its economic importance in Ethiopian agriculture date back to a long period of history (Beyene, 1965). The principal use of fenugreek in Ethiopia is a rotation crop, it improves both the soil structure and fertility, flavoring of the traditional bread, maintains the soft texture of “*tef-injera*” in cooler zones of the country where the latter is a staple food (Jemal, 1998). The other additional advantage of fenugreek is the wide

variety of its uses at different crop stages such as green manuring, leaf vegetable (Beyene, 1965).

The production distribution of fenugreek in Ethiopia is nearly similar to those of other cool-season food legumes such as fababean, field pea, lentils, chickpea, and grass pea, etc. Improving this crop production and productivity is a means of opening a new vista of the market opportunity in the face of the ever-expanding world trade for the country in general and for the resource-poor farmer in particular. Fenugreek grows in the Dega and weina-dega agro-ecology of Ethiopia in general and in high lands of the southern zone of Tigray in particular. Even though the highland area of southern Tigray is suitable for fenugreek production and its cultivation history lasts many years. Farmers have been produced in a very small strip of land using low yielding local cultivars as the result of low research attention. Therefore, this research is initiated to evaluate fenugreek genotypes in the study area

Objectives: To evaluate the yield and yield performance of improved fenugreek varieties in the study area

MATERIALS AND METHODS

Description of the Study Area:

This research was undertaken in Ofla Woreda in the rain feed season of 2019 G.C. Ofla woreda is one of the five woredas of the southern zone of Tigray. The woreda is located on the geographic coordinates of 12031' North Latitude and 39033' East Longitude. The altitude varies between 1700-2800 m a.s.l. The mean annual temperature of the study area is 22°C with minimum and maximum temperatures of 6°C and 30°C respectively (Ofla wereda BoARD, 2009). Fluvisol and Vertisols are the major soil types dominantly found in the area while on sloping land with dissected plain and medium gradient escarpment land Leptosols are more dominant covering 56% and 66% of the respective landforms (Amanuel, 2015).

Treatments and Experimental Design:

In this experiment, seventeen fenugreek genotypes including one local cultivar were evaluated. The trial was undertaken under rain feed at Awuligara testing site of Ofla Woreda. The trial was laid out in *randomized complete block design* (RCBD) with three replications in a plot size of 1.5m x 1.2m. The plots and blocks were separated by 1m. A spacing of 20 cm between rows and the recommended fertilizer rate for the crop was applied during planting.

Data Collection:

Phenology data (days to maturity and flowering) were collected from the entire plot's observation. Growth and yield component data except for seed yield/ha were collected from eight randomly selected plants of central rows. Seed yield (kg/ ha) was recorded from the middle four rows excluding the border rows. Pod length and diameter were collected from ten randomly selected pods at maturity where the growth and yield component data were collected.

Data Analysis:

Analysis of variance was performed following the procedure of Gomez and Gomez (1984). Varieties showed significant difference were subjected to Duncan's multiple range tests for mean separation at a 5% level of significance using Genstat version 13.

RESULTS AND DISCUSSION

Days to Flowering And Maturity:

The performance of genotypes ($p < 0.05$) for days to flowering and maturity did not show significant variation. The numerical variation of the genotypes was very small ranged

from 44.00-46.00 for days to flowering and. Likewise, days to maturity were not varied as days to flowering might influence it. The minimum days for maturity were recorded from the variety Jamma. However, this treatment was significantly influenced by other genotypes which taken maximum days (150 days) for maturity. Similarly, Mohammed *et al.* (2016) reported that days to flowering for sixteen genotypes were not influenced by genotypic difference.

Biomass Yield and Number of Productive Branches Per Plant, and Plant Height:

Genotypic variation for all biomass yield (Qt/ha), the number of productive branches per plant, and plant height (cm) were not observed in the study area (Table 1 and Fig. 1). It could be due to as most growth parameters were not affected by the genotypic difference. Many researches indicated that plant height, branch number, biomass yield, and other growth parameters are positively correlated. It is in line with Mohammed *et al.* (2016) who obtained that plant height had a positive significance positive correlation with the number of branches and biomass yield.

Table 1. Phenology, yield and growth performance of the accessions in Oflla Woreda

Treatments	50 %F	DM (days)	BY(qt/ha)	NProB	PH (cm)
Acc#220023	44.33	150.0	180.6	9.533	50.40
Acc#234027	44.67	150.0	152.8	8.133	55.87
Acc#234028	46.00	142.0	175.0	9.800	58.00
Acc#234031	44.67	150.0	177.8	7.733	54.4
Acc#234032	44.67	150.0	175.0	9.600	51.60
Acc#238247	45.00	142.0	197.2	8.400	60.00
Collected from Hatsebo	45.00	150.0	197.2	8.200	60.40
Collected from Maishire	45.33	142.0	172.2	6.667	61.07
Collected from Lesalso	44.00	142.0	194.4	6.000	55.60
Collected from Endaeyesus	46.67	142.0	188.9	9.933	56.13
Collected from Zorat	46.00	142.0	188.9	8.333	60.40
Collected from Dura	45.33	142.0	197.2	7.267	58.20
Collected from medebayzana	45.33	138.7	116.7	6.267	55.93
Collected from Sefeho	46.00	136.3	123.6	5.667	61.93
Collected from Tahtay Maichew	46.00	142.0	216.7	8.467	59.73
Local Check	46.00	144.3	169.4	8.800	61.60
Jamma (St.Check)	45.33	130.7	188.9	7.800	55.40
CV	3.2	7.8	28.0	29.6	21.1
LSD	NS	NS	NS	NS	NS

DF=50 %F=days to flowering, DM=days to maturity, BY= biomass yield, NProB=number of productive branches, PH=plant height.



Fig.1. Vegetative performance of fenugreek genotypes

Seed Yield (qt/ha and (g/plant) and Number of Pods/Plant:

As shown in table 2, seed yield productivity for both per plant and per hectare and the number of pods/plant were not influenced by the different genotypes. This might be as the result that the performances of most yield component parameters (number of productive branches, biomass yield, pod length, plant height) were not significantly varied and its effect direct effect could be shown in seed yield productivities and its pod number. In the same way, Anubha *et al.* (2013) also reported that the number of pods plant⁻¹ and number of seeds per plant had a positive direct effect on seed yield productivity. The number of branches and biomass yield had a positive indirect effect on seed yield (Pushpa, 2010). The finding of Betelheim Belete (2018) also indicated that plant height exerted a positive direct effect on seed yield productivity of fenugreek. Sentayehu (2016) also suggested that seed yield productivity of fenugreek has a positive and significant association with the number of primary branches and plant height at maturity.

Disease Severity:

The different levels of disease susceptibility and resistance were evaluated and grouped based on (Iqbal *et al.* 2011.). The fenugreek diseases *Cercospora* leaf spot was observed in the experiment. This person with his colleagues had established disease resistance and susceptibility scale which considers 0 = 0% plant leaves affected (highly resistant=HR), 1 = 1-15% plant leaves affected (resistant=R), 2 = 16-40% plant leaves affected (moderately resistant=MR), 3 = 41-65% plant leaves affected (moderately susceptible=MS), 4 = 66- 90% plant leaves affected (susceptible=S) and 5 = 91-100% plant leaves affected (highly susceptible=HS). Out of these, sixteen accessions and one standard check, three (Acc#234031, Acc#234028 and Collected from Lesalso) were characterized as resistant (R). All other accessions except the standard check (Jamma) grouped as susceptible were characterized under moderately resistant (MR).

Table 2. Mean disease severity of 17 fenugreek accessions in the study area

Treatments	Npod/p	SY(Qt/ha)	SY/P (gm)	DS	RC (Iqbal <i>et al.</i> 2011.)
Acc#220023	37.13	18.24	3.113	2.333bc	MR
Acc#234027	30.73	17.19	3.093	2.000bc	MR
Acc#234028	36.80	28.11	4.407	2.000bc	MR
Acc#234031	30.00	19.37	3.233	1.333bc	R
Acc#234032	30.47	18.54	2.580	1.000c	R
Acc#238247	38.53	21.96	3.547	1.667bc	MR
Collected from Hatsebo	33.53	20.67	3.227	2.000bc	MR
Collected from Maishire	22.93	28.37	2.587	1.667bc	MR
Collected from Lesalso	21.60	26.36	1.915	1.333bc	R
Collected from Endaeyesus	31.27	28.61	4.193	1.667bc	MR
Collected from Zorat	29.53	30.05	3.187	2.000bc	MR
Collected from Dura	29.87	25.70	3.837	2.667ab	MS
Collected from medebayzana	29.53	24.77	3.747	1.667bc	MR
Collected from Sefeho	23.67	26.73	2.867	2.333bc	MR
Collected from TahtayMaichew	34.13	26.14	4.880	2.333abc	MR
Local Check	40.47	31.65	5.433	2.333abc	MR
Jamma (St. Check)	31.67	33.97	4.320	3.667a	S
CV	29.3	29.7	40.200	36.4	-
LSD	NS	NS	NS	1.210	-

R=Resistant; MR=Moderately resistant; MS=Moderately susceptible; S=Susceptible; HS=Highly susceptible Means sharing same superscripts are not significantly different from each other (Tukey's Honestly Significant Difference (HSD) at $p < 0.05$).

Recommendation

The production distribution of fenugreek in Ethiopia is nearly similar to other cool-season food legumes such as fababean, field pea, lentils, and chickpea. Therefore, yield improvement of fenugreek is a means for opening of new market opportunity. Fenugreek grows in the Dega and weina-dega agro-ecology of Ethiopia in general and in high lands of the southern zone of Tigray in particular. In this study sixteen fenugreek genotypes with one improved fenugreek variety were evaluated for yield and yield-related traits. The study has shown that all parameters except disease severity were not affected by the genotypic difference. The disease severity interaction of the genotypes, in general, was under R, MR, and S categories. However, most of the genotypes were found on MR scale. Therefore, further study on growth, yield, and disease interaction should be conducted to come in a strong recommendation.

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