International J. Seed Spices 7(2), July 2017:99-102

Agronomical, morphological and nutritive analysis of different fenugreek cultivars under cuttings management

S. A. Gupta, D. B. Prajapati, B. G. Prajapati and A. U. Amin

Seed Spices Research Station, Sardarkrushinagar Dantiwada Agricultural University, Jagudan-382 710, Dist. Mehsana (Gujarat)

Abstract

A field experiment was conducted at Seed Spices Research Station, SDAU, Jagudan and Vegetable Research Station, AAU, Anand during 2013-14 to 2014-15. Genotype JFg-261 was compared with check variety Pusa Early Bunching (PEB) for agronomical, morphological and nutritive content under cuttings management. Maximum biological yield was obtained from JFg-261 (20.5 mt ha^{-1}) than PEB (14.1 mt ha^{-1}), respectively from both the locations. The plants of JFg-261 are medium in nature with more number of branches and have late bolting habit resulted in faster regeneration. JFg-261 found numerically superior for producing higher seed yield (381 kg ha^{-1}) by 14.0 per cent as compared to PEB (334 kg ha^{-1}). It contains higher nutritive values *viz;* Iron (249 ppm), Copper (325 ppm) and Potassium (1.3 ppm) than PEB. The JFg-261 stored up to 06 days in refrigerator condition in polythene bags, which is higher than check PEB.

Key words : Cutting management, JFg-261, leafy fenugreek, leaf yield, pusa early bunching (PEB)

Introduction

Fenugreek (*Trigonella foenum graecum* L.) is an important condiment crop largely grown in northern India during *rabi* season. It occupies a prime position among various seed spices grown in Gujarat. In Gujarat, it is mainly cultivated in the districts of Patan, Banaskantha, Mehsana, Kutch, Sabarkantha, Ahmedabad, and Rajkot. For vegetable purpose it is grown in all over Gujarat. It is gaining importance for its medicinal and nutritional crop and rich in protein, minerals and diosgenin (Aykroyd, 1963). It is grown for both grain as well as vegetable purpose. The seeds and leaves of fenugreek are widely used as a culinary spice and condiment for food preparations and to enhance the taste and also used to reduce blood sugar and lower blood cholesterol in human and animals. Fenugreek leaves are used both dried and fresh in many different regional cuisines. Sun dried leaves, which are having aromatic qualities, used for quality flavour for meat, fish and vegetable dishes and seasoning of foods in off-seasons and use in cosmetic and hair conditioning. The leaves and shoots are quite rich in protein, minerals and vitamins A, B and C. Seeds and leaves are bitter in taste due to the presence of alkaloid (*trigonelline*). Another potential use of fenugreek is for extraction of *saponin and diosgenin* (0.4 to 1.26 %). Fenugreek seed contains volatile oil and fixed oil in small quantities (Sowmya and Rajyalakshmi, 1999). Fenugreek seeds are known and popular for their strong spicy flavour, in addition the high fibre contents (Najma *et al.*, 2011).

In India, it is mainly cultivated in the states of Rajasthan, Gujarat, Tamil Nadu, Andhra Pradesh, Uttar Pradesh, Himachal Pradesh, Madhya Pradesh and Haryana for grain purpose on an area of about 123.36'000 hectares of land producing 130.79 tonnes with the productivity of 1060 $kgha^{-1}$ (Anonymous, 2015). In Gujarat, it is cultivated for grain purpose on an area of about 9258 hectares of land producing 6429 tonnes with the productivity of 694 kg ha^{-1} (Anonymous, 2013-14). Fenugreek also grown as a vegetable crop in Gujarat with considerable acreages. In Gujarat, two varieties of fenugreek *viz.*, Gujarat Methi 1 (GM-1) and Gujarat Methi 2 (GM-2) were released in the year 2001 and 2006, respectively for seed purpose. The later variety GM-2 has occupied more than 70 % area of fenugreek in Gujarat, but no variety for vegetable purpose is available. Vegetable growers are mostly using GM-2 for vegetable purpose. Therefore, there is an urgent need to identify the leafy fenugreek variety having higher green demand in yield along with superior nutritive values under cutting management.

Material and methods

More than 25 germplasm lines collected during 2006 at Seed Spices Research Station, Sardarkrushinagar Dantiwada Agricultural University, Jagudan and in local areas of North Gujarat were selfed and purified during the years 2008-09. Ten high yielding entries *viz.*, JFg-179, JFg-226, JFg-234, JFg-240, JFg-250, JFg-253, JFg-260,

*Corresponding author email: gsonu2711@gmail.com

JFg-261, JFg-263, JFg-266 and two PEB & GM-2 checks varieties were evaluated for its performance in preliminary evaluation trial and small scale varietal trial during 2009-10 and 2010-11, respectively. Genotype JFg-261 was selected on the basis of consistent performance and evaluated for agronomic and morphological traits after two cuts in large scale varietal trials on a field experiment conducted at Seed Spices Research Station, SDAU, Jagudan and Vegetable Research Station, AAU, Anand during 2013-14 to 2014-15 using randomized complete block design with three replications. The plot size was 2.50 m x 2.00 m with row to row spacing 20.0 cm. The recommended package of practices was followed during the course of investigation. Data on various morphological characters like plant height (cm), no. of branches plant^{-1}, no. of leaflets, leaf length (cm), leaf width (cm), days to 1st cutting, days to 2nd cutting, days to bolting, dry matter (%) and green leaf yield (t ha^{-1}) were recorded. The bio-chemical parameters and post harvest studies have also been carried. The chlorophyll content in the green fenugreek was estimated by method of Witham *et al.*, (1971). The data pertaining to various characters were analyzed as per Panse and Sukhatme (1978) for individual environments.

Results and discussion

The variety, Pusa Early Bunching released by IARI, New Delhi for vegetable purpose and endorsed for Gujarat state was included in LSVT at two different locations *viz.*, Jagudan and Anand during the years from 2013-14 to 2014-15. On an average, the JFg-261 variety produced 20.5 Mt ha^{-1} green leaf against 14.1 Mt ha^{-1} of Pusa Early Bunching as check variety and out yielded by ranking 2/4. At Jagudan out of two trials, JFg-261 found higher green yield than PEB. JFg-261 gave significantly higher green biomass yield, which was 20.5 per cent higher than PEB during LSVT of 2013-14 to 2014-15. Thus, overall increase with JFg-261 was 45.4 *per cent* than check PEB (Table-3).

Green bio- mass and yield attributing characters

In general, JFg-261 was taller and has more number of primary at first cutting than PEB and less number of secondary branches than PEB. Days required for 1st and 2nd cutting and bolting were higher with JFg-261 than PEB (Table 3). Seed yield obtained after two cut found higher. The dry seeds are extensively used in from of powder as well as used in grain. But difference between JFg-261 and PEB was non-significant. JFg-261 found numerically superior for producing higher seed yield (381 kg ha^{-1}) by 14.0 per cent as compared to PEB (334 kg ha^{-1}) (Table 5).

Post -harvest study and dehydrated leaf

Post -harvest study was carried out in refrigerator condition at low temperature in lower density polythene bags (300 PE Gauge). The JFg-261 stored in refrigerator up to (5 days) without losing its quality. The dry matter (%) of JFg-261 is 15.8 per cent, which is higher than check **PEB** (15.4 %). JFg-261 recorded higher dehydrated leaves than

Table 1. Plant height (cm), branches plant^{-1} and days to cutting and bolting

Genotype	1st cutting*			2nd cutting*			Days to bolting
	Plant height	Branches** plant^{-1}	Days to cutting	Plant height	Bran.** pl. $^{-1}$	Days to cutting	
JFg-261	29.9	4.5	54.3	18.9	3.8	67.0	59
PEB (ch)	17.4	3.7	45.3	12.9	2.9	58.0	48

*****Mean of Jagudan (2 years) and Anand (2 years) &** indicating that number of primary branches.

Table 2. No. of primary and secondary branches per plant of first cutting

Variety	2013-14		2014-15	
	Pri.Br.*	Sec.Br.**	Pri.Br.*	Sec.Br.**
No. of Primary branches and Secondary branches per plant of first cutting				
JFg-261	5.1	3.9	3.1	3.7
PEB (ch)	4.3	4.8	2.9	2.8
No. of primary branches and secondary branches per plant of second cutting				
JFg-261	4.6	4.7	3.7	4.0
PEB (ch)	3.2	2.6	1.9	1.6

***** Indicating primary branches ** secondary branches work out from two years mean data taken at SSRS,SDAU, Jagudan

Table 3. Comparative marketable green leaf yield (Mt ha^{-1}) performance at individual location and mean over the locations (two cuts)

Location	Name of experiment	Green biomass yield (Mt ha^{-1})		% IOC		C.D. 5%	C.V. %
		JFg-261	PEB	Rank of (PEB)	PEB (ch)		
Jagudan	LSVT2013-14	16.4	17.4	3/12	-5.7	2.9	11.6
	LSVT2014-15	13.8	14.3	2/12	-3.5	3.4	18.4
	Mean	20.5	14.1	-	-	-	-
Anand	LSVT2013-14	27.0*	13.5	1/12	100.0	6.5	18.5
	LSVT2014-15	19.9*	8.65	1/12	130.1	1.9	9.2
	Mean	23.5	11.1	2/12	111.1	-	-
Over all Pooled Mean (4 trials)		**20.5**	**14.1**		45.4	1.6	14.9
Significantly superiority over check		**2/4**					

Note: * indicate that the JFg-261 variety is significantly superior to check, **PEB** in green leaf yield

Table 4. Year and cutting wise green leaf yield (t ha^{-1}) performance at Jagudan

Cutting/ Variety	2013-14		2014-15	
	JFg-261	PEB	JFg-261	PEB
1st cutting	9.22	7.20	7.47	5.00
2nd cutting	8.22	8.40	6.80	5.27
Total	**17.44**	**15.6**	**14.27**	**10.27**

Table 5. Comparative grain yield *(*kg ha^{-1}) performance (after two cuttings)

Location	Name of experiment	Grain yield (kg ha^{-1})		% increase over PEB	C.D. 5 %	C.V. %
		JFg-261	PEB (ch)			
	LSVT2013-14	392	389	0.80	191	23.7
	LSVT2014-15	370	368	0.54	205	22.4
	Pooled Mean	**381**	334	**14.0**	167	23.1

Table 6. Post-harvest study and quality parameters of JFg-261 and PEB

Genotype	Moisture (%)	Dry matter (%)	Dehydrated leaves kg^{-1} green bio-mass	Foaming Index*	Total Chlorophyll (mg g^{-1})	Aroma (after six days) **
JFg-261	84.5	15.8	158 g	<1 (0.8 to 0.9 cm)	0.86	No off-odour
PEB (ch)	84.8	15.4	154 g	<1 (0.7 to 0.8 cm)	0.85	Very light off-odour

* indicates foaming index indicates saponin content, higher the index indicates more saponin content

** indicates the aroma assessment after five days storage under refrigerator condition

Table 7. Mineral contents (PPM) of fenugreek dry leaves.

Sr. No.	Name of Minerals	JFg-261	PEB
1	Iron (Fe)	249	245
2	Zinc (Zn)	214	220
3	Copper (Cu)	325	110
4	Manganese (Mn)	280	710
5	Potassium (K)	1.3	1.2

check PEB (Table 6). We can get 158 gms dry leaves than 154 g of PEB from 1 kg of leaves. Well dried leaves of methi can be stored for about one year. The nutritive values of Iron (249 ppm), Potassium (1.3 ppm) and Copper (325 ppm) were found higher in JFg-261 than PEB (Table 6).

Conclusion

Considering higher leaf yield, late bolting habit, superior in nutritive quality and less prone to disease and pests, JFg-261 found better for vegetable purpose under two cutting of bio-mass. It is need to precise further location trials for stability of leaf yield advantage and may be utilises in crossing programme.

References

Anonymous, 2013-14. District-wise area and production of Horticultural crops in Gujarat State, Directorate of Horticulture, Gujarat State, Gandhinagar.

Anonymous, 2015. Indian Horticulture Data base, 2016. N.H.B.,Government of India. pp. 244.

Aykroyd, W. R. 1963. The nutritive value of Indian foods and the planning of satisfactory diets. ICMR Special Report Series no. 42.

Najma, Z. B., Pardeep, K., Asia, T., Kale, R. K., Cowsik, S. M. and McLean, P. 2011.Metabolic and molecular action of *Trigonella foenum-graecum* (Fenugreek) and trace metals in experimental diabetic tissues. *J.Biosci*. 36:383-396.

Panse, V. G. and Sukhatme, P. V. 1978. Statistical methods for agricultural workers (III *Edn*.). I.C.A.R. Publication, New Delhi.

Witham, F. H., Blaydes, D. F. and Devlin, R.M. 1971. Experiments in Plant Physiology. Van Nostrand Reinhold Co., New York.pp.55-58

Received : March 2017; Revised : May 2017; Accepted : June 2017.