

Phule Kasturi (GKF-3) –A New Variety of Fenugreek for Western Maharashtra, India

M.B. Kadam^{*1}, V.M. Rajenimbalkar² and A.S. Patil³

¹Department of Horticulture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli 415 712, M.S., India

(Place of work: MAURB, MCAER, Bhosalenagar, Pune 411 007, M.S., India)

²Department of Horticulture, National Agricultural Research Project, Ganeshkhind, Pune 411 067, M.S., India

(Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar, M.S., India)

³Department of Horticulture, College of Horticulture, Pune 411 067, M.S., India

(Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar, M.S., India)

(Received 3 March, 2023; Accepted 8 May, 2023)

ABSTRACT

Fenugreek (*Trigonella foenum-graecum* L.) is an important leafy vegetable cum spice crop commonly known as "Methi" belongs to Fabaceae (Leguminosae) family. In Maharashtra, this crop is more popular and grown on large area for leaf or green foliage yield, Despite fenugreek being multipurpose crop, it has not obtained due importance in our cropping pattern and little research work has been done on crop improvement programme in Maharashtra. Hence, to explore the prospects and developing new cultivar, evaluation studies were undertaken. A research experiment was conducted during *rabi* season at National Agricultural Research Project, Ganeshkhind, Pune. Among the studies, three promising genotypes viz., GKF-1, GKF-2 and GKF-3 were evaluated with two check varieties Methi Extra Bold and RMT-1 for six years (2012-17). The performance of a selection GKL-3 (Purandar Local -1) renamed as "Phule Kasturi" was found most promising for higher yield (110.15 q/ha) than both check varieties Methi Extra Bold and RMT-1 (95.77 q/ha and 91.85q/ha respectively) with green foliage, red colour margin of leaves and better consumer acceptance. It also has good nutritional quality.

Key word: Fenugreek, Variety, Growth, Yield, Quality

Introduction

Fenugreek (*Trigonella foenum-graecum* L.) belongs to Fabaceae (Leguminosae) family. It is an annual herb, dicotyledonous, wild or cultivated, widely distributed throughout the world and an important leafy vegetable cum spice crop commonly known as "Methi". Fenugreek is originated from South-Eastern Europe and Western Asia and India is a leading nation as a producer and consumer of the fenugreek

vegetable. Among the major producing states of fenugreek seeds, Rajasthan ranks first (also considered as "fenugreek bowl" of the country (Anon., 2013) followed by Madhya Pradesh and Gujarat. Being a cool season crop, it is cultivated for leaf purpose throughout the country. As multifarious importance of this crop, every part of its plant is utilized in one or the other forms. The dried leaves and tender shoots are all consumed and are valued as food, flavouring agent and medicine. It is exten-

(¹Associate Prof., ²Assistant Prof., ³Assistant Prof.)

sively used as fresh leaves (green leafy vegetable), chopped leaves (flavouring agent), sprouts (salad) and micro greens (salad) (Aggarwal *et al.*, 2013). Recent research has identified fenugreek as a valuable medicinal plant with potential for multipurpose uses and as a source for preparing raw materials of pharmaceutical industry, especially steroidal hormones, also has an exceptional nutritional profile. Fenugreek leaves and shoots are quite rich in protein, iron, calcium, carotene and ascorbic acid (Farooqi *et al.*, 2003) as well as minerals and vitamins (Rao and Sharma, 1987). Its seeds are considered to be of commercial interest as a source of a steroid diosgenin, which is of importance to the pharmaceutical industry. Fenugreek leaves and seeds are consumed in different countries around the world for different purposes such as medicinal uses (anti-diabetic, lowering blood sugar and cholesterol level, anti-cancer, anti-microbial, etc.), making food (stew with rice in Iran, flavor cheese in Switzerland, syrup and bitter run in Germany, mixed seed powder with flour for making flat bread in Egypt, roasted grain as coffee-substitute in Africa), controlling insects in grain storages, perfume industries, etc. Fenugreek is a most popular fresh leafy vegetable and liked by all classes of people and all age groups in Maharashtra and farmers are getting good returns in the market. It is grown especially in areas having cool and dry climate. In fenugreek, the variability is found for plant type, growth habit, foliage characteristics, duration of vegetative phase and seed characters. In fenugreek, although several species have been reported but only two species, i. e. *T. foenum graecum*, the common *methi* (white colour flower) and *T. corniculata*, the *kasuri methi* (yellow colour flower) are of economic importance.

Despite fenugreek being multipurpose crop, it has not obtained due importance in our cropping pattern and very less research work has been done on crop improvement programme. In Maharashtra, Methi No.14 and Methi No.47, high yielding cultivars was released earlier for leaf yield and there is ample scope for its cultivation (Mini and Krishnakumary, 2004). In order to increase its foliage/leaf yield extensive studies are required by plant breeders, for the success of any crop improvement. Fast growth within a short period and the year round seed production enables plant breeders to advance generations of fenugreek year round. Hence, the improvement programme was started during 2011 to develop new genotype of fenugreek

with high foliage yield, more branching and better resistance to major pests and diseases by collecting local germplasm and released varieties from public sector. Eighteen genotypes were evaluated in field for high foliage yield and good quality during *rabi* seasons in 2012. The superior genotypes were advanced for further improvement on the basis of foliage yield and quality. The multilocation trials were conducted at Rahuri, Kolhapur, K. Digraj, Dhule and Pimpalgaon-Baswant during *rabi* 2016 and *rabi* 2017 with three superior genotypes and two check varieties.

Materials and Methods

The field experiment was conducted during *rabi* 2012-17 under irrigated condition at Vegetable Improvement Project, National Agricultural Research Project, Ganeshkhind, Pune (M.S.) The experiment was laid out in Randomized Block Design with five replications each having a plot size 3.00 m x 2.40 m with spacing 20 cm between rows using three promising genotypes and two checks. The crop was fertilized with 10 t^{ha} FYM and 40 kg N + 40 kg P₂O₅ + 40 kg K₂O ha⁻¹ in the form of urea, single super phosphate and muriate of potash respectively. Recommended practices were followed to raise healthy crop. Five plants were selected randomly from each replication for recording observations on growth characters *viz.*, plant height (cm), number of branches per plant, number of trifoliolate leaves, plant weight(g), internodal length, days to harvest, yield parameters green leaf/ foliage yield (q^{ha}) and quality parameters *viz.*, chlorophyll content.

Results and Discussion

All the genotypes showed significant variation in respect of plant height. Genotype GKF-3 (Purandar local-1) recorded significantly maximum plant height (27.25 cm) followed by GKF-2 (Rahuri Local-2) (27.08cm) while the check variety RMT-1 recorded minimum plant height (24.05 cm). Different responses to plant height might be due to genetic characteristic of genotypes and adaptability to a particular environment. These findings confirm the result obtained by Aggarwal *et al.*, (2013) in fenugreek. The maximum numbers of branches were produced by selection GKF-3 (3.71) which was found to be at par with Methi Extra Bold (3.48) whereas; the minimum number of branches (2.77) was recorded in

selection GKF-2. The maximum internodal length at 4-5th node (3.86 cm) found in check variety Methi Extra Bold it was found to be at par with selection GKF-3(3.70cm) whereas, the minimum intermodal length was recorded in check RMT-1 (2.51cm). The maximum number of trifoliolate leaves (37.16^{plant}) was recorded in the selection GKF-3, which was found to be at par with selection GKF-1 (34.11^{plant}), whereas, the minimum number of trifoliolate leaves (29.51/plant) were recorded in genotype GKF2. The number of leaves is an important character as the leaves are the plant factories for manufacturing photosynthesis. Therefore, the cultivar with more number of leaves generally gives high yields. These results obtained are accordance with the finding of Aggrwal *et al.*, (2013) in fenugreek. All the genotypes showed the significant variations in yield attributing characters. In respect to fresh plant weight, GKF-3 (Purandar Local-1) recorded significantly maximum plant weight (11.74 g) whereas the minimum was recorded by check variety RMT-1(9.47 g). The wide variation in growth parameters of all the cultivars might be due to their genetic makeup, which indirectly govern the morphology of plant. These results are in conformity with the findings of Aggarwal *et al.* (2013) and Datta and Chaudhari (2005). The genotype GKF-3 showed significant effect on green foliage yield. The significantly maximum yield (110.15 q^{ha}) was recorded in the genotype GKF-3 whereas, the minimum foliage yield was recorded by check variety RMT-1 (91.85 q^{ha}). Qualitative parameters were also assessed by visual observations and shown in Table 1. The leaf colour in different genotypes *viz.*, GKF-1- green, GKF2- Light green, GKF-3- green and check variety Methi Extra Bold and RMT-1- Light green were recorded. The data presented in Table 1 indicates that, there were significant differences in respect of leaf chlorophyll content of different fenugreek genotypes. The maximum leaf chlorophyll content (17.85 mg^g) was recorded by the genotype GKF-3 and GKF-1 found superior over all other genotype whereas, the minimum leaf chlorophyll content was observed in genotype GKF-2 (15.35mg^g).

For disease and pest reaction, the genotype GKF3 recorded resistance to downy mildew (PDI 10.83) and number of leaf mines (5.23 nos^{plant}) while check var. Methi Extra Bold recorded moderate resistance to downy mildew (PDI 24.33) and number of leaf mines (4.41 nos^{plant}) (Table 2). Among the quality characteristics, the fenugreek genotype GKL-3 re-

Table 1. Ancillary observations of promising fenugreek genotypes (*tribi* 2012-17)

| Sl. No. | Genotypes | Green foliage yield (q ha ⁻¹) | | Av. plant height (cm) | Av. inter nodal length (cm) | Av. No. trifoliolate leaves/plant | Av. plant weight (g) | Days to harvest | Leaf/ foliage colour | Chlorophyll (mg g ⁻¹ fresh wt) | Organoleptic evaluation | | |
|---------|--------------------------|---|--------|-----------------------|-----------------------------|-----------------------------------|----------------------|-----------------|----------------------|---|-------------------------|-------|-----|
| | | 2016 | 2017 | | | | | | | | | | |
| 1 | Rahuri Local - 1 (GKF-1) | 95.13 | 105.75 | 96.29 | 25.67 | 3.29 | 3.70 | 34.11 | 10.63 | 38.60 | Green | 17.85 | 8 |
| 2 | Rahuri Local - 2 (GKF-2) | 95.12 | 106.73 | 99.04 | 27.08 | 2.77 | 3.50 | 29.51 | 10.27 | 38.70 | Light green | 15.35 | 7.6 |
| 3 | Purandar Local -1(GKF-3) | 106.45 | 120.05 | 110.15 | 27.25 | 3.71 | 3.16 | 37.16 | 11.74 | 38.95 | Green | 17.85 | 8.2 |
| 4 | Methi Extra Bold (C) | 92.46 | 89.21 | 105.64 | 95.77 | 3.48 | 3.86 | 33.34 | 10.97 | 37.75 | Light green | 16.68 | 7.8 |
| 5 | RMT-1 (C) | 90.29 | 86.10 | 91.85 | 24.05 | 3.13 | 2.51 | 32.19 | 9.47 | 39.05 | Light green | 15.96 | 7.2 |
| | SE+ | 2.94 | 3.91 | 2.89 | 0.44 | 0.08 | 0.09 | 1.10 | 0.24 | 1.11 | - | - | - |
| | CD at 5% | 8.73 | 11.64 | 8.59 | 1.38 | 0.26 | 0.28 | 3.42 | 0.76 | NS | - | - | - |

Evaluation based on Hedonic scale 0 to 9

% increase in yield of GKL-2 over check variety Methi extra bold-15.01% and RMT-1- 19.92%

Station : NARP, Ganeshkhind Pune, Locations - 1.Rahuri 2. Kolhapur 3. K.Digraj 4.Pimpalgaon Baswant (Nasik) 5.Dhule

Table 2. Field reaction of promising fenugreek genotypes against major diseases and pest (pooled *rabi* 2012-17)

| Sr. No. | Genotypes | Damping off PDI20 DAS | Av. no of leaf mines ^{plant} |
|---------|----------------------------|-----------------------|---------------------------------------|
| 1 | Rahuri Local - 1 (GKF-1) | 25.50(30.26) | 4.84(2.37) |
| 2 | Rahuri Local - 2 (GKF-2) | 19.67(26.18) | 5.47(2.53) |
| 3 | Purandar Local - 1 (GKF-3) | 10.83(19.08) | 5.23(2.48) |
| 4 | Methi Extra Bold (C) | 24.33(29.46) | 4.41(2.30) |
| 5 | RMT-1 (C) | 21.50(27.55) | 4.97(2.40) |
| | SE+ | 1.13 | 0.10 |
| | CD at 5% | 3.36 | NS |

Note: Figures in parentheses indicates arcsin values

* PDI - Per cent Disease Incidence /Index

Table 3. Nutritive content/parameter of fenugreek genotypes (values are based on fresh weight)

| Sr. No. | Parameters | Test methods | Units | Genotypes | |
|---------|------------------------|-----------------------|-------------------------|--------------------------|-----------|
| | | | | Purandar Local-1 (GKF-3) | RMT-1 (C) |
| 1 | Energy value | By calculation | Kcal 100g ⁻¹ | 41 | 41 |
| 2 | Protein | AOAC 920.152 | g 100g ⁻¹ | 3.84 | 4.17 |
| 3 | Carbohydrate | IS:1656:2012 | g 100g ⁻¹ | 6.46 | 6.0 |
| 4 | Fat | IS:12711:2010 | g 100g ⁻¹ | < 0.5 | < 0.5 |
| 5 | Moisture | AOAC 920.151 | g 100g ⁻¹ | 88.40 | 88.45 |
| 6 | Dietary fibre | IS:11062:2010 | g 100g ⁻¹ | 2.29 | 2.07 |
| 7 | Calcium | IS:15121:2013 | mg 100g ⁻¹ | 105.85 | 135.95 |
| 8 | Magnesium | IS:15121:2013 | mg 100g ⁻¹ | 70.42 | 75.61 |
| 9 | Iron | AOAC 944.02, 32.01.09 | mg 100g ⁻¹ | 7.54 | 11.67 |
| 10 | Phosphorus | IS:14828:2013 | mg 100g ⁻¹ | 56.66 | 49.66 |
| 11 | Vitamin C | IS:5838:2015 | mg 100g ⁻¹ | 10.84 | 26.97 |
| 12 | Vitamin B ₆ | Roche Manual | mg 100g ⁻¹ | <1.0 | <1.0 |
| 13 | Vitamin A (β-carotene) | By HPLC | µg 100g ⁻¹ | 36503.22 | 22497.98 |

corded higher carbohydrates 6.46g^{-100g}, vitamin A as β-carotene -36503.22µg^{-100g}, dietary fibre -2.29 g^{-100g} and phosphorus-56.66 mg^{-100g} compared to check variety RMT-1 carbohydrates 6.00g^{-100g}, vitamin A as β-carotene 22497.98µg^{-100g}, dietary fibre -2.07 g^{-100g}, phosphorus -49.66mg^{-100g}.

Conclusion

The fenugreek selection Purandar Local-1 (GKF3) re-named as "*Phule Kasturi*" is green in colour with red colour margin of leaves and better consumer acceptance. It also has good nutritional quality and showed better reaction against major pests and diseases over the check cv. Methi Extra Bold and RMT-1.

Conflict of Interest

All the authors hereby declare that there is no conflict of interest regarding the publication of this article.

References

Anonymous, 2013. *Indian Horticulture Data base*. Published

by National Horticulture Board, Ministry of Agriculture, Government of India, Gurgaon, Haryana pp 288.

- Aggarwal, K.B., Ranjan, J.K., Rathore, S.S., Saxena S.N. and Mishra, B.K. 2013. Change in physical and biochemical properties of fenugreek (*Trigonella sp. L.*) leaf during different growth stages. *Int. J. Seed Spices*, 3(1): 31-35.
- Das, S.N. 2007. *Spices Their Cultivation, Processing and Uses*. Agro Tech publishing academy, pp.74.
- Datta, S. and Chaudhari, P. 2005. Evaluation of fenugreek germplasm for growth and seed yield. *J. Res. SKUAST-J*. 4: 235-237.
- Farooqi, A.A., Sreeramu, B.S. and Srinivasappa, K.N. 2003. *Tropical Spice Crops and their Cultivation*. Kavyakala Prakashana, Bengaluru.
- Lal, G., Singh, B., Mehta, R.S. and Maheria, S.P. 2015. Performance of fenugreek (*Trigonella foenumgraecum L.*) as influenced by sulphur and zinc, *Int. J. Seed Spices*. 5(1): 29-33.
- Mini, C. and Krishnakumary, K. 2004. *Text Book of Leafy Vegetables*. Agrotech Publishing Academy. 45-114.
- Rao P.U. and Sharma, R.D. 1987. An evaluation of protein quality in fenugreek seed and their supplementary effect. *Food Chemistry*. 24(1): 1-9.