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RESEARCH ARTICLE

EVALUATION OF QUALITATIVE PARAMETERS IN DIFFERENT FORMS OF FENUGREEK (*Trigonella foenum-graecum*)

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ABSTRACT

The experiment was carried out during 2016 - 2018 on rabi season to evaluate the qualitative parameters in different forms of fenugreek. Seven different forms viz., young seedlings (7-10 days after germination), fresh leaf at matured stage (30-40 days after sowing), dry leaf at matured stage (30-40 days after sowing), fresh leaf at matured stage (60-70 days after sowing), dry leaf at matured stage (60-70 days after sowing), dry seed and sprouted seed were studied. The results revealed that the sprouted seeds and the dried seeds were found to be best with high quality parameters, chlorophyll contents (a, b and total), catalase activity, soluble protein content, total carbohydrate content. On the other hand, the fresh leaves at matured stage (60-70 days after sowing) recorded higher ascorbic acid content.

INTRODUCTION

Fenugreek (*Trigonella foenum-graecum* L.) is an important seed spice originated from South-Eastern Europe and belongs to the family Fabaceae. The plant is characterized with trifoliate leaves, white papilionaceous flowers, roots bearing conspicuous root nodules and hard textured golden yellow seeds. Seed is one of the principal odoriferous constituents of curry powder. Dried seeds, leaves and tender shoots are consumed and are valued as food, flavouring agent and medicine. The leaves are specially used for vegetable purpose. Fenugreek is mainly grown as leafy vegetable throughout India and there is an ample scope for its cultivation as seed spice. Fenugreek contains a number of chemical constituents including steroidal saponin, 23-26% protein, 6-7% fat and 58% carbohydrates of which about 25% is dietary fibre. Fenugreek is also a rich source of iron and containing 33 mg/100 g dry weight. Leaves contain seven saponins, graecunins compounds of diosgenin, 86.1% moisture, 4.4% protein, 0.9% fat, 1.5% minerals, 1.1% fibre, 6% carbohydrates, ascorbic acid (220.97 mg per 100 g of leaves), β -carotene (19 mg per 100 g of leaves), vitamin C (52 mg), thiamine (40 μ g), riboflavin (310 μ g) and nicotinic acid (800 μ g). Germinated seeds have several beneficial properties over ungerminated seeds. Germination improves *in vitro* protein digestion, as well as fat absorption capacity, higher phenolic and flavonoid content, reduces blood sugar levels and cholesterol in diabetic patients.

Fenugreek contains three important chemical constituents with medicinal value: steroidal saponin, galactomannans and isoleucine. These constituents seem to work in a synergistic way to produce health effects and have placed fenugreek among the most commonly recognized "nutraceutical" or health food products. In recent years fenugreek has attracted the attention of producers to meet manufacturing demands for "functional food" additives and Natural Health Products. Considering all these aspects, the present study was undertaken to evaluate the qualitative parameters in different forms of fenugreek.

MATERIALS AND METHODS

An experiment on evaluation of qualitative parameters in different forms of fenugreek was conducted in Department of Medicinal & Aromatic Crops, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore during 2016 - 2017. Seeds of CO 2 fenugreek was raised in the grow bags during Rabi season (November-December) for the collection of samples (leaves & seeds) for quality analysis. The fresh leaves at young seedling stage (7-10 days after sowing), 30-40 days after sowing & 60-70 days after sowing were collected and carried to the laboratory for biochemical analysis.

The experiment was conducted with seven treatments in three replications under Completely Randomized Block Design (CRD). The treatment details includes T1-Young seedlings (7-10 days after germination), T2 - Fresh leaf at matured stage (30-40 days after sowing), T3 - Dry leaf at matured stage (30-40 days after sowing), T4 - Fresh leaf at matured stage (60-70 days after sowing), T5- Dry leaf at matured stage (60-70 days after sowing), T6 - Dry seed, T7 - Sprouted. The germinated seedlings at young and matured stages were harvested and analyzed for the biochemical parameters. Observations were recorded at different stages of crop growth and dates of sowing for physiological parameters, Chlorophyll content (mg g⁻¹), Catalase activity ($\mu\text{g H}_2\text{O}_2 \text{ g}^{-1} \text{ min}^{-1}$) by titration method using potassium permanganate and biochemical parameters viz., Total carbohydrate content (mg g⁻¹) by anthrone method, Total soluble protein content (mg g⁻¹) estimated by the method suggested by Lowry *et al.* (1951). Ascorbic acid content (mg 100 g⁻¹) by Horwitz (1975) method. The data were analyzed statistically using SPSS (Nei, 1978).

RESULTS AND DISCUSSION

Fenugreek leaves at different stages viz. young seedling stage at 7-10 days after germination, fresh and dried leaves at the stages of 30-40 days and 60- 70 days after sowing, dry and sprouted seeds were analysed for quality parameters.

Table 1. Effect of different stages of fenugreek on Chlorophyll 'a', chlorophyll 'b' and total chlorophyll content (mg/g)

Treatment	Chlorophyll 'a' (mg/g)	Chlorophyll 'b' (mg/g)	Total chlorophyll content (mg/g)
T1 - Young seedlings at 7-10 days after germination	2.19	1.16	3.35
T2 - Fresh leaf at matured stage at 30-40 days after sowing	2.13	1.09	3.22
T3 - Dry leaf at matured stage at 30-40 days after sowing	0.964	0.341	1.18
T4 - Fresh leaf at matured stage at 60-70 days after sowing	2.07	1.02	3.09
T5 - Dry leaf at matured stage at 60-70 days after sowing	0.643	0.216	0.983
Mean	1.60	0.765	2.36
SEd(±)	0.037	0.014	0.052
CD (5%)	0.081	0.032	0.115

Table 2. Effect of different stages of fenugreek on catalase activity ($\mu\text{g of H}_2\text{O}_2 \text{ g}^{-1} \text{ min}^{-1}$), soluble protein (g/100g), total carbohydrate and ascorbic acid content (mg/100g)

Treatment	Catalase activity ($\mu\text{g of H}_2\text{O}_2 \text{ g}^{-1} \text{ min}^{-1}$)	Soluble protein content (g/100g)	Total carbohydrate content (mg/g)	Ascorbic acid content (mg/100g)
T ₁ - Young seedlings at 7-10 days after germination	9.24	8.93	11.88	52.02
T ₂ - Fresh leaf at matured stage at 30- 40 days after sowing	10.33	8.75	6.51	54.26
T ₃ - Dry leaf at matured stage at 30-40 days after sowing	8.67	6.74	5.09	51.17
T ₄ - Fresh leaf at matured stage at 60-70 days after sowing	10.51	8.27	6.49	54.37
T ₅ - Dry leaf at matured stage at 60-70 days after sowing	8.93	6.25	5.25	52.32
T ₆ - Dry seed	11.27	10.52	21.24	42.96
T ₇ - Sprouted seed	10.21	10.98	18.07	40.07
Mean	9.88	8.63	10.65	49.61
SEd(±)	0.148	0.210	0.288	1.262
CD(5%)	0.318	0.450	0.617	2.706

Quality parameters: The physiological parameters of Chlorophyll 'a'(2.19 mg/g), chlorophyll 'b'(1.16 mg/g) and total chlorophyll content (3.35 mg/g) was found higher in the young seedling followed by 30-40 days after sowing and 60-70 days after sowing (Table 1). In dried leaves, the chlorophyll contents were low with 0.643, 0.216, 0.983 mg/g respectively. Chlorophyll is a pigment responsible for antioxidant activity gets diminished with maturity due to biosynthesis up to the stages of growth after which it declines. Similar results have also been reported by (Negi and Roy, 2003) in leafy vegetables. The chlorophyll content in fenugreek was estimated and higher amount of chlorophyll 'a' (2.232 to 2.600 mg/g fresh wt.), chlorophyll 'b' (0.899 to 1.123 mg/g fresh weight.) were present in leaves (Linn, 2017) compared to other plant parts and this amply support the present findings. Catalase is a ubiquitous antioxidant enzyme that degrades hydrogen peroxide into water and oxygen. The highest catalase activity was found in dry seed with range of 11.27 $\mu\text{g of H}_2\text{O}_2/\text{g} \cdot \text{min}$.

Leaves at matured stage at 60-70 days after sowing also have the high level of catalase. Similar results were reported with the activity of enzymatic antioxidant viz., catalase and glutathione reductase content higher in leaves of *Withania somnifera* 1192±0.21 and 0.084±0.76 U/mg whereas (Jaleel *et al.*, 2009) reported catalase activity of 3.43 U/mg in leaves 6.5 $\mu\text{g/g}$ of *Withania somnifera* leaves.

Biochemical parameters: Soluble protein content (10.98 g/100g) was higher in sprouted seed stage followed by soluble protein content (10.52 g/100g) was registered in dry seed (Table 2). This result is well supported by the findings of Islam (2004) in leafy vegetables. Total carbohydrate content was higher in dry seed with 21.24 mg/g and followed by the sprouted seed which registered 18.07 mg/g. The carbohydrate content was found to be higher in fresh leaves (5.09-11.88 mg/g) than the dried leaves (Table 2). The results reaveled with the carbohydrate content in seed are in consonance with Sumayya *et al.*, (2012). Ascorbic acid content was found highest in the form of fresh leaves at matured stage at 60-70 days after sowing (54.37 mg/100g) followed by fresh leaves at 30-40 days after sowing (54.26mg/100g) respectively (Table 2). This finding is well supported by the findings of (Tabata *et al.*, 2002) and (Punia, 2006). The difference in ascorbic acid content was probably due to balance of oxidation and reduction of ascorbic dehydro ascorbic acid that leads to determination of vitamin C content of leafy vegetables (Sahoo and Acharya, 2005).

CONCLUSION

This study revealed the variation of quality and biochemical parameters in different forms of fenugreek. It was observed that, the sprouted seed and the dried seed was found to be best with higher quality parameters, chlorophyll contents (a, b and total), catalase activity, soluble protein content, total carbohydrate content and the fresh leaves at matured stage (60-70 days after sowing) recorded higher ascorbic acid content.

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