



REVIEW

Fenugreek a multipurpose crop: Potentialities and improvements



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Abstract Fenugreek is one of the oldest medicinal plants with exceptional medicinal and nutritional profile. Fenugreek seeds contain a substantial amount of fiber, phospholipids, glycolipids, oleic acid, linolenic acid, linoleic acid, choline, vitamins A, B1, B2, C, nicotinic acid, niacin, and many other functional elements. It may grow well under diverse and a wide range of conditions; it is moderately tolerant to drought and salinity, and can even be grown on marginal lands in profitable way. Owing to these characteristics and heavy metal remediation potential, fenugreek may well fit several cropping systems. In addition to its medicinal uses, it may serve as an excellent off-season fodder and animal food supplement. However, efforts should be initiated to develop strategies for improving its biomass production; genetic diversity among different accessions may be mapped, breeding and crop improvement programs may be initiated to improve the biomass and nutritional and functional elements. This review highlights the morphology, adaptability, nutritional constituents and associated functionality and medicinal significance of fenugreek; its ethno-historical uses, pharmacological assumptions

Abbreviations: AAS, Atomic Absorption Spectrophotometer; CAT, catalase; EMS, ethylmethane sulfonate; ESP, exchangeable sodium percentage; HPLC, high performance liquid chromatography; HDL-C, high-density lipoprotein-cholesterol; IU, international unit; ISSR, inter-simple sequence repeat; LDL-C, low density lipoproteins-cholesterol; NAEs, N-acyl ethanolamines; PGRs, plant growth regulators; RAPD, random amplified polymorphic DNA; RAE, retinol activity equivalents; SOD, superoxide dismutase

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1. Introduction

Fenugreek belongs to Fabaceae family; it was named, *Trigonella*, from Latin language that means “little triangle” due to its yellowish-white triangular flowers (Flammang et al., 2004). It is named as Methi (Hindi, Urdu, Punjabi and Marathi), Hulba (Arabic), Moshoseitaro (Greek), Uluva (Malayalam), Shoot (Hebrew), Dari (Persian), and heyyeed in English. Fenugreek (*Trigonella foenum-graecum* L.) is one of the oldest medicinal plants from Fabaceae family originated in central Asia ~4000 BC (Altuntas et al., 2005). Its description and benefits had been reported in the Ebers Papyrus (one of the oldest maintained medicinal document) earlier in 1500 BC in Egypt (Betty, 2008). It is being commercially grown in India, Pakistan, Afghanistan, Iran, Nepal, Egypt, France, Spain, Turkey, Morocco, North Africa, Middle East and Argentina (Flammang et al., 2004; Altuntas et al., 2005).

Fenugreek seeds contain a substantial amount of fiber (Montgomery, 2009; Meghwal and Goswami, 2012), phospholipids, glycolipids, oleic acid, linolenic acid, linoleic acid (Suliman et al., 2000; Chatterjee et al., 2010), choline, vitamin A, B1, B2, C, nicotinic acid, niacin (Leela and Shafeekh, 2008), and many other functional elements. Despite its exceptional nutritional and medicinal values, only a few studies have been done for its genetic enhancements and development of production agronomy. In this review, we have discussed the morphology, adaptability, nutritional constituents and

associated functionality and medicinal significance of fenugreek; its ethno-historical uses, pharmacological assumptions have also been discussed. Researchable areas are also indicated to improve its production and adaptability.

2. Morphological description, phenology and cultivation

Fenugreek is an annual legume, diploid ($2n = 16$) plant (Ahmad et al., 1999) with no aneuploidy (Petropoulos, 2002; Trease and Evans, 2002; Flammang et al., 2004). Morphologically, it is an erect, aromatic annual closely resembling large clover. The stem is long cylindrical (30–60 cm long) and pinkish in color; whereas its roots are massive finger like structures (Basu, 2006; Mehrafarin et al., 2011; Moradi kor and Moradi, 2013). Fenugreek has pinnate, trifoliate, long stalked compound leaves having toothed, lanceolate, stipules triangular, obovate to oblanceolate leaflets (Srinivasan, 2006; Basu, 2006). It blooms with white to yellowish white, axillary and sessile flowers that are hermaphrodite and insect pollinated. Flowers have 5 petals referred as banner, wing and keel. The ovary is deep green and glaucous while the pollen grains are oval to circular in shape (Basu, 2006; Montgomery, 2009; Mehrafarin et al., 2011). Fenugreek flower produces brownish to yellowish brown ~15 cm long 2–8 pods. Each pod contains 10–20 seeds per pod; seeds are small (~5 mm long), hard, smooth, dull yellow to brownish yellow in color (Altuntas et al., 2005; Moradi kor and Moradi, 2013).

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