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Evaluation of diosgenin content in diferent genotypes of fenugreek (*Trigonella foenum-graecum* L.)

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Abstract

The diosgenin content of the seeds of fenugreek (*Trigonella foenum-graecum* L.) in different genotypes collected from the states of Gujarat and Rajasthan, India were estimated and compared. Among the 17 Gujarat genotypes evaluated CVT UM 361 recorded the maximum diosgenin content (1.27 per cent), while among the Rajasthan genotypes, NDM 25 recorded the maximum diosgenin content (1.35 per cent). The results confirm the existence of variations in diosgenin content in different genotypes of different geographical localities.

Keywords : fenugreek, genotypes, geographical variations, diosgenin content, *Trigonella foenum-graecum*

INTRODUCTION

Fenugreek (*Trigonella foenum-graecum* L.) is an erect annual herb native to Southern Europe and Asia. Undoubtly one of the oldest cultivated medicinal plants, fenugreek is widely grown today in the Mediterranean countries, Argentina, France, India, north Africa, and United States as a food, condiment, medicine, dye and forage plant. The plant reaches a height of 0.3 to 0.8 meter and has trifoliate leaves. White flowers appear in early summer and develop into long, slender and yellow brown pods containing the brown seeds. Seeds are aromatic, bitter, carminative, galactogogue, antibacterial and may be eaten raw or cooked. Bulk of the seed is dietary fiber (50%) and protein (30%), both of which have no taste or flavor. Bitterness is mainly due to the oil, steroidal saponines and alkaloids. For 100g of mature seeds, there is 30g protein, 30 g soluble fibre, 20 g insoluble fiber, 7.5g lipids, 160mg Ca, 1.5 mg Fe, 370 mg P, 19mg Na, 530 mg K, 33 mg Cu, 1550 mg Mn, 160mg Mg, 7 mg Zn, 43 mg ascorbic acid, 340 mg thaiamine and 1100mg nicotinic acid (Giardon *et al.*, 2005). Diosgenin, a steroid Sapogenin found in fenugreek seed, but currently isolated from *Dioscorea* species, is the starting compound for over 60% of the total steroid production by the pharmaceutical industry. Other Saponins found in fenugreek seed include Yamogenin, Gitogenin, Tigogenin and Neotigogenins. Other constituents of fenugreek include mucilage, bitter fixed oil, volatile oil, and the alkaloids Choline and Trigonelline. Presence of Diosgenin, a raw material for steroidal hormones, has already been reported in the seeds of fenugreek (Sharma and Kamal, 2002). As such understanding variations in diosgenin content in different genotypes could be crucial in the cultivation of this medicinal herb. Fenugreek (*Trigonella foenum-greacum* L.) seeds collected from two states of India viz., Gujarat and Rajasthan, have been analyzed for their diosgenin content to assess the geographical variability of diosgenin in this species.

MATERIALS AND METHODS

Evaluation of different fenugreek (*Trigonella foenum-graecum* L.) genotypes for variations and diosgenin content was carried out at the Department of Spices and Plantation Crops, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore, South India during the year 2006-2007. The experiment was laid out in Completely Randomized block Design (CRD) with three replications. The details of the source of genotypes collected from Gujarat and Rajasthan are given in table 1. For diosgenin content estimation, the seeds are cleaned with water, dried and powdered in an iron pestle and mortar. A representative sample of 100g was dried in an oven for 6-8 hours at 100^0C. The dried sample was used for diosgenin assay. About 20 g of dried sample was blended thoroughly in a "Braun" mixer with known amount of water (50 ml) for 5 minutes. The slurry was quantitatively transferred using 150 ml of water to a 500 ml flask fitted with B 24 joint and a calculated amount of 11.3 N hydrochloric acid was added to maintain the required acid concentration. Hydrolysis of the sample was carried out by placing the flask fitted with a condenser in a boiling water bath for requisite time. The slurry after hydrolysis was allowed to attain the room temperature, and filtered using vacuum bunchner funnel. The residue was frequently washed with distilled water till the filtrate was free from acid as indicated by litmus paper. The filtered residue was transferred to a Petri dish and dried in an oven at 100^0C for 6 hours. It was extracted with petroleum ether (Boiling Point 40-60 ^{0}C) in a soxhlet for 8 hours. The extracted solvent with diosgenin was

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concentrated to about 25 ml, chilled in ice and filtered. The mother liquor obtained after filtering and washing the diosgenin, if any, was added to the first crop and the whole diosgenin was weighed after drying it in an oven for 2 hours at 100^{0}C (Morris, 1971).

RESULTS AND DISCUSSION

Fenugreek seeds (*Trigonella foenum-graecum* L.) collected from Gujarat

The genotype, CVT UM 361 recorded maximum diosgenin content (1.27 per cent) followed by CVT LFC 87, CVT RM 70, CVTJFG 273, CVTRM 28, CVT Hisar sonali, Guj methi 2 and CVT (13) UM 362 (0.64, 0.61, 0.53, 0.48, 0.45, 0.40, and 0.37 per cent, respectively), whereas CVT HM 232 recorded 0.31 per cent of diosgenin and of CVT HM 292, CVT LFC 84, CVT Guj methi 1, CVT UM 363 and CVT NDM 20 recorded 0.32, 0.32, 0.32, 0.34, and 0.32 per cent, respectively. The genotypes CVTRM 18, CVT JFG 239 and CVT HM 219 recorded by low levels content of diosgenin (0.30, 0.21 and 0.17 per cent, respectively) (Table 2).

Fenugreek seeds (*Trigonella foenum-graecum* L.) collected from Rajasthan

The genotype, NDM 25 recorded highest amount of diosgenin (1.35 per cent) followed by RM 18, Hisar sonali, RM 28, HM 232, HM 292, Rmt 1,UM 363 and UM 362 (0.75, 0.71, 0.68, 0.64, 0.63, 0.62, 0.61 and 0.60 per cent, respectively). While the genotypes NDM 19, JF 273 and JF 239 recorded lower contents of diosgenin (0.18, 0.24 and 0.31 per cent respectively) (Table 2).

Table 1. Details of fenugreek genotypes collected for the study

S.No	Genotypes	
	Gujarat	Rajasthan
1	CVT (13) UM 362	UM361
2	CVT HM 232	UM 362
3	CVT HM 292	UM 363
4	CVT LFC 84	JF 239
5	CVT RM 70	JF 273
6	CVT Guj methi 1	HM 219
7	CVT JFG 239	HM 232
8	Guj methi 2	HM 292
9	CVT Hisar sonali	LFC 84
10	CVT HM 219	LFC 87
11	CVTRM 18	NDM 19
12	CVTRM 28	NDM 20
13	CVT LFC 87	NDM 25
14	CVT UM 361	RM 18
15	CVT UM 363	RM 28
16	CVTJFG 273	RM 70
17	CVT NDM 20	Hisar sonali
18	-	Rmt 1
19	-	Rmt 303
20	-	Local

Table 2. Mean diosgenin content of fenugreek (*Trigonella foenum-graecum* L.) seeds from different genotypes collected from Gujarat and Rajasthan, India

S. No	Gujarat		Rajasthan	
	Genotypes	Diosgenin content (Per cent)	Genotypes	Diosgenin content (Per cent)
1.	CVT (13) UM 362	0.37	UM361	0.49
2.	CVT HM 232	0.31	UM 362	0.60
3.	CVT HM 292	0.32	UM 363	0.61
4.	CVT LFC 84	0.32	JF 239	0.31
5.	CVT RM 70	0.61	JF 273	0.24
6.	CVT Guj methi 1	0.32	HM 219	0.32
7.	CVT JFG 239	0.21	HM 232	0.64
8.	Guj methi 2	0.40	HM 292	0.63
9.	CVT Hisar sonali	0.45	LFC 84	0.53
10.	CVT HM 219	0.17	LFC 87	0.50
11.	CVTRM 18	0.30	NDM 19	0.18
12.	CVTRM 28	0.48	NDM 20	0.50
13.	CVT LFC 87	0.64	NDM 25	1.35
14.	CVT UM 361	1.27	RM 18	0.75
15.	CVT UM 363	0.34	RM 28	0.68
16.	CVTJFG 273	0.53	RM 70	0.43
17.	CVT NDM 20	0.32	Hisar sonali	0.71
18.			Rmt 1	0.62
19.			Rmt 303	0.55
20			Local	0.41
	SE	0.013	SE	0.018
	CD (0.05)	0.027	CD (0.05)	0.039

Thus there exists variations in the diasgenin content both geographically and genetically. Variations in diosgenin content due to genotypes has already been indicated by Morris (1971) as well.

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