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Chemical and Amino Acid Composition of Fenugreek Seeds Grown in Sudan

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ABSTRACT

The proximate chemical composition and amino acid profile of fenugreek seeds grown in Sudan were determined. The seeds are rich in leucine, valine, lysine and phenylalanine. Manganese, magnesium, zinc and copper contents are reported for the first time.

INTRODUCTION

Fenugreek (*Trigonella foenumgraecum* L.) is an ancient plant indigenous to Sudan, as well as to Egypt, Ethiopia and Morocco. It is also grown in Europe, i.e. in Greece, Turkey and Russia, and in Asia, i.e. in India, Iran, China, etc.

Recently, the crop has attracted much interest (especially the seeds) as a cheap source of good protein (Sauvaine & Baccou, 1976) and as a protein supplement to Jowar—*Sorghum vulgare* (Talwalker & Patel, 1970)—or corn flour (El Madfa & Kuhl, 1976).

In Sudan fenugreek is grown in the Northern Region and is known as *Helba*. It is used by lactating women as porridge (with sorghum and/or

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millet flour) or prepared as a dessert (Gorafi, 1983). It is also boiled with water and taken hot or cold to sooth stomach ailments (Gorafi, 1983). Similar uses were reported in India and Ethiopia (Shankarackarya & Natarajan, 1972). It probably delays subsequent pregnancy due to the presence of diosgenin, the starting material used in the synthesis of sex hormones and oral contraceptives (Marker *et al.*, 1947).

This study aims at investigating the proximate chemical composition, amino acid profile and mineral composition of fenugreek grown in Sudan during the 1983 season.

MATERIALS AND METHODS

Fenugreek seeds (1983 season) were bought from Khartoum North market. Seeds were ground prior to analysis. Moisture, protein (N × 6·25), crude fat, crude fibre and ash contents were estimated according to the methods of the AOAC (1970).

Nitrogen-free extract (NFE) was calculated by difference. All analyses were carried out in triplicate.

For the amino acid composition, the sample was hydrolysed with 6N HCl; duplicate aliquots were assayed in an Astechnicon LKB (A2672) amino acid analyser using lithium buffer.

The minerals were determined in the ash using an EEL flame photometer.

RESULTS AND DISCUSSION

Table 1 shows the proximate chemical composition of fenugreek seeds; values for protein and ash are similar to the minimum values reported by Shankarackarya *et al.* (1973) for twenty-four samples of Indian raw fenugreek seeds. However, the content of crude fat in Sudanese fenugreek (6·7%) is similar to the average value of 6·29% (5·16–8·24 range) reported by Shankarackarya *et al.* (1973). Crude fibre, calculated on a dry matter basis (7·0%), is lower than that reported by El Madfa & Kuhl (1976). The values for moisture and ash are within the PFA Act (India) 1954 for good quality fenugreek.

The mineral composition of fenugreek seed is shown in Table 2. It is rich in copper, manganese and potassium. The iron content is higher

TABLE 1
Proximate Chemical Composition of Fenugreek Seeds

Parameter	*Percentage*
Moisture	4·3
Crude protein	27·3
Crude fat	6·7
Crude fibre	6·7
NFE[a]	51·2
Ash	3·8

[a] Nitrogen-free extract.

TABLE 2
Mineral Composition of Fenugreek Seeds

Mineral	*mg/100 g*
Na	49·3
K	1 306
Fe	22·5
Ca	158
P	415
Mn	1 550
Zn	9·9
Cu	331

than that reported by Shankarackarya & Natarajan (1972) but lower than Duke's (1981) figure. The phosphorus content is higher than those reported by the above authors. The calcium content is similar to that reported by Shankarackarya & Natarajan (1972), while the contents of sodium and potassium were found to be 2·5 times that reported by the

TABLE 3
Amino Acid Composition of Fenugreek Seed

Amino acid	*Milligrams per gram of protein*
Isoleucine	38·5
Leucine	53·5
Lysine	51·4
Methionine	5·6
Phenylalanine	58·0
Threonine	26·6
Valine	50·0
Histidine	19·6
Tyrosine	24·5
Alanine	29·7
Aspartic acid	82·2
Glutamic acid	115
Glycine	39·8
Proline	32·1
Serine	35·3
Ornithine	3·1
Phosphoethanolamine	10·8

TABLE 4
Scoring Pattern of Fenugreek Amino Acids

Amino acid	*Milligrams per gram of protein fenugreek*	*FAO RI*[a]	*Score*
Isoleucine	38·5	40	96·2
Leucine	53·5	70	76·4
Lysine	51·4	55	93·4
Methionine	5·6[b]	35	16
Phenylalanine + Tyrosine	58·0	60	96·6
Threonine	26·6	40	66·5
Valine	31·5	50	63

[a] FAO/WHO (1973) recommended intakes.
[b] Cystine was not determined.

same authors. Manganese, magnesium, zinc and copper contents of fenugreek seeds were reported for the first time.

The amino acid composition of fenugreek seed is shown in Table 3. High, and similar, values were obtained for leucine, lysine and valine and a slightly higher value for phenylalanine; Shankarackarya & Natarajan (1972) reported that the seed is rich in lysine, leucine, valine and threonine; our figure for threonine was not high in this study. Cystine and tryptophan were not determined.

The scoring pattern of fenugreek seeds, calculated from the recommended intakes of the FAO/WHO (1973), is shown in Table 4. Methionine, as for legumes, is the first limiting amino acid while valine and threonine are second. This confirms the previous findings of Sauvaine & Baccou (1976).

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