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Some characteristics of the Sudanese bread (Kisra) supplement with fenugreek (Trigonella foenum-graecum L)*

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ABSTRACT

In this study the chemical composition of two fenugreek seed types known locally as Sudanese and Ethiopian' types and sorghum kisras supplemented with 5%, 10% and 20% flour of the two fenugreek types after removal of the bitter taste, was determined* The two fenugreek seed types had shown slightly small differences in most of their chemical components, however, the Ethiopian type had slightly more protein (26.4+0.4 %) than that of the Sudanese type (25.5± 0.07 %). On the other hand, the Sudanese type contained more mucilage (23.5±0.04 %) than that of the Ethiopian type (22.6±0.010/0). The most significant effect of kisra supplementation was the increase in good quality protein by a range of 31-66%. It increased from 11.20% in the control kisra to the range of 14.70-18.64%. The crude fibre% of the control kisra (3.40%) increased in the supplemented kisras to the range of 4.54-5.30%. The ash% decreased from 2.42% in the control kisra, to the range of 2.20 - le20% in the supplemented kisras. The sensory analysis indicated that the fenugreek supplemented kisra was accepted by the panelists at the 5% level of fenugreek seed flour supplementation. The overall acceptance level of the different samples decreased with the increase in fenugreek seed flour used in supplementation.

INTRODUCTION

Kisra is the staple Sudanese diet. It is a morsel or piece of bread prepared from fermented sorghum flour (Abdel Gadir and Mohamed, 1983), It provides most of the dietary proteins and energy in some

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Parts of Sudan especially the rural areas, nowadays most urban people depend upon bread as stable diets. it is baked traditionally by the housewife and also at the industrial level although the latter is still limited. Kisra is propably the thinnest staple bread of the entire world. The baking time for each sheet of Kisra is 15-20 seconds (Dirar, 1993). Kisra is consumed while still fresh. The average values for the composition of Kisra as reported by many investigators are 50% moisture, 30-40% carbohydrates, 12% protein, 2% crude fibre and 1.50/0 et al.,1985•, Dirar, 1993).

Fenugreek (Trigonella foenum-graecum L) is an annual herbaceous plant of the leguminaceae family. its distribution includes the Mediterranean region of Europe, the Neareast and Iridia . The seeds are small in size green-yellowish colour and also contain high levels of carbohydrates (49%), proteins (24-32%), fibres 020/0), (90%) as well as minerals like phosphorus and calcium, and the alkaloids like trigonelline, mucilage, saponin, nicotinic acid and vitamins A and C (Shankaracharya, and Nalarjan, 1973). In Sudan, fenugreek seeds are grown mainly in the northern part of the country whereby the prevalent environmental conditions are favorable. Fenuyeek seed has recently received attention from research investigators due to its unique chemical composition. High carbohydrates and good quality protein levels coupled with other nutritional factors that make it a good source for supplementation (Musa et al., 1987).

Fenugreek is consumed in various ways, e.g., the seeds are used to brew a hot beverage (in many Arabic countries). In Egypt, seeds are ground and mixed with corn flour to bake bread. In India, part of the plant is consumed as a vegetable. In Sudan, the seeds have got many uses, e.g., they are swallowed as anti-acid, or against dysentery and stomach disturbances and a special porridge prepared from ground seeds with wheat flour to which milk is added, is given to the lactating women to increase their milk production. Fenugreek seeds are known to have antidiabetic activity. They are used by several nations in the folk medicine as antidiarrhoeal, antigonorrhoeal, emollient, carminative and aphrodisiac (Musa et ale, 1987).

Fenugeek is believed to be a good supplement for cereals because of its high contents of lysine and tryptophan amino acids, which are deficient in cereals (Sharma, 1986). The presence of bitter saponins in fenugreek seed limit their acceptability in foods, however, it has been possible to debitter fenugeek seeds without compromising on their

nutritional properties (Sharma, 1986; Udayasekhera and Sharma, 1987). Keeping this in view, the present work was undertaken to stud some of the components of Sudanese and Ethiopian fenugreek seeds increasing protein level' of kisra and the quality of kisra supplemented with various levels of fenugreek seed flour.

MATERIALS AND METHODS

Seeds of fenugreek, known locally as Sudanese and Ethiopian types and sorghum seeds (cv D abar) were obtained from the local market during the first week of October 1994. All the seeds were cleaned from extraneous materials, washed, dried and milled by a laboratory mill, then passed through 60 mesh sieve to obtain flour of a uniforn particle size. The extraction rate of fenugreek was 90%. The extraction rate for sorghum seeds was 72%.

Proximate analysis

Proximate analysis was carried out on samples consisting of fenugreek seed flour and kisras supplemented with various levels of freated fenugreek seed flour. The percentages of moisture, protein, oil and crude fibre were detennined using the AOAC methods (1984). The protein content was calculated using a conversion factor of 6.25 The mucilage content was detennined according to the method described by Sharma (1986). The carbohydrate percentage was determined by difference.

Debittering of fenugreek seed flour

The fenugreek bitter taste was removed and its characteristic flavor was reduced according to the method described by Sharma (198). The process started by extraction with n-hexane for 24 hours followed by another 24 hours extraction with ethanol using a soxhlet extractor. The extracted samples were air-dried. It was tasteless and odourless Different levels of the debittered fenugreek seed flour, were used for kisra supplementation.

Preparation of the control and the supplemented samples

In the control sample, 800g of sorghum flour were mixed with 1600 ml water in a round earthenware container (khumara), 240g of previously fermented dough was then added to act as a starter, In the supplemented samples, 5%, 10%and 20% of debittered Sudanese and Ethiopian fenugreek seed flour, were used to supplement sorghum flour in such a way that doughs contain a total of 800g of sorghum and

fenugeek seed flour. 1600 ml water and 240g starter were then added. The aliquot samples were allowed to ferment for 18 hours at room temperature (320C).

Dough analysis

All the prepared dough samples were analysed for pH, total titrable acidity (T.T.A) and total soluble solids (Tess) before and after the fermentation period. The pH was determined using the pH meter, total titrable acidity was determined by titration against 0.1 N hydrochloric acid. The total soluble solids were determined using Abbe refract-torneter.

Kisra baking method

Kisra was baked traditionally as the method described by Dirar (1993) with slight modifications. An electrical plate (saj) was heated to 160 oc. A small amount of fermented dough (84g) was spread on the hot plate into a thin sheet which was peeled off the plate after about 10 seconds baking. The produced kisra sheets were stacked one over the other and was ready for further analysis.

Taste panel

A panel of 20 members composed of male and female adults was used to judge the quality of the different types of kisras supplemented with various levels of fenugeek seed flour compared to the unsupp-lemented kisra (control). The panelists were asked to evaluate each sample for colour, flavour, texture and overall acceptance level using 9 points scale. Those points were distributed as follows:

1: Extremely bad; 2: Very bad; 3: Bad; 4: Fairly bad; 5: Satisfactory; 6: Fairly good 7: Good; 8: Very good; 9: Excellent. Samples tested included freshly prepared sorghum kisra (control), Sudanese fenu-greek kisra (SFK), and Ethiopian fenugeek kisra (EFK). The order of presentation of the various samples was randomized and given codes before being tested by the panelists.

RESULTS AND DISCUSSSION

Proximate analysis of the two fenugreek seeds types (Sudanese and Ethiopian) showed that most of the chemical components of the Ethiopian type were slightly higher than that of the Sudanese type (Table 1). However, the percentages of carbohydrates and mucilage content were slightly higher in the Sudanese type when compared with the Ethiopian type. The moisture content reported in this investigation

(7.7±0.1 and 8.4+0.080/0) for the Sudanese and Ethiopian fenugeek types, respectively, were lower than that reported by Mounir et al. (1987) who found a moisture content of 9.3% in fenugreek seeds, but higher than the values reported by Shankaracharya and Nalarjan (1973), and Abdel Aal and Rahma (1986), who reported (5.7%) and (4.3%), respectively. These variations in moisture contents could be attributed to variation in environmental conditions, harvesting time and storage facilities. The extracted oil of fenugreek seeds (8.04+0.1 and 9.]+0.04%) had a golden yellow colour, a distinctive odour and bitter taste and it was liquid at room temperature. The crude fibre content of the two types were higher than that of most of the leguminous crop seeds (Hemavathy and Prabhakar, 1989).

Tablel. Chemical composition of Sudanese and Ethiopian fenugreek seeds.

Component (%) of	Sudanese fenugreek	Ethiopian fenugreek
Moisture	7.7±0.10	8.4±0.08
Protein	25.5±0.70	26.4±0.04
Oil	8.0±0.10	9.1±0.04
Crude fibre	9.8±0.14	10.0±0.10
Mucilage	23.5±0.04	22.6±0.10
Ash	4.4±0.10	4.6±0. O
Carbohydrates	21.1±0.10	18.8±0.10

Results reported as means of triplicate determinations.

The mucilage contents (23.5+0.04 and 22.6+0.1%) were higher than the value reported by Abuzeid (1986), (20%) and less than that of Musa et al. (1987), (28%). Fenugreek seed has an antidiabetic property attributed to the presence of mucilage which retards the absorption of carbohydrates thus lowering serum glucose level, also it decreases the serum cholesterol level (Sharma, 1986). The estimated values of ash content (4.4+0.10 and 4.6+0.100/0) were generally in close agreement to the range of 3.15-4.8% reported by Shank-aracharya and Nalarjan (1973). The carbohydrate contents (21.06 and 18.86%) were far less than that reported by Abdel Aal and Rahma (1986) who found 40.6+0.610/0. The protein contents (25.5+ 0.7 and 26.4+0.040/0) were slightly lower than those obtained by El Mahdi (1985) who reported 29.5% protein content in fenugreek seeds. On the

other hand, Shankaracharya and Nalarjan(1973) gave a lower value (16.97%) for protein content in fenugeek seeds. This variability could be due to genotypic, soil and environmental differences. It was reported that fenugreek protein had a high biological value due to the presence of all essential amino acids including lysine in appreciable amounts (Shanna, 1986).

The pH in all fermented samples was slightly lower than those of the non-ferrnented sarnples (Table 2). This drop in pH was accompanied with an increase in titrable acidity. This increase in acidity has a definite effect on production of very thin kisra sheets, an explanation of this was given by Novellie (1982) who stated that the acid produced by fermentation softens the protein matrix so that the fermented dough becomes more coherent and can easily be spread out in very thin sheets. The estimated total soluble solids were higher in the supplemented dough sarnples.

Table 2. pH, total titrable acidity (T.T.A) and total soluble solids (T.S.S.) contents of control, fermented (F) and non-fennented (NF) supplemented doughs.

Kind of kisra	pH		Total titrable acidity (%)		T.S.S. (%)	
	F	NF	F	NF	F	NF
Contol	4.38	4.32	0.78	2.16	9.73	9.85
5% SFD	4.32	4.25	0.73	2.00	9.50	9.72
I0%SFD	4.30	3.62	0.64	1.83	9.80	9.97
20%SFD	4.12	3.44	0.61	1.74	10.40	10.54
5% EFD	4,34	3.70	0.70	1.92	9.71	9.64
10%EFD	4.30	3.61	0.62	1.80	10.30	10.52
20%EFD	4.30	3.40	0.60	1.72	10.60	10.86

SFD: Sudanese fenugreek supplemented sorghum dough.
EFD: Ethiopian fenugreek supplemented sorghum dough.

The moisture contents decreased as a result of fenugreek addition, and this could be attributed to the loss of most of the water absorbed in the gummy portion of fenugreek supplemented dough during baking process (Table 3).

The most significant effect of fenugreek supplementation of kisra was the improvement in protein content resulting in 31-66% increase in protein content of kisra. Hamaker et al. (1987) reported that protein digestibility of cooked sorghum is lower than that of other major

cereals due to the formation of disulfide bonds during cooking. Also, the presence of tannins reduces the digestibility. However, the supplementation with fenugeek may improve the protein digestibility as it generally aids digestion (Fazli and Hardman, 1968). The crude fibre contents were nearly similar to that of the control unsupplemented sample.

Table 3.The chemical composition of fenugeek supplemented kisras.

	Percentage of					
Kisra kind	moisture	protein	oil	crude fibre	ash	carbohydrate
Control Kisra	52.92	11.20	2.20	3.40	2.42	26.72
5% SFK	50.92	14.70	3.52	4.04	2.10	24.72
10%SFK	48.63	16.24	3.76	4.80	2.11	24.46
20%SFK	47.54	17.90	3.82	6.10	1.54	23.10
5% EFK	50.22	16.12	3.96	4.60	2.54	22.56
I0%EFK	49.43	17.22	4,20	4.90	1.93	22.32
20%EFK	48.63	18.64	4.46	5.30	1.20	21.77

SFD: Sudanese fenugreek supplemented sorghum dough.
EFD:Ethiopian fenugreek supplemented sorghum dough.

The mucilage contents of kisras is of great interest from a therapeutic point of view with regard to people suffering diabetes. The ash contents (0.81-2.54%) were lower than that of the control kisra (Table3). Continuous soxhlet extraction of fenugreek flour with organic solvents to remove the bitter taste could probably result in removal of certain minerals, thus reduced the ash content of these kisra samples. The carbohydrates content of the control sample (26.72 %) was higher Chan those of the supplemented kisras. This drop could be due to the reduction in the amount of sorghum flour in these fonnulations.

The mean scores for sensory attributes of the various fenugreek supplemented kisras were shown in Table 4. The data indicated slight differences between the control unsupplemented kisra and the kisra supplemented with 5% fenugreek flour. However, the acceptability of the various kisras decreased with the increase in fenugreek flour. It seemed that the debittering of fenugreek flour led to high scores of kisra flavour as assessed by the panelists.

Fenugreek seed flour has a great potential as a supplement agent for kisra, which is the staple diet for most of the Sudanese people, and

also as a supplement in the diets of undernourished and diabetic people, particularly in the developing countries. This is because fenugreek seed has a great amount of good quality protein and it has an antidiabetic property. The two investigated types of fenugreek showed small differences in most of the chemical components. The most important effect of kisra supplementation was that it increased the protein content. The production of kisra supplemented with 5% fenugreek flour was similar to the control kisra in most of the chemical components and all the sensory attributes. The sensory attributes and most of the chemical components of supplemented kisras were not affected with the type of fenugreek seed.

Further studies are required to feed diabetic people fenugreek supplemented kisra and to follow the serum glucose and cholesterol levels.

Table 4.Mean scores for sensory attributes* of control unsupplemented kisra and kisra supplemented with different levels of Sudanese fenugreek flour (SFK) and Ethiopian fenugreek flour (EFK).

Kind of kisra	Colour	Flavour	Texture	Overall acceptance level
Control kisra	8.1	8.2	8.1	8.0
5% SFK	8.2	8.1	8.2	8.0
I0% SFK	8.0	7.6	7.5	7.8
20% SFK	7.5	7.4	5.5	6.5
5% EFK	8.5	8.3	8.1	8.1
I0% EFK	8.0	7.7	7.6	7.7
20% EFK	7.8	7.6	5.7	6.8

*Means based on 9 points scale (9=excellent, 1= extremely bad)

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