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RESEARCH NOTE

Ocimum basilicum: A new non-conventional source of fibre

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Ocimum seeds contain a reasonable amount of hemicellulose and cellulose, accounting for their hydrophilic character. They are high in fibre and associated nutritional properties, and can be considered as a new non-conventional source of fibre.

INTRODUCTION

The importance of fibre in the diet is very well established (Burkitt & Trowell, 1975; Schneeman, 1986; Dreher, 1987). Sources of dietary fibre have already been studied in detail (Dreher, 1987). However, there is a continuous search for newer sources of dietary fibre. In India, traditionally seeds of *Ocimum basilicum* (locally known as sabza) have been used in the treatment of dysentery and diarrhoea. These seeds are mucilaginous and are more popularly employed as a thickened infusion in water or milk to form a refreshing preparation called 'Falooda'. No systematic studies of the major food constituents of these seeds have been so far reported. The present work reports on the preliminary findings obtained during investigation on constituents responsible for the swelling properties of these seeds, when dispersed in water.

MATERIALS AND METHODS

Cleaned seeds of *Ocimum basilicum* obtained from a local market in Bombay city, were visually examined for physical characteristics and analyzed for bulk density (g/cm^3) and 100-seed weight (g). The seeds were coarsely ground to 20 mesh and stored in clean dry bottles. Moisture, protein, ash and fat were estimated by AOAC methods (1980) and carbohydrate content was calculated by difference (Burkitt & Trowell, 1975). Free reducing sugars were determined by the DNS method (Sumner, 1925) after extraction in 80% alcohol (Pomeranz & Meloan, 1971). Starch was estimated polarimetrically after selective extraction with acid calcium chloride (Fraser *et al.*, 1956; Southgate, 1976), pentosans by the standard bromate–bromide method (Browning, 1967) and lignin by extraction in 72% (w/w) sulphuric acid (Southgate, 1976). Crude fibre (Southgate, 1976), neutral detergent fibre, NDF (Van Soest, 1963*a*; Van Soest & Wine, 1967), acid detergent fibre, ADF (Van Soest, 1963*b*; Van Soest & Wine, 1968) and acid insoluble lignin (Southgate, 1976) were also determined by documented methods in the literature. Cellulose was calculated as the difference between ADF and acid-insoluble lignin, and hemicellulose as the difference between the NDF and ADF. The swelling factor of the seeds was determined by the method of Schneeman (1986). For this, 1 g of the seed was soaked in 40 ml water for different lengths of time at room temperature (30°C) and at refrigeration (10–12°C). Excess water was strained off using a strainer for 15 min. The wet weight was determined and water-holding capacity was estimated as the difference in wet weight and constant dry weight of the sample dried at 60°C. Water-holding capacity of *O. basilicum* seeds in milk (6% fat and 8% non-fat solids) was also determined as above.

RESULTS AND DISCUSSION

The physical characteristics, proximate composition, carbohydrate profile and swelling index of *O. basilicum* seeds are presented in Table 1. The protein content of 14·76% in the seeds is lower than the reported values of 16·4% for *O. basilicum* and 24·2% for *O. americanum*, respectively (Khan *et al.*, 1961; Prakash *et al.*, 1988). Results on the carbohydrate profile of the ocimum seeds indicate a low content of starch (8·54%) and free

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Table 1. Physical characteristics, proximate composition, carbohydrate profile and swelling index of *Ocimum basilicum* seeds[a]

Parameter	Value
Physical characteristics	
Colour	Black
Size: Length (μm)	197·5 ± 0·66
Width (μm)	106·0 ± 2·67
Shape	Ovate
Bulk density (g/cc)	0·73 ± 0·018
100-seed weight (g)	0·1471 ± 0·003
Proximate composition	
Moisture (%)	9·63 ± 0·14
Ash (%)[b]	7·70 ± 0·20
Protein (%)[b]	14·76 ± 1·52
Fat (%)[b]	13·8 ± 0·29
Carbohydrates (by difference) (%)[b]	63·8 ± 2·01
Carbohydrate profile[c]	
Starch (%)	8·54 ± 0·64
Pentosans (%)	10·9 ± 0·43
Free reducing sugars (%)	0·12 ± 0·07
Crude fibre (%)	22·6 ± 1·56
Acid detergent fibre (%)	30·1 ± 1·62
Neutral detergent fibre (%)	40·0 ± 1·19
Hemicellulose (%)	9·87 ± 0·44
Cellulose (%)	8·03 ± 1·06
Acid-insoluble lignin (%)	22·1 ± 0·56
Lignin (%)	35·2 ± 2·02
Swelling index:	34–35 ml

[a] Values are mean ± SD of three determinations.
[b] On a dry weight basis.
[c] On an as-is basis.

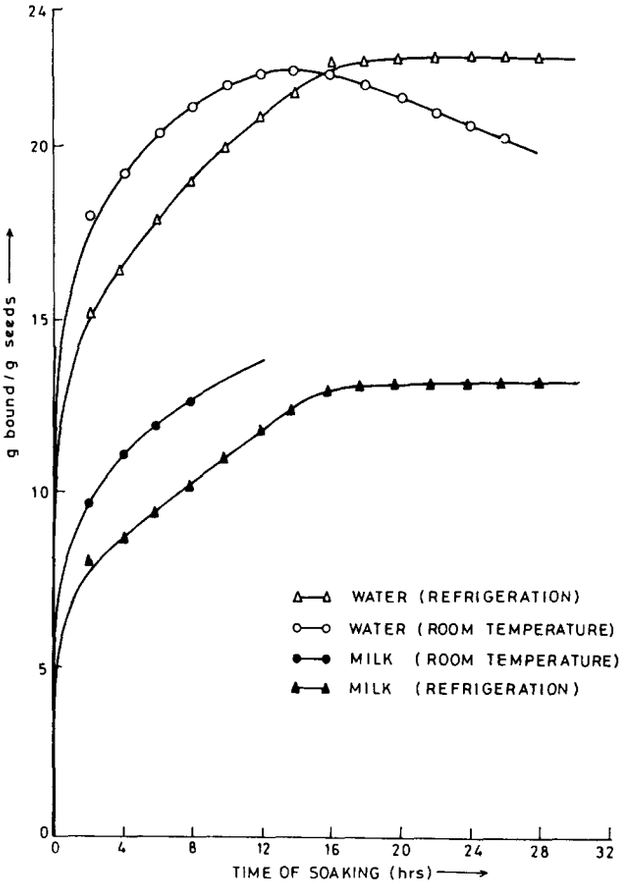

Fig. 1. Progress of uptake of water/milk bound by *Ocimum basilicum* seeds at room temperature (~30°C) and at refrigeration (10–12°C).

reducing sugars (0·12%), suggesting that the seeds contain non-starchy polysaccharides. The seeds are rich in crude fibre, NDF and ADF. The crude fibre was 22·6% as against a reported value of 29% by Khan *et al.* (1961). The NDF and ADF values were 40·0% and 30·1%, respectively, whilst cellulose, hemicellulose and lignin contents were 8·0%, 9·9% and 35·1%, respectively. Thus, this seed can be considered lignin-rich (Southgate, 1976).

The NDF of 40·0% for ocimum is similar to that for psyllium seeds, a source of dietary fibre (Van Soest *et al.*, 1983); wheat bran contains almost 50% NDF.

In determination of swelling index, water to the 40 cc mark, rather than the 20 cc mark was used (Anon, 1936). This was necessary to prevent compaction of the mucilage in the tube. A swelling index of 34–35 ml was observed for ocimum seeds.

Figure 1 shows the water-holding capacity in water and milk at room temperature and refrigeration. At refrigeration temperature, the water-holding capacity increased during 2–16 h from 15·0 cc/g to 22·8 cc/g. At 30°C; the maximum value of 22·0 cc/g was reached at 12 h, remained constant up to 18 h, and declined to 20·5 cc/g after 26 h. This decrease may be due to either desorption of the swollen mucilage, or disintegration along with fermentation of the mucilage as indicated by the presence of gas bubbles after 22 h. Since *Ocimum basilicum* seeds are traditionally used in falooda preparation in which milk is used as the medium, the holding capacity in milk was measured. The seeds held less milk than an equivalent weight of water. The determination could be done only up to 10 h owing to the spoilage of milk thereafter. The maximum water-holding capacity in milk under refrigeration was 13·0 cc/g as opposed to 22·5 cc/g in water. The water-holding capacity of the fibres depends upon the chemistry of the macromolecules, electrolyte concentration and pH of the surrounding medium (McConnel *et al.*, 1974; Cadden, 1988) Therefore, the presence of lipids, carbohydrates, proteins, other organic compounds and inorganic salts in milk (Meyer, 1973) seems to be responsible for the observed differences in holding of water/milk by *Ocimum basilicum* seeds.

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