ELSEVIER

Food Chemistry 52 (1995) 139–141

0308-8146/95/$9.50

Nutritive value of a melon seed beverage

Sibel Karakaya, Aysel Kavas, Sedef Nehir El, Naile Gündüç & Lemi Akdoğan

Department of Food Engineering, Faculty of Engineering, Ege University, 35100 Bornova, İzmir, Turkey

(Received 13 December 1993; revised version received and accepted 15 March 1994)

A beverage from melon seeds was produced to make a waste product available for human consumption. Energy, moisture, fat, protein, ash, iron, magnesium and vitamin C analyses were conducted to determine the nutritional value of the beverage, following a consumer panel test to evaluate its acceptability. The beverage had an energy value of 67 kcal/100 g. The moisture, fat, protein, ash and carbohydrate values were found to be 86·36, 1·92, 1·28, 0·27 and 10·17%, respectively. The Indices of Nutritional Quality (INQ) calculated for protein, iron and magnesium indicated that the beverage was a good source of iron and magnesium and a fair source of protein. The magnesium, iron and vitamin C contents of the beverage were found to be 22·23, 0·90 and 0·31 mg/100 g, respectively, and no arsenic could be detected. The consumer panel test results showed that the beverage was liked very much (4·9 on a 5-point hedonic scale).

INTRODUCTION

The musk-melon (*Cucumis-melo* L.) of the family Cucurbitacea is native to Africa and Asia, ancient records indicating cultivation of melons as early as 2400 years before the Christian era. The musk-melon, of which there are numerous varieties, is cultivated for its tasty fruit, which may be used as an appetizer, a dessert or in salads (Considine & Considine, 1982). The seeds of musk-melon, however, are not much consumed. Only in some countries are their kernels used as a dressing for breads, cakes, confectionery and snack foods, often in place of almonds and pistachios. A refreshing beverage is prepared from ground melon seed kernels which are considered beneficial in chronic or acute eczema and are reported to be diuretic (Teotia *et al.*, 1989). Also, oil that has been expressed from the seeds is used for edible purposes. The presence of high amounts of the unsaturated fatty acids (95% of the total oil) may suggest a possible hypo-cholesterolaemic effect. The oil could also be used in the manufacture of margarines, shortenings and cooking oils (Ajibola *et al.*, 1990).

Lazos (1986) has investigated the proximate composition of the melon seeds. The crude oil, protein and fibre contents were found to be 37·8, 25·2 and 15·4%, respectively. Sulphur amino acid (methionine and cysteine) content, limiting in many proteins, was found to be considerably greater than that of soya bean (Sharma *et al.*, 1986). As reported by Kaur *et al.* (1988), lysine is the first and the sulphur amino acids are the second limiting amino acids in musk-melon seeds. It was also found that melon seeds contained considerable amounts of minerals, especially potassium, phosphorus and magnesium.

The melon is a favourable fruit for direct consumption. However, the seeds are thrown away which might be considered an economical and nutritional loss. Increased attention has been focussed in recent years on the utilization of by-products and wastes from food processing in order to regain these losses.

Therefore, the objectives of this study were to make a waste product available for human consumption by producing a beverage from melon seeds, to determine its nutritional value and to evaluate the consumer acceptance of the product. In this study, a milky beverage, traditionally named as 'Sübye', was made of ground melon seeds, sugar and water; and total energy, moisture, fat, protein, ash and some mineral and vitamin contents were determined.

MATERIALS AND METHODS

Materials

Ripe musk-melons (*Cucumis-melo* L.) were purchased from local markets of İzmir, Turkey. The ripe fruits were cut in half. The seeds were separated, washed thoroughly with water and then sun-dried. Commercial sucrose and tap water were the other ingredients used in the preparation of the beverage.

Preparation of the beverage

The sun-dried melon seeds were soaked in tap water at room temperature (25 ± 3°C) for 30 min. One hundred grams of the seeds were blended in an electrical blender at low speed for 2 min. Sixty grams of sugar and 200

ml of water were added for a second blending process. Once again, approximately 200 ml of water was added and mixed thoroughly. The mixture was passed through a kitchen sieve into a glass container. The residue was blended again with 200 ml of water. The slurry was passed through the sieve. The blending and sieving procedure was repeated until approximately 500 ml of the beverage was obtained.

Analyses

After the beverage was homogenized, 100 ml aliquots were taken for analyses. Energy, moisture, fat, protein, ash, mineral, vitamin C and the nutrient density determinations of the beverage were conducted. The energy value of the beverage was determined by the Adiabatic Bomb Calorimeter (IKA kalorimeter C 400 adiabatisch). The fat content was determined using the Gerber method according to Türk Standartlari Enstitüsü (1981). The protein content was determined by the Kjeldahl method (AOAC, 1990). The percentage of protein was calculated using the factor 6·25 × *N*. The moisture, ash and mineral contents of the beverage were determined by the methods of AOAC (1990). For the iron and magnesium determinations, a PYE Unicam SP9 Atomic Absorption Spectrophotometer was used. The vitamin C content was determined by the spectrophotometric method (PYE Unicam SP8-100 UV/VIS Spectrophotometer). Arsenic was determined using the silver diethyldithiocarbamate method (AOAC, 1990). All analyses were done in triplicate.

The nutrient density of the beverage was calculated by the Index of Nutritional Quality (INQ) using the equation below:

$$\text{Index of Nutritional Quality} = \frac{\%\text{ of nutrient allowance}}{\%\text{ of energy requirement}}$$

If the index is 1·0, the food supplies the nutrient need in the same proportion as the caloric need. If the index is above 1·0, the food provides the nutrient in greater proportion than the caloric need. Conversely, an index below 1·0 indicates that the food fails to provide a proportionate amount of the nutrient (Hansen, 1973). The nutritional quality of the beverage was evaluated by comparing with the United States Recommended Daily Allowances (USRDA) values.

The consumer panel test was applied to 50 panellists (ages ranging between 20 and 50). The freshly prepared beverage was presented to the panellists and they were asked to indicate their preferences on a 5-point hedonic scale ranging from 'like very much' to 'dislike very much' (Amerine *et al.*, 1965).

RESULTS AND DISCUSSION

Energy, moisture and macro-nutrient contents of the beverage are shown in Table 1. The energy value was found to be 67 kcal/100 g and the moisture content was 86·36%. The moisture content of melon seed was reported to be 6·39% (Lazos, 1986). It is obvious that the dilution of the ground seeds with water and thus an increase in the moisture content would cause a decrease in the amounts of other nutrients.

Table 1. Energy content and proximate composition of the melon seed beverage

Energy (kcal/100 g)	67 ± 1·09[a]
(kj/100 g)	280 ± 4·54
Moisture (%)	86·36 ± 0·13
Fat (%)	1·92 ± 0·15
Protein (%)	1·28 ± 0·15
Ash (%)	0·27 ± 0·03
Carbohydrate (%)[b]	10·2 ± 0·08

[a]Mean ± standard deviation.
[b]Carbohydrate value was determined by difference.

The fat content of the beverage was found to be 14·07% on a dry weight basis, lower than the value of melon seed which is reported as 37·8% (Lazos, 1986). This loss could be explained by the process applied in obtaining the beverage since some fat particles might have remained in the residue over the sieve. The same could apply to the protein content which was found to be 9·38% on a dry weight basis since the protein content of melon seed was reported as 25·2% (Lazos, 1986).

The micro-nutrient contents of the beverage are shown in Table 2. Magnesium (Mg) and iron (Fe) contents of the beverage were found to be 163 and 6·6 mg/100 g, respectively, lower than the melon seed values which were 256 and 7·3 mg/100 g, respectively, on a dry weight basis (Lazos, 1986). Arsenic was analysed as it might have come from the pesticides used, but no arsenic could be detected in the beverage. The vitamin C content of the beverage was very low (0·31 mg/100 g) compared with the daily human requirement of this vitamin (50 mg/100 g); therefore, this beverage could not be considered a good source of vitamin C.

Indices of Nutritional Quality for protein, iron and magnesium were found as 0·52, 1·34 and 1·48, respectively (Fig. 1). Indices for iron and magnesium were above 1·0 which indicated that the beverage is a good source of these nutrients in relation to the calorie content. However, this beverage could not be considered a good source of protein.

The consumer panel test results showed that the beverage was evaluated by the panellists as 'liked very much' (the overall score on a 5-point hedonic scale was 4·9).

This study has proved that some food wastes and by-products could be utilized to make them available for

Table 2. Micro-nutrient contents of the beverage

Micro-nutrient	Content (mg/100 g)
Magnesium	22·2 ± 4·48[a]
Iron	0·90 ± 0·14
Arsenic	—
Vitamin C	0·31 ± 0·01

[a]Mean ± standard deviation.

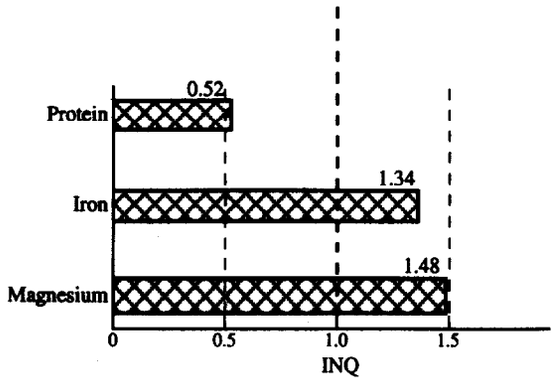

Fig. 1. Nutritional quality indices of the melon seed beverage.

human consumption. From the analyses performed in this study, melon seed beverage can be considered as a good source of magnesium and iron and a fair source of protein. It was free of arsenic and was highly accepted by the panellists as an alternative beverage. However, further research is needed on the other nutrients that were not analysed in this study, i.e. antinutritional factors and the effects of such processes as fermentation, pasteurization or freezing on this product, before it is presented for human consumption.

REFERENCES

Ajibola, O. O., Enijemo, S. E., Fasina, O. O. & Adeeko, K. A. (1990). Mechanical expression of oil from melon seeds. *J. Agric. Engng. Res.*, **45**, 45–53.

Amerine, M. A., Pangborn, R. M. & Roessler, E. B. (1965). *Principles of Sensory Evaluation of Food.* Academic Press, New York.

AOAC (1990). *Official Methods of Analyses* (15th Edn). Association of Official Agricultural Chemists, Washington, DC.

Considine, D. M. & Considine, G. D. (1982). *Foods and Food Production Encyclopedia.* Van Nostrand Reinhold Company, New York.

Hansen, R. G. (1973). An index of food quality. *Nut. Rev.*, **31**, 1.

Kaur, M., Mann, S. K., Hira, C. K. & Bajaj, S. (1988). Effect of musk-melon seed supplementation on the nutritive value of wheat chapati. *J. Food Sci. Tech., India*, **25**, 263–6.

Lazos, S. E. (1986). Nutritional, fatty acid and oil characteristics of pumpkin and melon seeds. *J. Food Sci.*, **51**, 1382–3.

Sharma, P. B., Lal, B. M., Madaon, T. R. & Chatterjee, S. R. (1986). Studies on the nutritional quality of some cucurbit kernel proteins. *J. Sci. Food & Agric.*, **37**, 418–20.

Teotia, M. S., Kour, S. & Berry, S. K. (1989). Sorption behavior of melon seeds. *J. Food Sci. Tech., India*, **26**, 288–9.

Türk Standartlari Enstitüsü (Turkish Standards Institute). (1981). Sütte yağ tayini (Gerber Metodu). TS 1018/Aralik.