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Effects of Cooking on the n-Hexanal Content of Peanut Milk

– Research Note –

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Abstract

The effects of cooking peanut kernels before grinding on the n-hexanal content of peanut milk was investigated. Analysis of headspace volatiles revealed that n-hexanal was greatly reduced by cooking peanut kernels before grinding. Total solids and protein content tended to decrease as cooking time was increased. The most satisfactory condition of cooking peanut kernels for preparing peanut milk was 10 min.

Key words: peanut milk, cooking, n-hexanal, beany flavor

INTRODUCTION

Procedures for producing peanut milk have been described in several reports (1-4). Since peanuts contain approximately 26% protein (5), milk-type beverage formulations from peanuts have potential for use as a substitute for cow's milk in developing countries. But it was reported that the beany flavor is considered as one of the major sensory defects when consuming peanut milk. Many studies on the beany flavor have been done to improve sensory qualities of soybean milk. It is recognized that pentanal, n-hexanal, 2-heptanal, 2-octenal, 2,4-nonadienal, 2,4-decadienal and pentanol arise from linoleic acid as a result of the catalytic action of lipoxygenase in soybean (6). n-Hexanal, which has a very low aroma threshold value, has been considered as one of the major compounds responsible for the beany flavor of soybean milk. Treatments to reduce the beany flavor of soybean milk include treatment at high temperature, rapid-hydration grinding, cooking the soybean slurry at pH below 3.85 (7) and blanching the soybeans before milling (8). Based on these reports, it is considered that chemical and sensory qualities of peanut milk change significantly upon heat treatments.

An objective of this investigation was to determine the effect of cooking peanut kernels before grinding on the n-hexanal content of peanut milk.

MATERIALS AND METHODS

Materials

Florunner cultivar peanuts (*Arachis hypogaea* L.) were used and stored at 7°C and 60% relative humidity.

Preparation of peanut milk

Peanut kernels were dry-blanched using a roller blancher (Ashton Food Machinery Co., Newark, NJ, USA), submerged in tap water (2 : 1, water : peanut) and soaked for 18 hr at 21~23°C. The soak water was then drained, and seeds were washed with fresh tap water, combined with water (2 : 1, water : peanut), and cooked at 100°C for 0, 10, 20 and 30 min in a steam jacketted kettle. After draining and washing with tap water, peanuts were mixed with distilled water (5 : 1, water : peanut), coarsely ground through a Morehouse Mill (Electra Motors, Anaheim, CA, USA) and filtered through unbleached muslin cloth. The filtered peanut milk was passed through a laboratory homogenizer (APV Gaulin, Inc., Everett, MA, USA). Homogenization was carried out at a pressure of 2000 N/m^2.

Chemical analyses

Total solid content was determined by drying 80 g samples at 60°C for 3 days and protein content was determined by the Kjeldahl method (9).

Analysis of headspace volatiles

Quantitation of n-hexanal in the headspace gas in sealed containers of peanut milk was done using the method described by Young and Hovis (10). Peanut milk (1.5 mL) was deposited in a 5-mL vial and tightly sealed with a Teflon-lined silicone disc using a screw cap. After heating the vial at 120°C in a block heater for 15 min, headspace gas (1 cc) was withdrawn using a syringe and injected into a gas chromatograph (5890A, Hewlett-Packard, Avondale, PA, USA) fitted with a flame ionization detector and a 1 m×2 mm (i.d.) glass column packed with 80~100 mesh Propak P (Waters, Millipore Corp., Milford, MA, USA). The carrier gas (nitrogen) flow rate was adjusted to approximately 40 mL/min, son-hexanal eluted at 5.00±0.03 min. The initial column temperature (120°C) was programmed to increase at a rate of 20°C/min to 200°C, where it was held for 3 min. The injector and detector temperature was 220°C. n-Hexanal standard was quantified using diffusion oil (Dow-Corning, Midland, MI, USA) as a carrier.

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RESULTS AND DISCUSSION

Chemical analyses

Total solids content of peanut milk decreased as the cooking time increased (Fig. 1). Peanut milk prepared from cooking peanut kernels for 30 min at 100°C before grinding has the lowest value. The protein content in peanut milk also decreased as the cooking time increased (Fig. 2). Exposure of protein to heat resulted in denaturation and decrease of solubility, which is caused by fixation of protein bodies (11). Since a higher total solid and protein content is desirable in terms of nutrient availability, minimal cooking time should be given.

Analysis of headspace volatiles

Flavor component changes as determined by the analysis of headspace gas volatiles showed that the n-hexanal content was steadily declined during cooking (Fig. 3). Peanut milk prepared from cooking peanut kernels more than 10 min at 100°C had significantly lower levels of n-hexanal compared to that without cooking. Since n-hexanal has been known as one of the compounds responsible for the undesirable beany flavor, an overall reduction of n-hexanal in headspace volatiles can be associated with improvement of sensory qualities of peanut milk. However, the sulfur aromatic compounds resulting from the hydrolysis of the disulfide bonds are believed to be present in legumes in considerable amounts (12). Therefore more studies are needed to determine the precise relationship between headspace volatiles measured from the gas chromatographic analysis and sensory qualities of peanut milk. Even though cooking peanut kernels for 30 min before grinding has the lowest value in n-hexanal content, this processing condition drastically reduces the amount of protein extracted. Therefore, it is considered that cooking peanut kernels for 10 min at 100°C before grinding is the most satisfactory condition for preparing peanut milk.

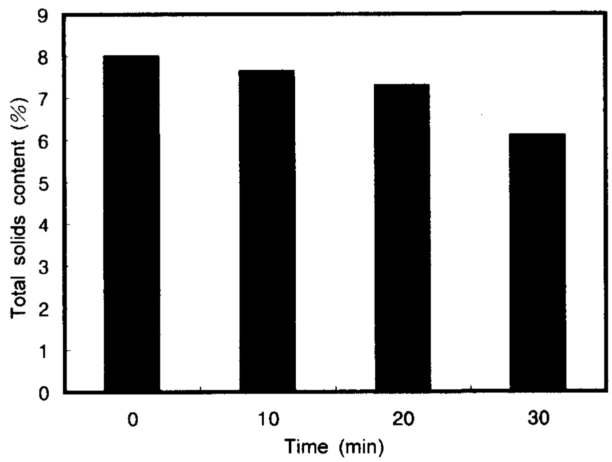

Fig. 1. Changes in total solids content of peanut milk during cooking.

Fig. 2. Changes in protein content of peanut milk during cooking.

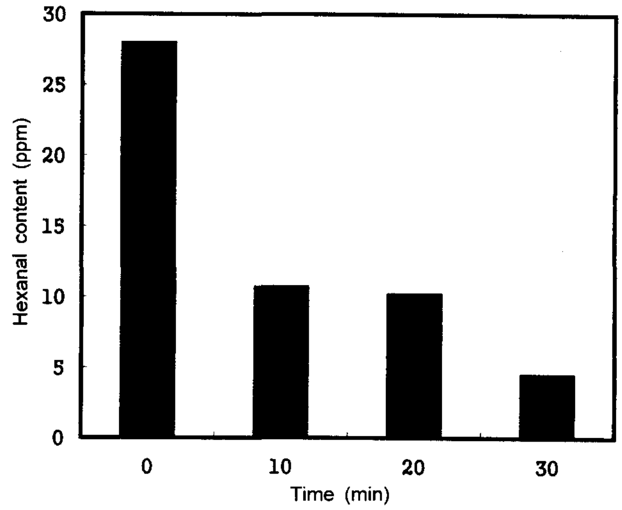

Fig. 3. Changes in hexanal content of peanut milk during cooking.

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