Development of Canned Ready-to-eat Rice Porridges for Primary School Children

Kharidah Muhammad, Ma Yongqin, Dzulkifly Mat Hashim and Salmah Yusof

Faculty of Food Science and Biotechnology
Universiti Putra Malaysia
43400 UPM, Serdang, Selangor
Malaysia

E-mail of Corresponding Author: kharidah@fsb.upm.edu.my

Key words: congee, physical, chemical, microbiological and sensory evaluation.

Introduction

Rice has been the staple food in Malaysia for centuries. However, in recent years, the consumption of whole rice in Malaysia, either boiled or steamed, is declining. It is envisaged that the consumption of rice in these two forms will continue to decrease, but the demand for rice in the form of rice-based products such as noodles, snacks and other forms of processed rice will increase. Thus, efforts should be directed toward development of more convenient rice-based foods. One of these should be ready-to-eat rice porridge, which is very popular in Japan, China and South Korea, and still not found in the market in Malaysia. In addition to this, a survey of food products available in the Malaysian market showed that ready-to-eat nutritious food products for children are lacking. The recommended daily dietary allowances (RDA) for energy and nutrients for 7-12 years old children in Malaysia are 2190-2600 kcal, 35-43 g protein, 450-650 mg calcium, 10 mg iron, 400-575 μg RE vitamin A, 0.9-1.0 mg thiamin, 1.3-1.6 mg riboflavin, 14.5-17.2 mg NE niacin, 100 μg folic acid, 1.5-2.0 μg vitamin B_{12} and 20 mg ascorbic acid. To meet this requirement, a child aged 7-12 years (primary school) has to consume a combination of cereal, fish, meat, egg, vegetables and fruits per meal. This combination can be presented to a child in the form of canned ready-to-eat rice porridge which can be made available through a vending machine which is coupled to a means to heat the can prior to its opening.

Materials and Methods

Three rice varieties; long-grain rice, broken rice and glutinous rice were obtained from Padiberas Nasional Berhad, Sekinchan, Selangor. Texturised soy protein was obtained from Markaids Sdn Bhd. in Kuala Lumpur. Chicken (breast), beef, fish(Jenahak), yellow dhal (legume), carrots, potato, pumpkin, sweet potato, red onions, spring onions, garlic, ginger, stock (chicken, fish, beef and prawn), salt and sugar used were purchased from the local market. Long-grain rice was mixed with broken rice or glutinous rice at a ratio of 0:100, 25:75, 50:50, 75:25 and 100:0, respectively. Each mixture was processed into canned plain rice porridge. The physical and sensory properties of the plain rice porridges were evaluated. An optimum rice ratio was selected for the preparation of chicken-carrot, beef-potato, fish-pumpkin or dhal-sweet potato rice porridge. Freshly prepared canned chicken-carrot, beef-potato, fish-pumpkin or dhal-sweet potato rice porridge were evaluated to determine their physico-chemical, microbiological and sensory qualities. The optimum conditions for canning were established earlier. A storage study was then carried out to determine the quality changes in the porridges stored at room temperature (27°C) and in a refrigerator (4°C) for 3 months.

Results and Discussion

Various combinations of broken, long-grain and glutinous rice were processed into canned plain rice porridge. The best rice to use, in terms of physical and sensory qualities of canned rice porridge produced, was found to be 100% long-grain rice. For economic purposes, up to 50% substitution of long-grain rice with broken rice is possible without changing the physical and sensory qualities of the rice porridge produced significantly. When long-grain rice was substituted with increasing amounts of glutinous rice, the pH value and whiteness of the porridges decreased but their %Brix and viscosity increased gradually. The porridges exhibited poor canning stability and were organoleptically unacceptable in all attributes studied when glutinous rice was in excess of 25% in the composite rice. When canned chicken-carrot, beef-potato, fish-pumpkin or dhal-sweet potato rice porridge were prepared using 50:50 long-grain and broken rice mixture, the beef-potato rice porridge was found to be the best in terms of nutritional quality for primary school children while the fish-pumpkin rice porridge was ranked the first in terms of sensory quality. The chicken-carrot rice porridge was also acceptable nutritionally and sensory wise but the dhal-sweet potato rice porridge was rejected by the panellists although it was satisfactory nutritionally. When the canned fish-pumpkin or beef-potato rice porridge was stored at room temperature for three months, it was found to be stable physically, nutritionally and microbiologically, and was well accepted by the panellist. Nevertheless, if these canned porridges were stored in a refrigerator, they would be stable physically, nutritionally and microbiologically up to three months, but their sensory qualities would deteriorate after one month of storage. Low storage temperature caused the porridge to be thinner in appearance, whiter in colour and scored less in terms of flavour and taste.

Conclusions

A composite of broken rice and long-grain rice at a ratio of 50:50 is recommended for the production of canned plain rice porridge. A can of the fish-pumpkin, beef-potato or chicken-carrot rice porridge can provide a quarter of the RDA for energy and nutrients for 7-12 years old children. All porridges stored at room temperature and in the refrigerator complied with the standard for food hygiene and safety up to 3 months of storage. However, the canned rice porridges should be stored

at room temperature to maintain its sensory quality.

Benefits from the study

Three types of tasty, nutritious and shelf-stable canned rice porridge for 7-12 years old children were obtained.

Literature cited in the text

None.

Project Publications in Refereed Journals

None.

Project Publications in Conference Proceedings

None.

Graduate Research

Ma Yongqin. 2000. Food Technology [M.Sc.]. Universiti Putra Malaysia.

Research funded by the Intensification of Research in Priority areas (IRPA) - Supported by IRPA RM-7 (1996-2000), Cycle 1997, Grant 01-02-04-0228.