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PREPARATION OF A READY-TO-USE COCONUT *CUM* SPICES PASTE FOR CHICKEN CURRY AND EVALUATION OF ITS PHYSICO-CHEMICAL AND STORAGE PROPERTIES

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ABSTRACT

A Ready-to-use Coconut cum Spices Paste (RCSP) suited for making chicken curry is likely to have a good demand among both local urban consumers and Sri Lankan communities overseas. The main objective of this study was to develop such a product to exploit this perceived demand, and evaluate its physico-chemical and sensory properties.

A RCSP for chicken curry was prepared from roasted spices, onions, garlic, ginger, coconut paste and coconut oil. Its proximate composition and water activity were determined, and the product was packed in LLDPE/Nylon and LLDPE/Polyester laminated pouches, hermetically sealed, and stored at room temperature (28 +/-2^0 C). Alpha tocopherol at three levels (0, 50 ppm and 100 ppm) was tested as an antioxidant. Peroxide value, free fatty acids (FFA) value, sensory properties and microbial levels were determined at two-monthly intervals during the storage period of six months.

This product contained 5.9% moisture, 7.4% minerals, 56.5% fat, 6.7% protein and 4.2% fiber and its water activity was 0.76. The Peroxide value of all samples tested over the entire storage period remained unchanged at zero. FFA value of the RCSP, with 0 and 50 ppm tocopherol, increased from 0.046 to 0.072% during storage, irrespective of the type of packing material used..At 100 ppm tocopherol, FFA level increased from 0.046 to 0.150% suggesting that, tocopherol may act as a pro-oxidant at the higher concentrations. However, at these levels of increase in FFA there was no effect on rancidity development or the overall sensory properties. The product was found to be microbiologically safe up to six months of storage.

INTRODUCTION

A large number of ingredients are used in cooking food, especially in the preparation of curries. These ingredients include coconut, spices, table salt, vinegar etc., which are used to impart flavor, taste, texture and also enhance the nutritional value of food.

Coconut is traditionally used in preparing food in the coconut-growing countries. It provides the cooking medium and enhances the texture and flavor of curries. Coconut is a good source of nutrients. Fat is the major nutrient in coconut and therefore it is a good source of energy. Coconut is also a good source of protein. Coconut meat (kernel) contain considerable amounts of essential amino acids. Of particular importance is lysine which is deficient in cereal based foods (Woodroof, 1979). Considerable amounts of vitamins, especially vitamin B complex, and minerals are present in coconut meat (Fernando, 1995). The use of coconut paste in the preparation of curries enhances its nutritional value (Anon, 2002). Coconut paste is the product obtained by grinding of dried scraped coconut and has a longer shelf-life compare with aqueous form of coconut

In addition to extracts of coconut meat, a number of spices are incorporated in curries. Chillies, garlic, onion, ginger, coriander, cumin, cloves, pepper and cardamom are some of the important spices used in cooking curries. Spices possess a number of beneficial properties such as antioxigenic, antibacterial, physiological and flavoring, as well as health and medicinal properties (Pruthi, 1998). This makes spices a very important component of cooked food.

The preparation of delicious and wholesome curries is both time consuming and labour-intensive due to the need to roast, grind and blend spices, scrape coconuts extract its 'milk' with water, dispose residues etc. Today, especially in urban areas, there is a demand for convenience products. In response to this demand a variety of instant spice mixtures are already available in the market. However, a product combining spices and coconut is not available. As a quality product of this nature would no doubt be a boon to busy housewives, this study aims to develop

MATERIALS AND METHOD

The raw materials, whole spices, corn flour, vitamin E, table salt and packaging materials were procured from the local market. Fresh coconuts were supplied by Bandirippuwa Estate, Lunuwila.

Preparation of the curry powder with selected spices

Preliminary studies were conducted to determine the most suitable blend of spices for preparing chicken curry. These findings showed that the spice ingredients and quantities required for the optimum blend were: roasted red chillies (*Capsicum annum*) (1000 g), roasted coriander (*Coriandrum sativum)* (400 g), cumin seed (*Cuminum cynimu*) (150 g), fennel seed (*Foeniculum vulgare*) (250 g), fenugreek (*Anethum graveolens*) (20 g), black pepper (*Piper nigrum*) (50 g), cardamom (*Elettaria cardamomum*) (20 g), cloves (*Eugenia caryophyllus*) (20 g), turmeric (*Curcuma longa)* (20 g) and

cinnamon (*Cinnamomum zeylanicum*) (20 g). Each of the spices was powdered separately in a grinder (Super Grinder, HL 1641/D). The powdered spices were then mixed in a blender (Super Grinder, HL 1641/D) to get a homogenous product.

Preparation of coconut paste

Coconut paste was prepared according to the method described by Anon (2002)

Preparation of the ready-to-use coconut *cum* spices paste (RCSP)

One litre of Coconut oil was heated in a stainless steel vessel to 120 ^{0}C, and chopped garlic (200 g), ginger (100 g), red onions (1500 g), green chillies (200 g) and curry-leaves (80 g) and vitamin E were added and heated for 5 min. Two kilograms of the mixture of powdered spices was added to the hot coconut oil and stirred continuously. Table salt (80 g), corn flour (200 g) and vinegar (4% acetic acid) (200 ml) were also added while mixing. Finally, coconut paste (4000 g) was added and the mixture was heated for a further 10 min at 80 ^{0}C. Vitamin E (Alpha tocopherol) was tested at three levels, 0, 50 ppm and 100 ppm, as an antioxidant for extending shelf-life and delaying the development of rancidity.

Storage of RCSP

RCSP was packed in Nylon/LLDPE and Polyester/LLDPE laminated pouches and hermetically sealed. Each pouch contained 100 g of the paste. Twelve pouches of each type were stored at room temperature (28 +/-2^{0} C). Initially, and at 2-monthly intervals, two samples of each pouch type were removed for peroxide value and free fatty acids (FFA) value analysis, and for a sensory evaluation.

Sensory evaluation

The sensory evaluation was performed on a chicken curry prepared with the ready-to-use RCSP. Fifty grams of RCSP was mixed with 450 g chicken and 300 ml water in a stainless steel vessel. The mixture was brought to the boil and allowed to simmer for 10 minutes. The chicken curry thus prepared was presented to a panel of 20 untrained judges for grading its colour, taste, flavour and overall acceptability on a 5-point Hedonic scale, with 5 for excellent in all respects and 1 for highly disliked samples.

Analysis

Proximate composition of RCSP was determined by standard methods. Moisture, total ash and crude fat were analyzed using AOAC (2001) and

crude protein and crude fiber were estimated using the method described in Pearson (1978) and carbohydrate content by difference.

For studies on rancidity development (determination of Peroxide and FFA values), a 30 g sample of the paste was shaken with 250ml chloroform and blended.

To determine FFA values a 25 ml aliquot of the chloroform extract was treated with 25 ml of neutralized 95% ethanol solution and titrated with I standard 0.1N NaOH using 1% phenolphthalein solution as indicator.

To determine peroxide value, a 25 ml aliquot of the chloroform extract was mixed with 37 ml of glacial acetic acid and 1 ml saturated KI solution and allowed to stand for about 1 minute. Then, 30 ml of distilled water was added and titrated with 0.01N $Na_2S_2O_3$ using starch as indicator.

The microbial status of the product was evaluated by measuring total plate count, as described by Ranganna (1996).

Water activity of the product was determined by measuring the equilibrium relative humidity (ERH) by a modification of the graphical interpolation method of Landrock and Proctor. Five gram samples of RCSP were exposed for 24 hours to different relative humidity levels viz. 10, 30, 50, 70 and 95% at room temperature in desiccators containing known concentrations of H_2S0_4 and the gain or loss in weight of each sample determined. The values were plotted with reference to the RH; the gain in weight being shown above, and the loss in weight shown below, a horizontally drawn zero base line representing no change in weight. A smooth curve was drawn through the plotted points and the ERH interpolated at the point where the curve intersected the zero base line. The water activity was calculated as ERH%.

Statistical Analysis

A non-parametric ranking procedure was used with Friedman rank sum test for the evaluation of appearance, taste, odour and overall acceptability. SAS statistical program was used for analyzing the storage data.

RESULTS AND DISCUSSION

Traditionally, Sri Lankans use roasted spices for the preparation of meat curries. According to Pruthi (1998) the inclusion of roasted spices in the spice mixture enhances the sensory properties as many chemical reactions occur during roasting such as maillard browning, caramalization, streaker degradation, pyrolysis of protein and thermal degradation of lipids, that result in flavor and aroma development. Furfural, hydroxy methyl furfural,

pyridines, pyrazines, aldehydes and ketones are a few examples of flavor compounds generated during roasting.

Proximate analysis

The proximate composition of RCSP is presented in Table 1.

Table 1: Proximate composition of the RCSP

Constituent	Composition (%)
Moisture	5.9±0.5
Ash	7.4±0.3
Crude fat	56.5±1
Crude protein	6.71±0.8
Crude fiber	4.21±0.5
Carbohydrate	19.3
Water activity	0.76

The moisture content and water activity (a_w) of RCSP was 5.9±0.5% and 0.76, respectively. Water activity was calculated as ERH/100. Water activity influences the growth of microorganisms. Water activity *per se,* prevents the growth of bacteria below 0.86, yeasts at 0.78 and moulds below 0.95-0.96 (Kaplow, 1970). Fat content of RCSP was about 56% and comes mainly from the coconut oil and coconut paste used in its preparation. Since coconut fat is saturated, product containing low amount of moisture. Protein and crude fibre contents of RCSP was about 6.7% and 4.2%, respectively. The relatively high levels of these two constituents in RCSP could be traced to the use of coconut paste in its preparation. Consequently, using RCSP rather than a spice mix plus coconut milk extracted from scraped coconut, would increase the quality and quantity of protein and crude fibre in the curry.

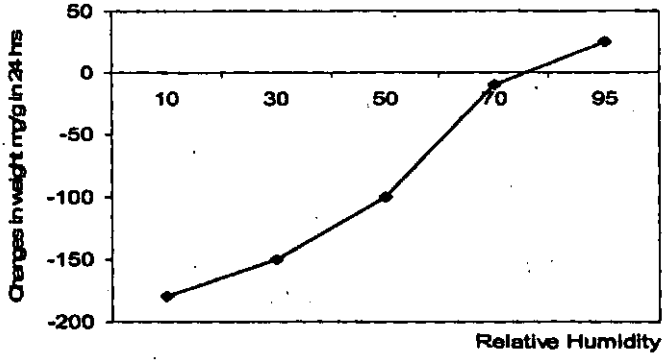

Figure 1 ERH curve for Instant Curry Paste at RT

Storage study

Results of the sensory evaluation (Table 2) showed that over the six-month storage period, the score for overall acceptability remained at four on the five point hedonic scale, irrespective of the type of packing material and level of alpha tocopherol.except the sample with 100ppm alpha tocopherol, packed in polyester/LLDPE

Table 2: Effect of packing material, alpha tocopherol level and period of storage on FFA value and sensory score of RCSP

Sample	Storage Period (months)	FFA Value	Sensory score (overall acceptability)
A1	0	0.046	4.00
	2	0.073	4.00
	4	0.063	4.10
	6	0.073	3.90
A2	0	0.046	3.80
	2	0.074	3.98
	4	0.062	3.98
	6	0.073	3.78
A3	0	0.046	3.95
	2	0.072	3.68
	4	0.065	3.75
	6	0.072	3.70
A4	0	0.046	3.86
	2	0.069	4.01
	4	0.060	3.98
	6	0.069	4.00
A5	0	0.046	3.79
	2	0.140	3.83
	4	0.124	3.78
	6	0.142	3.80
A6	0	0.046	3.08
	2	0.160	3.00
	4	0.135	3.15
	6	0.165	3.00

(A1=No tocopherol + Nylon/LLDPE packs; A2=No tocopherol + Polyester/LLDPE packs; A3=50 ppm tocopherol + Nylon/LLDPE packs; A4=50 ppm tocopherol + Polyester/LLDPE packs; A5=100 ppm tocopherol + Nylon/LLDPE packs; A6=100 ppm tocopherol + Polyester/LLDPE packs)

FFA value and the peroxide value were used to estimate rancidity development in RCSP. The FFA value and the peroxide value are measures of hydrolytic rancidity and oxidative rancidity, respectively (Lawson *et.al.* 1984). Tocopherols compete with oxidation reactions and suppress the oxidation process in a food system (Fennima et al, 1995).

All treatments (packing materials, tocopherol and storage levels) recorded a peroxide value of zero. This indicates that oxidative rancidity did not occur in RCSP over the storage period of six months. On the other hand, the FFA level increased in all treatments after two months of storage. Generally the increases were marginal; the steepest increases were recorded in the RCSP samples with 100ppm tocopherol.

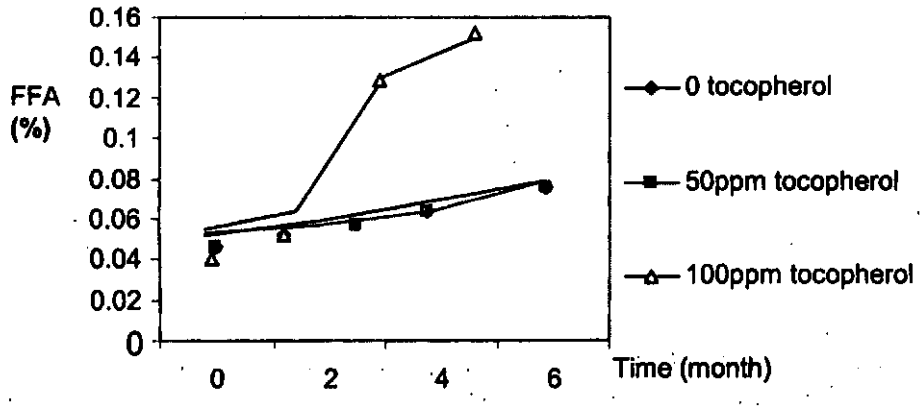

Figure 2: Effect of α tocopherol level on FFA

RCSP samples with zero and 50 ppm tocopherol had the lowest mean FFA values. These results support the report that tocopherols are most effective at relatively low levels, and could act as a pro oxidant at high concentrations Furia (1983).

The two packaging materials behaved in similar fashion and there was no significant differences in the FFA levels. This indicates that both Nylon/LLDPE and Polyester/LLDPE laminated pouches have similar water vapor and oxygen barrier properties.

Changes in FFA level did not affect the sensory properties of RCSP. The increases in FFA values were low in comparison to other fatty foods. This may due to the use of good quality oil, low moisture and water activity and the antioxidant properties of spices. There are several reports on the antioxidant effect of spices on fat in certain foods Pruthi (1998). The results showed (Figure 2) that the addition of alpha tocopherol is not essential to delay rancidity development in RCSP, and that high doses may promote oxidation.

Microbial changes in during storage

The microbial load in samples of RCSP are presented in Table 3.

Table 3: Effect of packing material, alpha tocopherol level and period of storage on microbial load of RCSP

Sample	Total plate count			
	Fresh product	After 2 months storage	After 4 months storage	After 6 months storage
A1	$2.1x10^2$	$9.0x10^2$	$6.5x10^2$	$9.0x10^2$
A2	$2.1x10^2$	$8.9x10^2$	$7.0x10^2$	$8.5x10^2$
A3	$2.1x10^2$	$9.9x10^2$	$7.5x10^2$	$9.0x10^2$
A4	$2.1x10^2$	$1.0x10^2$	$8.0x10^2$	$7.0x10^2$
A5	$2.1x10^2$	$8.9x10^2$	$7.0x10^2$	$8.0x10^2$
A6	$2.1x10^2$	$9.6x10^2$	$7.2x10^2$	$9.6x10^2$

(A1=No tocopherol + Nylon/LLDPE packs; A2=No tocopherol + Polyester/LLDPE packs; A3=50 ppm tocopherol + Nylon/LLDPE packs; A4=50 ppm tocopherol + Polyester/LLDPE packs; A5=100 ppm tocopherol + Nylon/LLDPE packs; A6=100 ppm tocopherol + Polyester/LLDPE packs)

Although the microbial load in the RCSP increased during the six-month period of storage it remained well within safety limits. This may be due to the low moisture level, low water activity and the effect of spices in RCSP. According to Pruthi (1998), spices have antimicrobial properties and contain natural bactericides, and bacteriostatic and fungi static compounds. Most of these properties depend on chemical compounds present in spices e.g. allicin in garlic, eugenole in cloves, gereniole in ginger and cumin aldehyde in cumin. Also, coconut paste has a low water activity, and as a major component of RCSP it would have a positive effect on the keeping quality. Total colony counts were within the range of safety levels and RCSP stored at a room temperature of 28^0 C is microbiologically safe, at least for a period of six months.

CONCLUSION

The production of an acceptable ready-to-use coconut *cum* spices paste to be used as a convenience product in preparing curried chicken is feasible. The product has an extended shelf-life at room temperature, without added preservatives or antioxidants.

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