Formulation of Instant Soup Mix Powder Using Uncooked Palmyrah (*Borassus flabellifer*) Tuber Flour and Locally Available Vegetables

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ABSTRACT

Vegetable and prawn added soup prepared with palmyrah tuber flour known as 'Odiyal Kool' is one of the popular and traditional food of Northern Sri Lankan population. This study was aimed at to develop dehydrated instant soup mix to reduce the difficulty in the preparation of soup. An instant dehydrated vegetable and prawn added soup mix were developed using uncooked palmyrah tuber flour as thickening agent and dried vegetables, salt, spice and tamarind paste as other ingredients. Initially the saponin content of the flour was removed by a pretreatment before adding to the soup. The ingredients such as manioc, long bean, carrot, moringa leaves, onion and garlic were dehydrated in an oven using established procedures. The optimum concentrations of uncooked palmyrah tuber flour, tamarind paste and garlic powder were determined by carrying out preliminary trials using five point hedonic scale sensory evaluation tests. Then optimum amount of prawn powder was incorporated into prawn added soup mix in addition to other ingredients used in the vegetable soup mix using similar trials. Soup mix: water ratio of 1: 12.5 was selected as the most preferable level for the reconstitution of the soup mix. Proximate analysis revealed that the final vegetable and prawn added soup mix respectively contained 3.24 & 4.76 moisture; 1.16 & 1.50 fat; 5.9 & 7.15 protein; 5.58 & 8.66 asH 4.8 & 5.1 fibre; 79.32 & 72.8 carbohydrate; and 5.56 & 6.52 pH. The total plate count of fresh vegetable and prawn added soup mix was $2.1x10^3$ and 2.9×10^3 cfu/g respectively which was within the safe range. The result of the shelf life evaluation studies namely moisture content, sensory evaluation and microbial analysis revealed that both soup mixes could be stored for two months without affecting their quality. The results of the cost of production analysis revealed that the unit price for vegetable and prawn added soup mix were 30.11and 51.06 rupees respectively.

Key words- Dehydrated vegetables, Soup mix, Uncooked palmyrah tuber flour

1. INTRODUCTION

Soup is the one of the traditional food which can be classified as an appetizer, warm food during cold and sick. In the modern world commercially prepared instant soup such as canned, dehydrated, and frozen soups have replaced homemade soup as preparing a soup is a time consuming process. Instant soup can become an alternative food for breakfast because it could fulfill the adequacy of energy and nutrient required by the body, very practical in preparation and taking only short time to serve [1].

Dry soup mix contained vegetables in many forms have several advantages over canned soups [2].These soup mixes are popular among the people because of easy to make. Among all dehydrated products instant mixes gained popularity in the recent years, by way to providing convenience, hygienic, extensible shelf life and easy to carry. So that it reduces the transportation cost and available in various packages and it requires very less time to prepare food [3].

Palmyrah has an existing potential of producing 3000 metric tons of tuber flour annually [4]. Palmyrah tuber flour is considered a good source of carbohydrates, fiber and some micronutrients such as calcium, magnesium and ferrous ions [5].The consumption of the 'odiyal' flour can be increased by the introduction of more value added products with good palatability. 'Odiyal' flour was used up to certain level in the instant soup mix. The nutritive and health beneficial components found in the tuber might improve the quality of soup mix.

Vegetables are low in calories and high in fiber content. They are also best source of antioxidants and other phytonutrients. An important advantage in using dehydrated vegetables are available year round rather than seasonally [6].

This study was carried out to develop consumer preferable nutritious precooked soup mix from locally available resources and evaluates the nutritional as well as sensory attributes of the developed mix. The objective of this study is to develop a dehydrated instant

vegetable soup mix and prawn added soup mix using 'odiyal' flour and a mix of compatible ingredients namely vegetables (manioc, long bean, carrot, moringa leaves and onions),rice grits, spice(garlic), salt, chili powder, tamarind and prawn powder.

2. MATERIALS AND METHODS

This study was carried out in the laboratory of Palmyrah Research Institute (PRI), Kaithady, Jaffna. Raw materials were procured from the sales centre of Palmyrah Development Board ('Katpaham') and local market. Analytical test were conducted in PRI Laboratory and laboratory of Dept. of Agricultural Chemistry, University of Jaffna. All the chemicals used for the analysis were of analytical grade and each experiment was carried out in triplicates.

Preparation of uncooked palmyrah tuber flour ('Odiyal' flour)

'Odiyal' flour was sieved using 60-mesh size sieve and soaked in excess water for about two hours to remove soluble bitter compounds, which are present in 'Odiyal' flour. After draining the excess water wet 'odiyal' flour was mixed with the required amount of tamarind paste according to the soup composition (Table 5). Then the 'odiyal' flour tamarind paste mix was spread as thin layers and dried in an oven at 80°C for 3 hours. The dried flour paste mix was ground with a mechanical grinder, sieved off, packed and kept at room temperature (28±2°C) until further use.

Preparation of vegetables

Selected vegetable samples such as long bean, carrot, moringa leaves were blanched for 3-5 minutes, immersed in 0.2% sodium metabisulphite (SMS) solution, and dried in an oven for specified temperature and time (long bean-60^0C for 9 hours, carrot-40^0C for 12 hours and moringa leaves-40^oC for 6 hours) Peeled and boiled manioc tubers were dried at 65^0C for 12 hours. Peeled onion and garlic samples were sliced and dried in an oven at 60^0C for 5-6 hours. The whole dried samples except onion and garlic were ground and sieved off to a thickness of 0.5mm using NO.35 sieves. The ground onion and garlic samples were sieved off to a thickness of 0.25mm using No.60 sieves. These ground and sieved samples were packed and kept at room temperature (28±2°C) until further use [6, 7].

Preparation of prawns

Fresh and good quality prawns were selected, their skin was peeled off and cooked with excess 2 %(w/v) salt solution in pan. The cooked prawns were sliced into small pieces and dried in an oven for 10 hours at 65°C and the dried product was ground, packed and kept at room temperature (28±2°C) until further use.

Optimization of ingredients

All the ingredients were mixed according to the specified ratio (Table 5) for the development of soup mix.

In sensory evaluation, each sample was subjected to five-point hedonic scale test (5-like very much, 1- dislike very much) and acceptability of sample was judged by 30 untrained members. The panelists judged the sensory characteristic such as appearance, colour, aroma, texture, taste mouth feel and overall acceptability of the samples.

In the first trial, the amount of uncooked palmyrah tuber flour was changed (5, 10, 20, 30, and 35 g) and all other ingredients were kept at the same level (Table 1). Then a panel of judges tasted the developed soup mix samples. The most preferable amount of 'odiyal' flour used for the soup mix was selected from results of the above panel.

In the second trial the soup mix was prepared by using different amount of tamarind paste (5, 10, 15 and 20 g) (Table 2).The most preferable amount of tamarind paste used for the soup mix was selected from the results of the sensory panel. Similarly, the most preferable amount of garlic was selected in the third trial based on the evaluation of sensory panel (Table 3). Based on the results of the sensory panel the ingredients needed for the vegetable soup mix was finalized.

Then in the fourth trial prawn added soup mix was prepared by using different amount of prawn powder (6.3, 12.6 and 18.9 g) and maintaining all other ingredients at the same level similar to vegetable soup mix (Table 4). The most preferable amount of prawn powder was selected from the results of the sensory panel.

Table 5 gives the optimized amount of ingredients used for the preparation of both vegetable and prawn added soup mix.

Proximate analysis

Moisture, ash, fat and fibre content were analyzed by standard AOAC methods [8]. Protein content was analyzed by Kjeldhal method [9] and Total carbohydrate content was determined by subtracting the measured protein, fat, ash and moisture from 100 [9]. Calorific value was estimated by multiplying the percentages of protein, fat and carbohydrate with their respective physiological fuel value. pH value was determined with pH meter.

Reconstitution of the formulated soup mix

The optimum condition for the reconstitution of formulated soup mix was evaluated by conducting preliminary trials. Initially known weights of soup mix samples (40g) was taken and mixed with different amounts of water (400, 500 and 600ml) separately and heated for 5 minutes in a hot plate. The appearance

and consistency of soup was observed by a panel. The optimum amount of water required for reconstitution was selected based on the evaluation made by the panelists.

Shelf life study

The vegetable and prawn added soup mix were packed in high density poly ethylene bags and kept at ambient temperature (28±2°C) for a period of 2 months. The changes in moisture content, microbial count (total plate count and yeast and mould count) and sensory characters were evaluated periodically at monthly interval.

Cost of production

Cost of production was estimated separately for both type of soup mixes and presented for unit (40 g) weight.

Statistical analysis

Friedman non-parametric statistical method was used to analyze the sensory evaluation data based on 5-point hedonic scales using Minitab software. The triplicate data of proximate contents were statistically analyzed by Completely Randomized Design (CRD) using analysis of variance (ANOVA) in SAS statistical software (Version 9.1). The significant differences were compared at 95% confidence interval ($p<0.05$) using Duncan's New Mul tiple Range Test (DNMRT).

3. RESULTS AND DISCUSSION

Proximate analysis results of vegetables and prawn added soup mix powder are given in Table 6.

The average moisture content of the vegetables and prawn added soup mix powder were 3.24 and 4.72% respectively. According to the U.S standard, the moisture content of the dry product must not greater than 5%. Prawn added soup mix (7.15%) had significantly ($p>0.05$) higher total protein content than vegetable soup mix (5.09%). The two soup mix samples had lower fat content (1.16 and 1.50%) than that reported by Abeysinghe and Illeperuma [2] for MSG free instant vegetable soup mix (4.1%). The ash content of the prawn added soup mix (8.66%) significantly higher ($p>0.05$) than the ash content of the vegetables soup mix (5.58%).This could be the due to mineral content of prawn powder and pre drying treatments of the prawns (cooking with 2% salt solution). Singh *et al*, [10] also observed higher percentage of ash (13.5%) content during the development of mushroom-whey soup powder. The fiber content of vegetable soup mix and prawn added soup mix were 4.8% and 5.10% respectively. The fiber content 'odiyal' flour incorporated soup mix was higher than other soup mixes [2]. This may be due to the higher fiber content of 'odiyal' flour (5.6%)[13].

Optimization of ingredients

In the first trial 35g 'odiyal' flour incorporated soup mix had obtained significantly higher level ($p>0.05$) of median values for most sensory characters when compared to other treatments. In the second trial 10 g tamarind paste incorporated soup mix had obtained significantly higher ($p>0.05$) level of median values for most sensory characters when compared to other treatments. Similarly in the third and fourth trials 0.082 g garlic mix and 12.6 g prawn powder added soup mix had got significantly higher level ($p>0.05$) of median values for most sensory characters when compared to other treatments.

Reconstitution of the formulated soup mix

Among the different ratio of reconstitution (1:10, 1:12.5. 1:15) the ratio of 1:12.5 was widely accepted by the panel of judges as the optimum level of reconstitution for both vegetable and prawn added soup mixes (Table 7).

Shelf life study

There was no significant difference in the sensory scores of both soup powder samples stored at room temperature (28 ± 2^0C) in high density polyethylene packaging materials for two months. Therefore, the developed soup mix samples have acceptable sensory character up to 2 months (Table 8).

Estimation of moisture content during storage

The initial moisture content of the vegetable soup mix (3.24%) increased to 3.25% after one month and no the change at the 2nd month. The initial moisture content of the prawn added soup mix (3.21%) increased to 3.24% after one month and at the 2nd month it was increased to 3.25%. The moisture content did not exceed 5% within 2 months, and this moisture content is acceptable for dehydrated vegetables products to avoid spoilage.

Microbial analysis

Both of soup mix samples showed negative results for the yeast and mold at 10^{-1} dilution. No molds and yeast growths were detected in both the fresh soup mix samples. Heat treatment would have prevented the growth of yeast and mold. The growth of yeast and mold was not observed at two months. Aerobic plate count of the fresh vegetable soup mix was 2.1×10^3cfu/g and prawn added soup mix was 2.9×10^3 cfu/g .A slight increase in aerobic plate count was observed in both samples at 2 months.

Jey reported that the product is microbiologically safe if the total microbial count of dehydrated soups is less than $1x10^4$cfu/g [11]. The ITI report point out that total bacterial count of their formulated soup is $3.8x10^3$ cfu/g[12]. Therefore, the developed soup mixes contained the total microbial count within acceptable limit for safe use for a period of 2 months.

Cost of production

The unit (40 g) price for vegetable soup mix and prawn added soup mix were 30.11 and 51.06 rupees respectively. These new products will help palmyrah-based industry to improve its edible products.

4. CONCLUSION

Vegetable and prawn added soup mixes prepared with the uncooked palmyrah tuber flour is one of the popular traditional foods of Northern Sri Lankan people. Nevertheless, the popularity of this soup is decreasing due to difficulty in the preparation of quality product. The developed vegetable and prawn added instant dried soup mixes have an acceptable sensory, nutritional and microbial quality and it can be stored under ambient condition without affecting the quality characters. The cost of production also found in acceptable level. The developed soup mix is more convenient than traditional product and this will improve its popularity among the younger generation.

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Table 1: Soup mix sample with different amount of

Components	Treatments				
	1	2	3	4	5
Odiyal flour(g)	5	10	20	30	35
Rice grits(g)	2	2	2	2	2
Manioc(g)	4	4	4	4	4
Long beans(g)	4	4	4	4	4
Moringa leaves(g)	0.25	0.25	0.25	0.25	0.25
Carrots(g)	0.18	0.18	0.18	0.18	0.18
Tamarind(g)	10	10	10	10	10
Chilli powder(g)	1	1	1	1	1
Salt(g)	5	5	5	5	5
Onion(g)	0.75	0.75	0.75	0.75	0.75

Table 2: Soup mix sample with different amount of uncooked 'odiyal' flour tamarind paste

Components	Treatments			
	1	2	3	4
Odiyal flour(g)	35	35	35	35
Rice grits(g)	2	2	2	2
Manioc(g)	4	4	4	4
Long beans(g)	4	4	4	4
Moringa leaves(g)	0.25	0.25	0.25	0.25
Carrots(g)	0.18	0.18	0.18	0.18
Tamarind(g)	5	10	15	20
Garlic(g)	0.082	0.082	0.082	0.082
Salt(g)	5	5	5	5
Onion(g)	0.75	0.75	0.75	0.75

Table 3: Soup mix sample with different amount of garlic powder

Components	Treatments			
	1	2	3	4
Odiyal flour(g)	35	35	35	35
Rice grits(g)	2	2	2	2
Manioc(g)	4	4	4	4
Long beans(g)	4	4	4	4
Moringa leaves(g)	0.25	0.25	0.25	0.25
Carrots(g)	0.15	0.15	0.15	0.15
Tamarind(g)	10	10	10	10
Chili powder(g)	1	1	1	1
Salt(g)	5	5	5	5
Onion(g)	0.75	0.75	0.75	0.75
Garlic(g)	0.82	0.82	0.82	0.82
Prawn(g)	-	6.3	12.6	18.9

Table 4: Soup mix sample with different amount of prawn powder

Components	Treatments			
	1	2	3	4
Odiyal flour(g)	35	35	35	35
Rice grits(g)	2	2	2	2
Manioc(g)	4	4	4	4
Long beans(g)	4	4	4	4
Moringa leaves(g)	0.25	0.25	0.25	0.25
Carrots(g)	0.18	0.18	0.18	0.18
Tamarind(g)	10	10	10	10
Garlic(g)	0.072	0.082	0.092	0.1
Salt(g)	5	5	5	5
Onion(g)	0.75	0.75	0.75	0.75

Table 5: Amount of ingredients present in the soup mixes

Ingredients	Vegetable soup mix	Prawn added soup mix
Odiyal flour (g)	35	35
Rice grits (g)	2	2
Manioc(g)	4	4
Long beans(g)	4	4
Moringa leaves(g)	0.25	0.25
Carrots(g)	0.15	0.15
Tamarind(g)	10	10
Chili powder(g)	1	1
Salt(g)	5	5
Onion(g)	0.75	0.75
Garlic(g)	0.82	0.82
Prawn powder (g)	0	12.6

Table 6: Proximate analysis of vegetable and prawn added soup mix powder

Components %	Vegetables soup mix powder (Mean ± SD)	Prawn added soup mix powder (mean ± SD)
Moisture	3.24 ± 0.75a	4.76 ± 0.35b
Fat	1.16 ± 0.03a	1.5 ± 0.06b
Protein	5.9 ± 0.15a	7.15 ± 0.13b
Ash	5.58 ± 0.14a	8.66 ± 0.33b
Fiber	4.8 ± 0.62a	5.1 ± 0.26a
Carbohydrate	79.32	72.83
Calorific value (kcal/g)	351.32	333.42
pH	5.5 6 ± 0.00	6.52 ± 0.01

Table 7: Median values for sensory scores of reconstituted of soup samples

Treatment	Consistency		Overall acceptability	
	VS	PS	VS	PS
1(1:10)	3.33^{b}	3.33^{b}	4.00^{b}	4.00^{b}
2(1:15)	4.00^{a}	4.00^{b}	5.00^{a}	5.00^{a}
3(1:20)	2.66^{c}	2.67^{c}	4.00^{b}	4.00^{b}

Table 8: Median values for sensory scores of soup mixes during storage

Months	Flavor		Consistency		Taste		Overall acceptability	
	VS	PS	VS	PS	VS	PS	VS	PS
0	4.2^{a}	4.0^{a}	4.5^{a}	4.5^{a}	4.0^{a}	4.5^{a}	4.0^{a}	4.5^{a}
1	4.0^{a}	4.0^{a}	4.5^{a}	4.5^{a}	4.0^{a}	4.5^{a}	4.0^{a}	4.5^{a}
2	4.2^{a}	4.0^{a}	4.5^{a}	4.5^{a}	4.0^{a}	4.5^{a}	4.0^{a}	4.3^{a}

$^{a-b}$ values in the same column with the same letter of the alphabet

do not differ significantly ($p>0.05$).

VS-vegetable soup mix

PS-Prawn added soup mix