

Developments of Supplementary Wrapper from Coconut By-Product for Fast Food Industry

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Abstract- Coconut flour was naturally low in digestible carbohydrate, gluten free; cheaper than most of the other nut flours, which is loaded with health promoting fiber and important nutrients. Main objective of the study was to prepare coconut wrap for the substitute to the wheat flour based products such as astortilla (directly with a savoury filling, pancake and Chinese roll outer casing). Wheat flour based products' keeping quality was very less in room temperature and high in cost of production. According to the literature people tried coconut wrap with unripen coconut meat but it was not a 100% successful method due to unavailability, wastage and high cost of production. This study mainly focused on usage of by product, which was obtained from virgin coconut oil residues. Cost per unit was Rs. 13.64 and it can drastically reduce, if this process carried out in large scale. Because, large drier, labour and cooker utilization cost calculate for one wrapper. Per serving can obtained 6.26g of protein, 2.26g of total fat, 11.40 g of carbohydrate, 9.09 g of total sugar, 1.33 g of dietary fiber, 27.82 mg of Sodium ion and 2.75 g of total ash. It is safe to consume due to 2.2x10² CFU/g of Total Plate Count (TPC) out of 5 x 10³ CFU/g, Yeast and moulds <10 CFU/g out of 100 CFU/g and negative in Coliform, Escherichia coli and salmonella. According to observations and results proven that coconut wrap shelf life should be maximum 9 months (36 weeks) in room temperature. Exposure to direct sun light and direct heat caused for colour change from light brown to dark brown.

Index terms- Coconut flour, Guar gum, Coconut Wrapper, Wheat wrapper, Fast food industry

I. INTRODUCTION

Coconut was grown in all most 93 countries in worldwide. Not like oil palm, all around the world, coconut cultivation is increased only by 0.14% per annum within the 2001-2005 periods and production was grown up to 2.42%. King coconut (*Cocosnucifera* var. *aurantiaca*) tender nut water is a very popular nutritious natural beverage and it is

rich in sugars, vitamins, amino acids and minerals [1][2][3][4][5][6].

Coconut was socially and culturally get together and providing jobs and income to millions of people in worldwide. In many countries' economies, it was the major source of revenue and is an integral part of the livelihood of the population [7]. In many countries, despite the various benefits derived, the coconut was under threat due to several factors such as change of farmers' fields to other oil crops (eg: oil palm), urbanization, phytoplasma disease and vagaries of the market particularly the volatility of its various products in global trade. The decreased of interest on coconut cultivation reflected distinctively based on the trends in world production of some major vegetable oils not the coconut oil.

The Coconut (*Cocosnucifera* L.) was named as the "tree of life" with multifarious uses. The coconut provides a nutritious source of meat, juice, milk, and oil that has fed and nourished populations' around the world for generations. Approximately one third of the world's population depends on coconut to some degree for their food and economy. Coconut is rich source of fiber, vitamins, and minerals. It is also believed and act as a "functional food" because it provided many health benefits with beyond its nutritional content. It can improve digestion, protect against diabetes, aided for regulate blood sugar, enhanced prevent heart disease and cancer, and aid in weight loss [8].

Coconut was naturally low in digestible carbohydrate, gluten free, it was more cheaper than most of the other nut flours, was loaded with health promoting fiber and important nutrients, and tastes terrific. Coconut flour was soft, flour like product made from the pulp of a coconut nut. Coconut flour was food-grade product

obtained after drying, expelling and/or extracting most of the oil or milk from tender coconut meat.

Coconut flour was sub-classified according to its fat content. Those are low, medium and high fat. Protein content also subdivided to high protein and fiber content (high fiber). Another co-product is Virgin Coconut Oil (VCO). Conversion of industrial by-products into functional ingredients, including coconut flour made from coconut residue incorporated with wheat flour in order to improve the health benefits of bread [9]. It contains more calorie free fiber than other wheat alternatives. Coconut flour also considered as a good source of protein.

Guar gum Seeds are used as a chemotherapeutic agent against smallpox. Boiled guar seeds are used as poultices for the plague, enlarged liver, and head swelling and on swelling due to broken bones [10]. Seeds are used as laxative [11]. Not self-gelling [12]. But, either borax or calcium can cross-link guar gum, causing it to gel.

In this study reflect coconut wrap which contain, Low Carbohydrate, Gluten Free, Low Calorie. And coconut wrap was a replacement of Chinese roll outer casing or pancake. And it is also, nearly nine month shelf life without refrigerator. It was not included grain, less amount of Starch, diabetic friendly and delicious product. This **coconut Wrap** has revolutionized the paleo community. This coconut wraps is a convenient, tortilla alternative for busy lifestyle and work schedules. Whether gone to a restaurant or just gone to work, school, home or travelling abroad, these portable wraps can be used. With a **shelf-life of approximately nine months**, there is no need to refrigerate or freeze those coconut wraps. This wraps can enjoy after storing in near room temperatures. Dehydration process acts as a natural preserver. But it should not be exposed to direct sunlight or high heat for extended time period. This wrap can consume after deep frying. When deep frying, this wrap act as chines roll outer casing or can directly consume with a savory filling or without any thing.

Key benefits of coconut wrap is higher the shelf life without refrigerated condition, high in calories, consumer awareness on coconut based products' benefits it can create high market share, ideal for stuffing whatever fit into wrap, minimal to no impact on blood sugar level and cholesterol level from Organic Unrefined Virgin Coconut Oil. Because **Wrap is made out of organic coconut**

flour which is the by-product of virgin coconut oil extraction or coconut milk extraction, less than 0.5% guar gum & water. Cost of production also less than wheat flour alternatives due to usage of by-products of virgin coconut oil or coconut milk. Aim of this study is to develop coconut wrap for the substitute to the wheat flour based products such as tortilla (directly with a savoury filling, pancake and Chinese roll outer casing). Wheat flour based products cannot keep for long time without refrigerated condition and high cost of production in Sri Lanka. Therefore, wheat flour is major import product due to unsuitable climatic condition to grow wheat in Sri Lanka. Not like wheat flour coconut flour having more health benefits. World trend is based on coconut base products due to its unique flavour and un-intended health benefits. Consumer demand raised through coconut based products.

II. RESEARCH METHODOLOGY AND MATERIAL USED

2.1 Preliminary studies in Developing Coconut Wrapper:

Nearly 40 number of trials with different compositions of Half ripen king coconut meat, Young coconut meat, King coconut water, Young coconut water Coconut Cream, coconut milk, Coconut flour, Water Guar gum and Mature coconut meat, Virgin coconut oil and Fresh coconut milk were carried out as primary study in order to determine the availability of the raw materials and to determine their characteristics of physical properties. As the first part of the research, detachability and rolling ability enhancing raw materials were determined. Then the desired product development was designed according to its compatibility with the resources and laboratory facilities available in the laboratory of CBL Natural Foods (Pvt) Ltd in Minuwangoda, where all the experiments of the research were carried out.

2.2 Development of Four Recipes for the Sensory Evaluation:

Coconut wrapper was developed by according to two factor factorial designs for two variables namely coconut flour (commercial) and guar gum at two levels. Design of experiment is given below:

Design:

Coconut Flour (a)	$a_0 = 75$ g $a_1 = 100$ g
Guar Gum (b)	$b_0 = 0.5$ % $b_1 = 1$ %

First, 100 g of coconut flour was weighed using weighing balance. Then, one gram of guar gum added in to the coconut flour and mixed well. Finally 450 g of water was added in to the mixture of flour and mixed well. Using organdhi cloth filter and collected the extract. Extract was heated using gas cooker in an Aluminium bowl at 100°C for 13 min until brix increased from 9 to 19° Brix and without changing its white colour continual stirring should be carried out until the extract get thickened and pH become 5.83 (Total weight reduce from 550 g to 266g). It was poured in to nonstick pan and spread evenly on the nonstick pan. Then the pan was placed in 60°C steam direr for 8 hrs. Treatments as in the table 1, were triplicated and stored them at room temperature. There after recovery percentage was determined and the final product was packed in U/P Nylon Vacuum bag (Nilon 15 + LLDPE 80, 255* 230 mm, Unprinted, Plain colour) and sealed for subsequent use for the study.

Table1: Ingredient Combination for the Four Treatments

Treatme nt	Abbreviatio ns	Cocon ut Flour (g)	Gua r gum %	Wate r (g)
A (256)	$a_1 b_1$	100	1	450
B (345)	$a_1 b_0$	100	0.5	450
C (747)	$a_0 b_1$	75	1	450
D (978)	$a_0 b_0$	75	0.5	450

2.3 Sensory evaluation:

Four different formulations of coconut wrappers were served to 30 semi trained panellists and five point hedonic scale test was performed with the panel. Sensory evaluation was carried out in two steps and the results were analysed using Kruskal-Wallis nonparametric method in MINITAB statistical software.

2.4 Preparation of vegetable Roll Using Wheat Flour and Coconut Paleora Wrapper:

The selected formula from first sensory evaluation was used as an outer casing of a roll and it was compared with normal Chinese roll outer casing by using same filling for both rolls. Rolls were served for a sensory panel of 50 semi trained panellists for duo trio test.

2.5 Proximate analysis:

Parameters of the proximate analysis (Moisture, Ash, Crude protein, crude fiber and Total fat) of the developed instant fish soup powder were determined as described by AOAC (2000)[13].

2.6 Determination of Shelf life:

The selected best Instant coconut wrapper was packed (26g per one pack) and well-sealed in packets made with laminated packaging material of U/P Nylon Vacuum bag (Nilon 15 + LLDPE 80, 255* 230 mm, Unprinted, Plain colour). The following tests were performed in two and four week intervals for 38 weeks. Total plate count and Yeast and mould count according to SLS 516: 1991; Moisture content Oven drying method, AOAC) [14].

2.7 Cost Analysis:

The production cost for coconut wrap and pancake were evaluated with the evaluation of total expenditure. During this process a price of ingredients were carefully maintained. Hence it became easy to determine a reasonable price for a coconut wrap. Cost analysis was computed.

III. RESULTS AND DISCUSSION

3.1 Preliminary studies to Identification of Major Ingredients for the Coconut Wrap:

According to the preliminary study it was proven that mature coconut not having binding property. Not like young coconut meat, maturity affects the increase of the fiber and oil content and reduction of the pectin content. Therefore without binding agent it cannot be developed in to a wrapper. On the other hand, not like coconut flour, coconut meat is direct input to the product. Coconut flour is a by-product of virgin coconut oil or coconut milk production process [15]. On this study, identified that to develop a wrapper it is needed a binding agent. Large scale usage of king coconut meat is not practicable. Because, young king coconut contained very low amount of meat and large amount of king coconut supply also a huge problem. According to the 40 trials, it was

emphasized that for the wrapper development coconut flour can be used as a base material and due to less amount of binding agent it can be compensated by adding guar gum.

3.2 Development of Four Recipes for the Sensory Evaluation:

Above observations shows that B, C and D were texturally similar but the colour and texture of the A was 0.05% significantly different. Stretchability and rolling ability of treatment D was less than other three treatments. Treatment D contained less amounts of Guar gum and coconut flour. In preliminary study observed that minimum 50 g of coconut flour should be in recipe to obtain standard thickness and stretchability. If coconut flour or guar gum ratio not up to the minimum required level it will not fulfil the required characteristics. Due to high amount of coconut flour and guar gum taste According to the results obtained from Kruskal-Wallis Test (MINITAB 15) for five point hedonic scale sensory evaluation for the four different coconut wrap formulae, sample 345, which was having the least guar gum percentage, has shown a 0.05 % significant difference in colour, appearance, odour, texture and taste when compared with other three wrappers. Least guar gum and coconut flour containing sample 747, whereas there was no significant difference when it was compared with the sample 256 that was having the highest guar gum and coconut flour percentage. Sensory profile indicates that best characteristics in sample 345 because, it contain least percentage of guar gum.

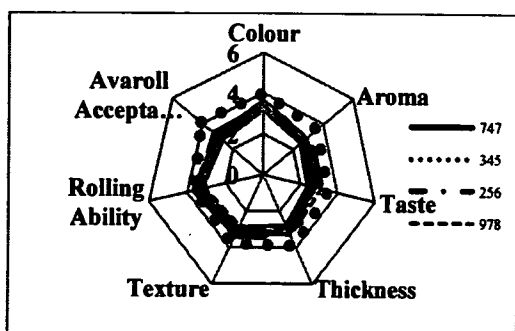


Figure 1: Chart of panellists' score for sensory parameters versus sample

3.4 Preparation of vegetable Roll Using Wheat Flour and Coconut Paleora Wrapper:

According to the duo trio test Sample 345 Coconut wrap roll was able to secured 28 responses in favour out of 50 semi trained responses and the rest sample 237 (vegetable roll) was able to get the

and texture was not desirable in treatment in preliminary study. According to the preliminary study with 50 g of coconut flour and 1% of guar gum also was not given suitable characteristics. Coconut flour was not enough to give enough amount of oil content to detach the wrap easily. If it was incorporated with 25 g of coconut flour and 1% guar gum also not applicable because, due to low thickness it was tend to tear while the wrap was detaching. 1% guar gum is little bit difficult to squeeze after put in to organdhi cloth. If this carried out in large scale 1% guar gum application should not be applicable.

3.3 Sensory Evaluation:

Selection of best coconut wrapper formula

To further validate the conclusion a sensory profile was grown with respect of seven sensory characteristics. The results were shown in figure 1.

balance responses. According to duo trio statistical test table a sample secured 33 or more than 33 significant difference at 0.05% confidence level. Therefore, there is no significant different between wheat flour wrap and coconut paleora wrap roll.

3.5 Proximate analysis:

Proximate composition of best sample 345 was analysed and results are given in Table 2. The date given in table 2 cited that coconut wrapper contained around 9.44% and 5.13% of crude fiber and dietary fiber respectively is helpful for human health.

Table 2: Results of the proximate analysis of the soup powder

Parameter	% w/w
Moisture	7.61
Ash	10.56
Total Fat	8.69
Crude Fiber	9.44
Protein	24.11
Carbohydrate	43.86
Total Sugar	34.98
Dietary Fiber	5.13
Sodium ion	107 mg

3.6 Determination of Shelf life:

Shelf life of coconut wrapper was ivaluated in terms of moisture, Total Plate Count and yeast and moulds for 38 weeks

Table 3: Changes in Tested Parameters during Storage

Weeks	Moisture %	Total Plate Count (CFU/g)	Yeast and Moulds (CFU/g)
0	7.61	2.2×10^2	<10
2	7.63	2.3×10^2	<10
4	7.63	2.3×10^2	<10
8	7.65	2.5×10^2	<10
12	7.66	2.7×10^2	<10
16	8.70	3.3×10^2	<10
20	8.77	3.9×10^2	<10
24	8.78	4.6×10^2	<10
28	8.82	7.3×10^2	<10
32	8.90	7.9×10^2	15
34	9.02	9.7×10^2	30
36	9.45	4.5×10^3	50
38	10.25	5.9×10^3	115

According to the results shown in table 4, moisture of the coconut wrap had increased over time. Increasing moisture percentage leads to enhance total plate count as well as yeast and mould count. Due to high moisture physical appearance of the coconut wrap also change by its colour and texture. With the time, colour got darkens and due to moisture (Table 3) it got sticky. Due to incremental microbial count (Table 3) taste also changed to rancid flavour. Coconuty aroma was changed to rancid smell. According to above observations and results proven that coconut wrap shelf life should be maximum 9 months (36 weeks) in room temperature. Exposure to direct sun light and direct heat caused for colour change from light brown to dark brown.

3.7 Cost Analysis:

Cost analysis for coconut wrap was performed and results are given in table 4.

Table 4: Cost for One Coconut wrap

Ingredient	Amount	Value in Rs.
Coconut Flour	100 g	7.00
Guar Gum	1 g	0.44
Water	450 g	0.20
Bag(Packaging material)	1	1.00
Approximate production cost for labour, cooker and drier		5.00
Cost per unit		13.64

Cost per unit can drastically reduce, if this process carried out in large scale. Because, large drier, labour and cooker utilization cost calculate for one wrapper.

IV. CONCLUSION AND FURTHER WORK

In this study reflects coconut flour was a by-product of Virgin Coconut Oil (VCO) or coconut milk production. Still people are not aware of coconut flour usage. Now a day's most bakery industry used coconut flour as an alternative to wheat flour. For the busy life style of people still no one able to discover fast food wrapper using this by product with long shelf life in room temperature by use of moisture reduction method.

According to the sensory results all characteristics were obtained by 345 coconut wrap sample, which was prepared by using 0.5% guar gum, 100 g of coconut flour and 450 g of water respectively. It was used to prepare roll and compared with normal vegetable roll characteristics. According to those results also proven that coconut wrap can create a good market share in local as well as in world market due to its high nutrient content, keeping quality, no added preservatives and the awareness of people on coconut nutrient benefits on human health.

Per serving can obtained 6.26g of protein, 2.26g of total fat, 11.40 g of carbohydrate, 9.09 g of total sugar, 1.33 g of dietary fiber, 27.82 mg of Sodium ion and 2.75 g of total ash. It is safe to consume due to 2.2×10^2 CFU/g of Total Plate Count (TPC) out of 5×10^3 CFU/g, Yeast and moulds <10 CFU/g out of 100 CFU/g and negative in Coliform, Escherichia coli and salmonella.

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