

# Development Of High Fibre Biscuit From Un-Boiled Palmyrah Tuber Flour

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**Abstract**—A study was conducted to develop high fibre biscuit using locally available raw materials specially incorporating palmyrah tuber flour. Biscuit with high fibre was developed according to two factor factorial design using three variables namely palmyrah tuber flour(40g,48g), *Alternantherasessilis* stem powder(5g,7.5g) and red rice flour(20g,24g) at two levels (low and high). The other ingredients, such as sesame seeds (12g), sugar (14g), salt (0.5g), ammonium bi carbonate (0.25g), sodium bi carbonate (0.2g), emulsifiers (16g), water (7.5ml) and milk powder (1g) were kept constant for all eight treatment combination. The bitter compound (Flabelliferin) of palmyrah tuber flour was removed by soaking it in distilled water for one hour trice. Biscuit dough relevant to eight treatment combination was prepared and baked using hot air oven. Then prepared biscuits were subjected to sensory evaluation in order to select best treatment combination according to sensory attributes crispiness, appearance, mouth feel, flavor, texture, colour and overall acceptability. Moisture content, Fat, Protein, Dietary fibre, Total sugar, Carbohydrate, Ash, Total Energy (MJ), Calcium, Copper, Magnesium, Manganese and Iron of these two treatment combination were analyzed.

Sensory evaluation results revealed that two best treatment combinations were palmyrah tuber flour: *Alternantherasessilis* stem powder: red rice flour; 40:7.5:20 and 48:5:20 respectively. Moisture content, Fat, Protein, Dietary fibre, Total sugar, Carbohydrate, Ash, Total Energy (MJ), Calcium, Copper, Magnesium, Manganese and Iron of these two treatments were 1.44±0.19%, 21.89±0.18%, 7.91%, 10.51%, 3.02%, 64.79%, 0.02±0.01%, 20.96±0.14%, 0.34mg/100g, 0.11mg/100g, 1.50mg/100g, 0.01mg/100g, 0.09mg/100g and 1.48±0.74%, 21.89±0.16%, 8.03%, 10.30%, 3.34%, 64.72%, 0.02±0.03%, 20.82±0.05%, 0.33mg/100g, 0.10mg/100g, 1.53mg/100g, 0.01mg/100g, 0.06mg/100g respectively. Shelf life test revealed these two biscuit products can be stored in triple laminate pouches (metalized polypropylene) for more than five months.

**Keywords**—*Alternantherasessilis*, Debittering, Flabelliferin, High fibre biscuit, palmyrah tuber flour, red rice flour.

## Introduction

With the increasing number of people suffering from malnutrition, cardiovascular disease, diabetes, cancer, cholesterol and obesity, demand for products that are high in fibre, protein and calorie rich is increasing. These problems arise because of the busy life style and lack of time to prepare nutritional foods at home.

There is therefore, a need for inexpensive fibre rich products. The main ingredient used in manufacturing of the biscuit is wheat flour, which is foreign origin and low amount of fibre (Joanne Slavin, 2013). Therefore, this study is mainly focused on developing a fibre rich biscuit by using locally available ingredients such palmyrah tuber flour, red rice flour and *Alternantherasessilis* stem powder along with other necessary ingredients for biscuits making.

## Materials and methods

### Material

Palmyrah tuber flour, Red rice flour, *Alternantherasessilis* stem powder, sesame seeds, Sugar, Salt, ammonium bi carbonate, sodium bi carbonate, Hot air oven.

### Methods

The key ingredients, palmyrah tuber flour, red rice flour and *Alternantherasessilis* stem powder were prepared using following methods.

2.1 Debittering process of Un-boiled palmyrah tuber flour - Un-boiled palmyrah tuber flour soaked in distilled water at room temperature for one hour. After that soaked tuber flour was poured into muslin cloth and filtered. This procedure was repeated three times.

2.2 *Alternantherasessilis* stems part powder preparation - *Alternantherasessilis* stem part was taken, cleaned and washed with tap water. Cleaned stems were cut into small pieces and dried in hot air oven until safe moisture content (4%) achieved. Dried stems were ground to get the stem powder.

2.3 Sesame seed preparation - White sesame was taken and washed with clean water; thereafter these seeds were dried in hot air oven to get the safe moisture content 6%.

2.4 Preparation of biscuit dough – This experiment was conducted according to two factor factorial design using three variables namely palmyrah tuber flour(40g,48g), *Alternantherasessilis* stem powder(5g,7.5g) and red rice flour(20g,24g) at two

levels (low and high). The other ingredients, such as sesame seeds(12g), sugar(14g), salt(0.5g), ammonium bi carbonate(0.25g), sodium bi carbonate(0.2g), emulsifiers(16g), water(7.5ml) and milk powder(1g) were kept constant for all eight treatments.

352g of debittered palmyrah tuber flour was taken and divide into two portions. One portion contains 160g of palmyrah tuber flour and rest portion had 192g. 160g of palmyrah tuber flour was taken and divide into two portions. Each portion was mixed with 20g and 24g of red rice flour. Finally these two portions were divided into two and one portion of each was mixed with 5g and 7.5g of *Alternanthera sessilis* stem powder. Same procedure was followed to rest 192g palmyrah tuber flour too. All treatments were replicated thrice.

Biscuits were prepared with respect to eight treatment combination and baked using hot air oven. Biscuits were subjected to sensory evaluation in order to select best treatment combination according to seven sensory attributes such as crispiness, appearance, mouth feel, flavor, texture, colour and overall acceptability. Results were analyzed using the MINITAB statistical analysis package according to the Friedman test. Selected biscuits were packed in triple laminate pouches (metalized polypropylene) for the subsequent steps involve in the experiment.

2.5 Proximate analysis of prepared biscuits - Selected biscuits were analyzed for Moisture content (AOAC, 2000), fat(AOAC, 2000), protein(AOAC, 2000), total sugar(Pearson, 1976 and Miller, 1959), dietary fibre(AOAC, 1997), Ash (AOAC, 2000), Total Energy(AOAC, 1995), carbohydrate (Percentage of carbohydrate = 100 - (moisture % + ash % + crude protein% + fat% + crude fibre %) (1) Calcium (AAS), Copper(AAS), Magnesium(AAS), Manganese(AAS) and Iron(AAS).

### 3 Results and Discussion

3.1 Organoleptic properties of eight treatment combination were determined according to seven sensory attributes namely crispiness, appearance, mouth feel, flavor, texture, colour and overall acceptability. Results are given in table 1.

Table 1 - Organoleptic properties of prepared biscuits

Treatment	crispiness	Mouth feel	Appearance	Texture	Colour	Flavour	Overall acceptability
Treatment 1 PTF:RRF: ASP 40:20:5	2.80 <sup>cd</sup>	3.56 <sup>b</sup>	3.00 <sup>c</sup>	3.00 <sup>c</sup>	2.80 <sup>e</sup>	2.96 <sup>c</sup>	2.83 <sup>d</sup>
Treatment 2 PTF:RRF: ASP 40:24:5	2.76 <sup>cd</sup>	3.13 <sup>bc</sup>	2.96 <sup>c</sup>	3.03 <sup>c</sup>	2.86 <sup>de</sup>	2.83 <sup>c</sup>	3.06 <sup>cd</sup>
Treatment 3 PTF:RRF: ASP 40:20:7.5	4.60 <sup>a</sup>	4.53 <sup>a</sup>	4.00 <sup>b</sup>	3.90 <sup>b</sup>	4.60 <sup>a</sup>	4.46 <sup>a</sup>	4.60 <sup>a</sup>
Treatment 4 PTF:RRF: ASP 40:24:7.5	2.70 <sup>d</sup>	3.23 <sup>bc</sup>	2.83 <sup>c</sup>	2.86 <sup>c</sup>	2.90 <sup>cde</sup>	3.16 <sup>b</sup>	2.90 <sup>cd</sup>
Treatment 5 PTF:RRF: ASP 48:20:5	4.36 <sup>a</sup>	4.23 <sup>a</sup>	4.56 <sup>a</sup>	4.53 <sup>a</sup>	4.06 <sup>b</sup>	4.10 <sup>a</sup>	4.10 <sup>b</sup>
Treatment 6 PTF:RRF: ASP 48:24:5	3.15 <sup>bc</sup>	2.86 <sup>c</sup>	3.13 <sup>c</sup>	2.80 <sup>c</sup>	3.26 <sup>cd</sup>	3.03 <sup>c</sup>	3.13 <sup>cd</sup>
Treatment 7 PTF:RRF: ASP 48:20:7.5	3.50 <sup>b</sup>	2.83 <sup>c</sup>	3.03 <sup>c</sup>	2.90 <sup>c</sup>	3.30 <sup>c</sup>	3.10 <sup>b</sup>	3.26 <sup>c</sup>
Treatment 8 PTF:RRF: ASP 48:24:7.5	3.56 <sup>b</sup>	2.86 <sup>c</sup>	2.93 <sup>c</sup>	2.8 <sup>c</sup>	3.26 <sup>cd</sup>	3.43 <sup>b</sup>	2.90 <sup>cd</sup>

PTF: RRF: ASP - Palmyrah tuber flour: Red rice flour: *Alternanthera sessilis*

3 and 5 were selected as the best samples by the sensory panelists containing 30 members.

### 3.2 Proximate analysis of selected product

Best two treatments were subjected to proximate analysis. Results are given in table 2.

Table 2 Composition of selected biscuit (Sample code 411 and 501)

Tests	Sample code 411	Sample code 501
Moisture (%)	1.44±0.19	1.48±0.74
Fat (%)	21.89±0.18	21.89±0.16
Protein (%)	7.91	8.03
Dietary fibre(%)	10.51	10.30
Total sugar (%)	3.02	3.34
Carbohydrate (%)	64.79	64.72
Ash (%)	0.02±0.01	0.02±0.03
Total Energy (MJ)	20.96±0.14	20.82±0.05
Calcium	0.34mg/100g	0.33mg/100g
Copper	0.11mg/100g	0.10mg/100g
Magnesium	1.50mg/100g	1.53mg/100g
Manganese	0.01mg/100g	0.01mg/100g
Iron	0.09mg/100g	0.06mg/100g

According to data given in Table 2 Dietary fibre content of high fibre biscuit is more than 10%, which is more fibre content than ordinary biscuits. Because palmyrah tuber flour, *Alternantherasessilis* stem powder and sesame seeds are fibre rich (Niamké Arthur Michel et al.2013).

High fibre biscuit contains 20.96 MJ and 20.82 MJ energy because palmyrah tuber flour is rich in carbohydrate (E.R.Jansz et al.2002).

3.3 Determination of pH value – Change of pH in biscuits from two treatments, packed in triple laminate pouches (metalized polypropylene) were studied for two months and results are show in figure 1.

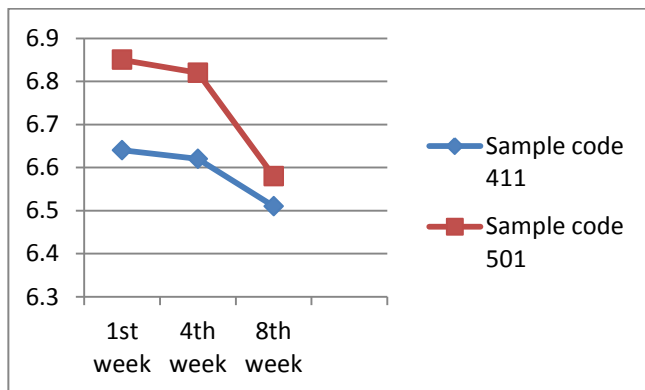


Figure 1 Changes in pH value

According to data given in Figure 2 pH changes are negligible. So packaging material triple laminate pouches (metalized polypropylene) is suitable for high fibre biscuit.

Sesame seeds were roasted to control hydrolytic and enzymatic rancidity.

#### 4 Conclusions

Bitter taste compound saponin can remove by soaking palmyrah tuber flour in distilled water trice for one hour.

High fibre biscuit can be prepared by incorporating palmyrah tuber flour along with other necessary ingredients *Alternantherasessilis* stem powder and red rice flour.

The study also revel palmyrah tuber flour incorporated biscuit contains more than 10%, which is more fibre content than ordinary biscuits.

Best packaging material of this product is triple laminate pouches (metalized polypropylene) and hydrolytic and enzymatic rancidity of sesame seeds can be control using an effective heat treatment at 95°C for 6 hours.

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