Development of manioc (*Manihot esculenta*) based nutria mix

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Introduction

A simple, convenient and quick to prepare food product besides being hygienic and convenient to eat is 'Instant food'. Various technologies are being used to develop "Instant foods" and add immense value to raw material (Pathania *et al.*, 2013). Fruits and vegetables nutritional value is highest when they are fresh, but it is not always possible to consume them immediately. Preserving of vegetables as a means of improving storability has been practiced for many centuries.

Life expectancy of Sri Lankans is 68 years for males and 76 years for females in 2006 (Hans *et al.*, 2008). Despite the relatively high literacy rate (90.8% in 2006) in the country (Central Bank Annual Report. 2008), and achievements in economic growth and the nutritional status of children is not satisfactory. The nutrition status shows a wide variation across the districts & as for wasting, it ranges from 10.5% to 28.1% substantiating the geographical disparity (Hans *et al.*, 2008). Therefore, the need to find inexpensive sources of nutritional food of good quality can be over emphasized. Once it is harvested, the agricultural product is edible for only a limited time, which can vary from a few days to weeks. Therefore processing of blends of manioc with murunga leaves, soy beans and banana blossom into forms which combine the advantage of nutritive value, convenience and preservation of use stands a better chance of success.

Methodology

Manioc flour, soy bean flour (Pb-1), muruga leaves flour and banana blossom flour were prepared. Flour items were analyzed for protein, fat, fiber, ash and moisture following AOAC(1990) methods. Prepared flours were used to prepare nutria mix with either 80% manioc flour and 10% soy bean flour (T1) or 75% manioc flour and 15% soy bean flour (T2) or 70% manioc flour and 20% soy bean flour (T3) or 60% manioc flour and 30% soy bean flour (T4) or 55% manioc flour and 35% soy bean flour (T5), following nutria mix preparation methods. Nutria mixes were analyzed for physico chemical characteristic following Sri Lanka standard methods of SLS 280 (2009). Sensory evaluation was conducted to evaluate and comment on sensory characteristics by untrained twenty sensory panels. Complete Randomized Design (CRD) was performed to compare values obtained from proximate composition. The data gathered from sensory evaluation were analyzed by using Friedman statistical technique.

Result and Discussion

Table 1: Physico -chemical analysis of prepared flour

Flour	Protein	Fat	Ash	Fiber	Moisture
Manioc	0.13±0.02	0.22±0.02	1.67±0.34	0.87±0.11	6.13±0.16
Soy bean	37.38±0.81	12.10±0.36	3.94±0.16	0.72±0.02	5.45±0.11
Murunga	24.31±0.00	3.46±0.44	9.13±0.20	8.29±0.50	8.31±0.09
B.Blossom	4.63±0.00	5.36±0.38	10.92±0.22	13.56±0.32	6.20±0.08

Values are mean ± standard deviation of triplicate (n=3)

As the results showed in Table 2 the moisture content of T_5 was lower than T_1, T2, T3 and T_4 and moisture content was slightly decreased with increased of soy bean flour. The pH of 3 different treatments T_1, T_2, T3, T4 and T_5 were 6.33±0.01, 6.35±0.01, 6.40±0.01, 6.36±0.01 and 6.27±0.01, respectively. The results have (Table 2) shown that the fat content was slightly increased with the increase of soy bean flour. The result (Table 1) shown that the fat content of soy bean flour was 12.10±0.36. This might be a reason to observe increased fact content with increased of soy bean flour.

There is no treatment effect on fiber. The result (Table 2) shown that the T5 had higher crude fibre content than T1, T2, T3 and T4. There is no treatment effect on ash. The result (Table 2) shown that the T5 had higher crude ash content than T1, T2, T3 and T4. The result (Table 2) shown that the protein content was slightly increased with increased of soy bean flour. The result (Table 1) shown that the protein content of soy bean flour was 37.38±0.81. This might be a reason to observe increased protein content with the increased of soy bean flour.

Table 2: Physico-chemical properties of mix

Treatment	Protein	Fat	Fiber	Ash	Moisture	pH
1	1.66±0.00	3.78±0.12	2.20±0.06	4.07±0.29	7.13±0.12	6.33±0.01
2	1.74±0.00	4.13±0.11	2.19±0.00	4.30±0.22	7.16±0.16	6.35±0.01
3	2.91±0.00	5.17±0.11	2.20±0.00	3.73±0.22	7.09±0.16	6.40±0.01
4	6.95±0.06	7.41±0.08	2.15±0.19	4.23±0.11	7.25±0.11	6.36±0.01
5	10.32±0.29	9.31±0.02	2.21±0.01	4.41±0.42	7.03±0.27	6.27±0.01

Values are mean ± standard deviation of triplicate (n=3)

The developed treatments 3, 4 and 5 were tested for appearance, color, aroma, taste, texture and overall acceptability. There is no significant different in characteristics of the mix versus samples.

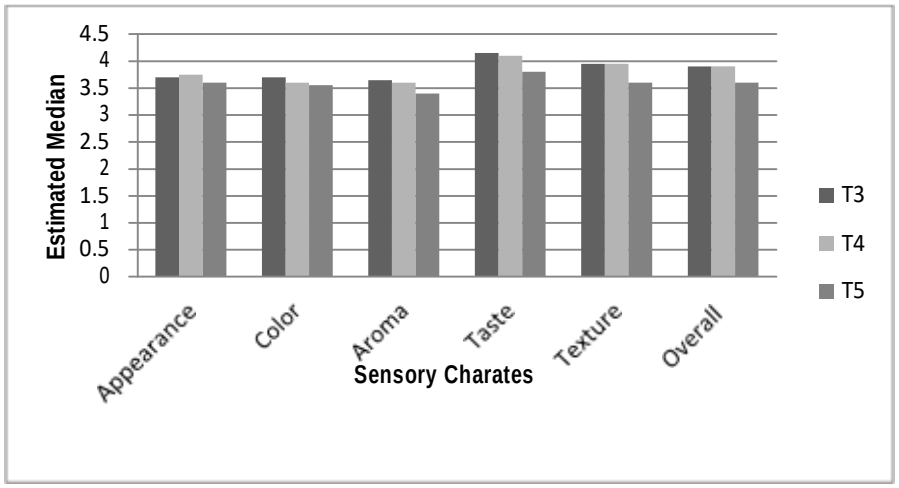

Figure 01: Estimated medians for sensory quality attributes of the mix

Conclusions

There is treatment effect on protein and fat. However treatment 5 (Manioc flour 55% and soy bean flour 35%) is best in protein and fat content. Other Treatments not equal to treatment 5 in protein and fat. There is no treatment effect on fiber, ash and moisture. But Treatment 5(Manioc flour 55% and soy bean flour 35%) is good in Fiber ash and moisture content. There were no significant difference in Appearance, Aroma, Color, Texture, Taste, Overall acceptability of the mix versus samples. Therefore treatment 5 (Manioc flour 55% and soy bean flour 35%) was selected as best treatment. This mix will be selected for later testing and extrusion processing. Moreover more investigations are necessary to improve the shelf life and packaging materials.

Acknowledgement

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