Development of Nutri Mix Fortified with Dehydrated Murunga Leaves and Pumpkin Powder

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Abstract— Nutri–mix is an instant food type that can be a good supplement of essential vitamins and minerals that contribute to recommended daily intake. Murunga leaves and pumpkins are commonly found in almost all areas in Sri Lanka, and they can be used as good replacements for traditional ingredients in nutri–mix, without altering their nutritional content. As these crops are underutilized in the Sri Lankan context, this study was carried out in order to introduce a new path to get the maximum use. As treatment, four recipes were prepared changing the percentage of dehydrated Murunga leaves powder (t_1 =2% , t_2 = 3% , t_3= 4% , t_4= 5%) and dehydrated pumpkin powder (t_1 =18% , t_2 = 17% , t_3= 16% , t_4= 15%). Then a constant percentage of brown rice (60%) and mung bean (20%) was added to develop the nutri-mix. Sensory evaluation of four samples was conducted using thirty untrained panelists using a five point Hedonic scale. Result shows that the treatments were significantly different ($p< 0.05$); Treatment 2 (3% murunga powder and 17% pumpkin powder) got the highest median scores for all sensory attributes, while treatment 4 (5% murunga powder and 15% pumpkin powder) showed the lowest median score. Therefore, treatment 2 was selected as the best ingredient combination for nutri-mix as it showed significantly higher sensory attributes among others.

Keywords— Nutri Mix, Murunga Leaves, Pumpkin Powder

I. INTRODUCTION

Nutri –mix is an instant food that can be good supplemant for essential vitamins and minerals to achieve recommended daily intake. It matches well with the busy life style of the pepole at present and an easy way of providing nutrients.various ingeredients are used to prepare different Nutri –mix in Sri Lanka to provide different nutrients to people .Eg: corn , soya, rice, green gram. There are several alternative and cheap ingredients readily available and wasted in huge amounts in the Sri Lankan context. In this research, murunga leaves, Pumpkin, Brown rice and Mung been were selected to prepare a nutri –mix.

Murunga (*Moringa oleifera*) which belongs to the family Moringacea is a popular dry zone, home garden vegetable crop.

This grows well in the areas such as Jaffna, Kalpitiya , Mannar, Puttalam and Hambantota. In Sri Lanka ther is no large scale commercial cultivation of *murunga* and therefore this crop is considered as an underutilized crop.

Several varieties of Moringa such as Rann Murunga (local variety), Jaffna and Chavakachcheri murunga are grown in Sri Lanka.(Ramachandren et al 1987). In addition several hybrid types such as Kalpitiya , V 19 and V 16 have been introduced. Partially matured pods, leaves and flowers can be used as medicines, animal fodder and seeds for oil extraction, water purification, cosmetic production, agro forestry and also in live fences. *Murunga* leaves contained high amount of protein, Calcium, Magnesium ,Potassium, Iron , Vitamin A, Choline, Thaimine , Vitamin C and valine.

At present the majority of women in Sri Lanka are employed and they have busy life style.Therefore, they look for products, which are convenient and time saving . Low cost *Murunga* leaves based nutri –mix is one of the options among them which consist of high amount of nutrients.

Pumpkin is a cheap vegetable but very in nutrients available all over the country. It is a source of dietary fiber , anti – oxidant, vitamins and minerals. Mung bean is widely produced and consumed in Sri Lanka. Mung beans have tremendous nutritional value. Therefore, commonly referred to as nutritional power house. It is easily digestible and prevent health problems. It's good source of Vitamin B, C, E, and K.

Brown rice is higher in nutritional constituent compared to milled rice. Considering the above context, this study was carried out to develop a nutri –mix using dried *Murunga* leaves powder, Pumpkin powder , Brown rice and Mung bean powder with the aims of popularize the

murunga leaves based products also to find out the economies of the developed product.

II. MATERIALS AND METHODS

A. Location
The Study was carried out at the food processing laboratory of the Institute of Post Harvest Technology (IPHT), Anuradhapura.

B. Sample Collection
Murunga leaves were picked from the farm of the Institute of Post Harvest Technology and the Brown rice, Mung bean and Pumpkin were purchased from the market, Anuradhapura.

C. Selection of suitable samples
Picked leaves and purchased Brown rice, Mung bean and Pumpkin were brought to IPHT food labotory. All damaged, ripened, diseased and immature leaves were removed during sorting. Diseased and damaged Pumpkin parts were removed during peeling.

D. Preparation of samples
Murunga leaves were dipped in Sodium Meta bi sulphite (SMS) containing water (1g/1 L) for three minutes. Then blanching was done for 3 minutes at 60 ^{0}C (1g SMS/1 L). Pumpkin were peeled out and cut in to slices (2mm) and were dipped in SMS water (1g/1 L) for three minutes. Then washed Pumpkin were put on cotton cloth and made a bunch. Then blanching was done for 3-5 minutes at 60 ^{0}C (1g SMS/1 L).

Mung bean were washed with water and then dipped in water for 6 hrs. after that water was removed and covered with wet cotton cloth for 12 hrs. Brown rice was put in a laboratory grinder and sieved using 150 um mesh.

E. Dehydration process
Dehydration of Murunga leaves was done at 45 ^{0}C for 4 hours in an oven (model mammert) Dehydration of pumpkin was carried out at 50 ^{0}C for 6 hours in an oven (model mammert Dehydration Mung bean was carried out at 50 ^{0}C for 6 hours in an oven (model mammert) After Dehydration dried Murunga leaves, dried Pumpkin and dried Mung bean were grounded and packed in polyethene bags.

Mung beans were washed, dried in the oven at 55 ^{0}C for 04 hours followed by toasting and grinded for make powder and sieved and packed in polythene bag. Red Paddy was dehusked and prepared the brown rice and followd by grinding to prepare brown rice flour.

Table 1. Experiment 1 Treatment combinations

Ingredients	Treatment 1	Treatment 2	Treatment 3	Treatment 4
Dehydrated Murunga leaves Powder	4%	8%	12%	16%
Dehydrated Pumpkin Powder	16%	12%	8%	4%

60% of Brown rice Powder and **20% of Mung Bean powder are Fixed for all treatments**

Sensory evaluation 1 was done to findout the most suitable treatment.

F. Proximate Composition Analysis
Crude protein, Crude fat, Crude fiber,Starch and total ash and moisture content were determined using the standards methods (AOAC, 2005).

III. RESULTS & DISCUSSION

A. Results of sensory evaluation 1
Table 1- Effect of different combination levels of dehydrated Murunga leaves powder and dehydrated Pumpkin Powder of the first sensory evaluation.

Table 2. Effect of different combination levels of dehydrated Murunga leaves powder and dehydrated Pumpkin Powder of the first sensory evaluation

Sensory attributes	Treatment			
	T1	T2	T3	T4
Colour	4.383[a]	3.521[b]	2.531[c]	1.8123[c]
Taste	4.642[a]	2.832[c]	2.631[c]	1.621[c]
Odour	3.432[b]	3.921[a,b]	3.453	2.123[c]
Overall acceptance	4.431[a]	2.832[b,c]	2.521[c]	1.987[c]

Different letters withtn each row indicate significant differences at (P<0.05)

For the color, treatment one obtained a significantly higher median value while the lowest (P<0.05) was obtained by treatment four. Overall acceptability is also the highest (P<0.05) in the combination of 4% Murunga leaf powder and 16% dehydrated Pumpkin Powder supplemented nutri-mix. The lowest (P<0.05) overall acceptability was obtained by treatment four where 16% dehydrated Murunga leaves Powder and 4% dehydrated Pumpkin Powder was supplemented. Moreover there was no significant different in taste and odour among the treatment 2 and treatment 3.

Treatments 2, 3 and 4 were rejected due to significant lower consumer acceptability. Furthermore, different ratios of dehydrated Murunga leaves Powder and dehydrated Pumpkin Powder were allocated to the nutri mix for next sensory evaluation near to the ratio of treatment one as sensory evaluation 2.

B. Results of sensory evaluation 2
Table 2 Effect of different combination levels of dehydrated Murunga leaves Powder and dehydrated Pumpkin Powder in the second sensory evaluation.

Table 2. Effect of different combination levels of dehydrated Murunga leaves Powder and dehydrated Pumpkin Powder in the second sensory evaluation

Sensory attributes	Treatment			
	T1	T2	T3	T4
Colour	3.231[b]	4.421[a]	3.998[b]	2.742[c]
Taste	4.178[a,b]	4.891[a]	3.875[b]	2.991[c]
Odour	4.732[a]	4.022[b]	3.752[b]	2.032[c]
Overall acceptance	4.142[a,b]	4.758[a]	3.653[b]	2.102[c]

Different letters withtn each row indicate significant differences at (P<0.05)

T_1 – 2% dehydrated Murunga leaves Powder, 18% dehydrated Pumpkin Powder, 60% Brown rice Powder, and 20% dehydrated Mung bean Powder
T_2 – 3% dehydrated Murunga leaves Powder, 17% dehydrated Pumpkin Powder, 60% Brown rice Powder, and 20% dehydrated Mung bean Powder
T_3 – 4% dehydrated Murunga leaves Powder, 16% dehydrated Pumpkin Powder, 60% Brown rice Powder, and 20% dehydrated Mung bean Powder
T_4 – 5% dehydrated Murunga leaves Powder, 15% dehydrated Pumpkin Powder, 60% Brown rice Powder, and 20% dehydrated Mung bean Powder.

Odour of the 2% dehydrated Murunga leaves Powder supplemented nutri mix was higher (P<0.05) than other treatments. That may be due to least amount of dehydrated Murunga leaves Powder addition where that has lowest leafy odour. Furthermore colour, taste and overall acceptability of treament two where 3% dehydrated Murunga leaves powder and 17% dehydrated Pumpkin Powder supplemented nutri-mix showed significantly higher median values. Even in the second sensory evaluation result, higher Murunga leaves powder supplemented nutri mix showed the significantly lower consumer acceptability. Thus, that emphasized consumer acceptability would be gradually decreased with the increases of supplemented Murunga leaves Powder for nutria-mix.

IV. CONCLUSION

The best combination of ingredients for the preparation of nutri-mix is 3% of dehydrated Murunga leaves Powder, 17% dehydrated Pumpkin Powder, 60% Brown rice Powder and 20% dehydrated Mung bean Powder. It contained 28% of Protein, 14% 0f Fibre, 3% of Fat, 43% of Starch and 12% of Moisture. With high amount of Vitamin A other nutrients. Ingradient cost was estimated as Rs. 35.00 to prepare 100 g of nutri-mix. If this product is mix with 5% sugar and 10 % of desicated cococnut can be used as instant ready to serve nutri mix.

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