

Development and Evaluation of Different Flavoured Medicinal Beverages from Peeled and Non- Peeled Nutmeg (*Myristica fragrans* L.) Pericarp

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ABSTRACT

Non flavoured, whole nutmeg flavoured (by adding kernel), ginger flavoured and cardamom flavoured beverages were developed using peeled and non peeled fresh nutmeg (*Myristica fragrans* L.) pericarps. Maroon and brown colouring agents were added for the improvement of colour. A sensory evaluation was carried out using a panel of 20 non trained tasters to check the consumer acceptance of taste, colour, smell, astringency, overall quality and purchasing intention using a five point hedonic scale. The data were analyzed using non-parametric Friedman and Mann-Whitney tests. There was no significant difference in the consumer acceptance between the beverages made from peeled and non peeled pericarps. The ginger flavoured maroon coloured and non flavoured maroon coloured beverages produced using with peel nutmeg pericarps recorded the highest preference among the panelists.

KEYWORDS: Beverage, Nutmeg pericarp, Sensory evaluation

INTRODUCTION

Nutmeg (*Myristica fragrans* L.) is an important perennial evergreen spice tree grown in the Mid Country areas of Sri Lanka. The tree yields two spices, nutmeg which is the kernel of the seed, and mace which is the net like crimson coloured leathery outer growth (aril) covering the shell of the seed.

Nutmeg is an aromatic, stimulant, sleep inducing, carminative and intoxicating, digestive tonic (Andrew, 1996). Nutmeg contains 2.8% volatile oil, a fixed oil, proteins, fat, starch, mucilage and ash. Mace contains 8% to 17% volatile oil, a fixed oil, resin, fat, sugar, dextrin and mucilage. The fixed oil which is called "butter of nutmeg" consists of myristin and myristic acid and a portion of an essential oil. Essential oil contains myristicin and myristicol (Veena, 2009). Myristicin is a phenylpropene, a natural organic compound present in small amounts in the essential oil of nutmeg which has ability to stimulate the brain (Andrew, 1996).

The nutmeg fruit turn yellow when ripe and the pericarp splits into two halves exposing a purplish-brown shiny seed surrounded by a red aril.

Usually the nutmeg fruits are allowed to split and fall to the ground before harvesting and the pericarp is removed and discarded.

Although unknown to many, nutmeg pericarp oil contains 16 monoterpenes (60%), 9 monoterpene alcohols (29%) and 8 aromatics and other minor components (Chempakam, 2008). The components are similar to those in Nutmeg (kernel) and mace oil but different substantially in concentration (Chempakam,

2008). The sabinene, myristicin and safrole concentrations are much low, while the terpinen-4-ol content is much higher than in nutmeg and mace oil (Choo *et al.*, 1999).

Nutmeg pericarp can be utilized for preparation of different non-fermented and fermented value added products such as juice, syrup, jam jellies, pickles, etc. (Veena, 2009). All of these preparations have the flavour of nutmeg (Andrew, 1996).

However, in Sri Lanka, nutmeg pericarps are mostly wasted under trees without much use due to lack of awareness about its industrial applications among growers.

Therefore, this study was carried out to develop different flavoured beverages from nutmeg pericarp as value added products and to evaluate consumer acceptance. This effort aims to introduce a medicinal drink to the local market while minimizing the wastage of nutmeg pericarp and creating an additional source of income to the growers.

MATERIALS AND METHODS

Location

The study was carried out at the Department of Horticulture and Landscape Gardening of the Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila from January to April 2013.

Sample Collection

Fresh nutmeg pericarps were obtained from small holder farmers in Akurana area.

Nutmeg Pericarp Pulp Preparation

Seeds were removed from fresh matured nutmeg fruits and the pericarps were washed thoroughly and immersed in 3% salt solution for two minutes. Cleaned pericarps were cut into small pieces and grinded using an electrical grinder until a uniform pulp was formed.

Beverage Preparation

2.25 L of cool clean water, 1.5 Kg of sugar and juice of a whole lemon were added to 1Kg of nutmeg pericarp pulp. Then 1.6 g of fresh granular active bakery yeast was added to the mixture and put into a plastic bottle leaving about an inch of head space. The bottle was shaken thoroughly to disperse the yeast grains. Bottles were placed in a warm place for 48 hours and stored in the refrigerator at 4°C for another 24 hours. Then the pulp was strained and the beverage was subjected to different treatments.

Experiment 1: Evaluation of the Effect of Nutmeg Pericarp Peel on the Flavour of Beverage

Ginger flavoured, cardamom flavoured, whole nutmeg flavoured and non flavoured beverages were prepared using peeled and non peeled nutmeg pericarps using the above described method. Eight treatments were tested in this experiment (Table 1). From the treatments in experiment 1, T4 (Peeled/non flavoured beverage) and T8 (Non peeled/cardamom flavoured beverage) were selected for further developments.

Table1. Treatments of Experiment 1

Treatment	Description
T1	Peeled/ ginger Flavoured
T2	Peeled/ cardamom flavoured
T3	Peeled/whole nutmeg flavoured
T4	Peeled/non flavoured
T5	Non peeled/ginger flavoured
T6	Non peeled/cardamom flavoured
T7	Non peeled/whole nutmeg flavoured
T8	Non peeled/non flavoured

Experiment 2: Evaluation of the Effect of Nutmeg Pericarp Peel on the Colour and Smell of Beverage

Maroon and brown colouring agents (2ml/250ml of beverage) were added to the selected treatments.

Four treatments were tested in the experiment 2 (Table 2).

Table2. Treatments of Experiment

Treatment	Description
T9	Peeled/ginger flavoured/maroon
T11	Non peeled/non flavoured/maroon
T10	Peeled/ginger flavoured/brown
T12	Non peeled/non flavoured/brown

Sensory Evaluation

A panel of 20 non-trained tasters carried out the acceptance test for both experiment 1 and 2 using a five point Hedonic Scale (Peryam and Pilgrimes, 1957) for colour, smell, taste, astringency, overall quality and purchasing intention (Peryam and Pilgrime, 1957). The sensory evaluations were done at the time of production.

The Scale of Acceptance (Five – Point Hedonic Scale)

5 – Strongly Like, 4 - Like, 3 – Neither like or dislike, 2 – Dislike, 1 – Strongly dislike

Statistical Analysis

Data were analyzed with non - parametric analysis method (Friedman test and Mann Whitney test) with the Minitab 15 statistical package.

RESULTS AND DISCUSSION

Significant differences were shown in all sensory attributes other than colour and smell in experiment 1 (table 3). After improvement in experiment 2 all sensory attributes were not significantly different other than the colour. There was no significant effect of peel on smell, taste, astringency, overall quality and purchasing intention.

Table 3. Mean values of different sensory properties of beverage samples processed according to the two experiments.

Experiment	Sensory Properties					
	Colour	Smell	Taste	Astringency	Overall quality	Purchasing intention
1	0.550	0.093	0.000*	0.000*	0.000*	0.000*
2	0.000	0.779	0.249	0.182	0.163	0.862

(Significant at 0.05)

Table 4. Grand median of acceptance for Nutmeg Beverage

Experiment	Sensory Properties					
	Colour	Smell	Taste	Astringency	Overall quality	Purchasing intention
1	3.5000	3.2650	3.5625	3.5000	3.9063	3.5938
2	3.6250	4.0000	4.0000	4.0000	4.0000	4.0000

(Significant at 0.05)

As shown in table 4, there was a significant difference in all sensory properties in experiments 1 and 2. Initially in experiment 1, all sensory properties were scored as 3 (neither like nor dislike) whereas, after improvements in colour and smell, in second experiment all sensory properties other than colour were shown as 4 (like). Application of less amounts of colouring agents could be the major reason for getting rank 3 (neither like nor dislike) for colour in both experiments. According to the results the ginger flavoured maroon coloured and non flavoured beverage made from both peeled and non peeled pericarps showed highest acceptance. Statistical analysis showed that there was no significant effect in peel for beverage.

Table 5. Quality evaluation of highest accepted nutmeg beverages.

Beverage	TSS	pH	Alcohol (%)
Peeled	28	2.88	3.4
Non Peeled	28	2.84	4.2

Virtually similar results were obtained for both beverages when Total soluble Solids content, pH and the alcohol percentage were measured. However, there is a slight difference

in the percentage of alcohol. Polyphenolic compounds in the peel could be the major reason for the slightly higher alcohol percentage in non peeled beverage. Acid content of both beverages showed high values throughout the experiment.

CONCLUSIONS

There was no significant peel effect on made beverage. Therefore, nutmeg pericarps with peel can be used to prepare different flavoured beverages. The ginger flavoured maroon coloured and non flavoured maroon coloured beverages produced using with peel nutmeg pericarps recorded the highest preference among the panelists. However, it is essential to identify that shelf life and the changes in alcohol percentage of the end product.

Further analysis of the chemical composition of the beverage is required to identify its medicinal properties.

Maintenance of hygienic conditions during processing is essential to estimate the shelf life and its true medicinal properties.

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