

# Development of *Moringa Oleifera* Gum Incorporated Juices and its Popularization

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## Abstract

An experimental study was done in an attempt to utilize the benefits and uses of *Moringa oleifera* gum powder and to enhance the nutritive value of the products developed by incorporating it in orange (grape variety) and watermelon juices. The yield percentage of Moringa gum from the tree (once) was calculated. The gums were collected from the tree, processed and used for further purposes. The collected gum was determined for its physico-chemical properties. The water-soaked gum powder was incorporated in different ratios in standard orange and watermelon juice. The incorporated juices were analyzed for their improved nutrient content and sensory evaluation was done. The cost calculation for standard and incorporated juices was calculated. The developed products were popularized among young adult girl students through questionnaires and pamphlets. The nutritional importance of Moringa and Moringa gum was explained to the subjects. From the results, it was concluded that among the incorporated orange juice formulations O3 sample received the highest acceptability among the samples O, O1, O2 and O3 and in the incorporated watermelon juice formulations W2 variation received the highest overall acceptability among the samples. The nutrition quality of samples increased in the aspect of Crude fibre, Vitamin A, Iron, Calcium, Total antioxidants and Phytochemical-Flavonoids.

**Keywords:** Juice, *Moringa oleifera*, Gum Powder, MOG, Nutrient Content

## 1. Introduction

*Moringa oleifera* is one of the best-known and most widely distributed trees. It is known as Moringa in the Dravidian language. It is also identified as Tree for Purifying. It is grown well in tropical and subtropical areas. *Moringa oleifera* is almost grown in all countries<sup>1</sup>. Where it contains 90 nutrients, different antioxidants and all eight essential amino acids. It was estimated that more than 300 diseases can be cured by taking Moringa<sup>2</sup>. It is regarded as the Mothers best buddy in Philippines<sup>3</sup>. Since it is used to improve woman's milk production and is sometimes given for anaemia and malnutrition<sup>4</sup>. Almost all the parts of the plant such as roots, bark, gum, leaf, fruit (pods), flowers, seeds and seed oil are used for various ailments in the indigenous medicine of South Asia. It is

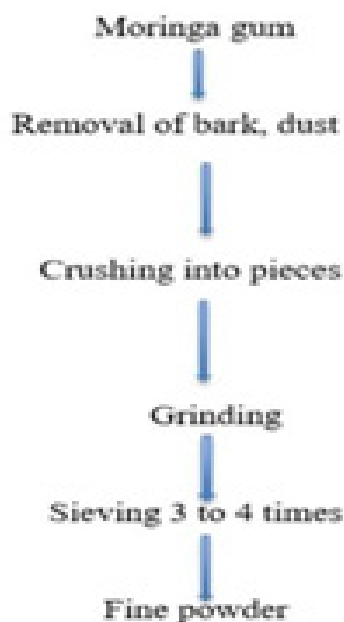
used in the treatment of inflammation and infectious disease along with cardiovascular, gastrointestinal haematological and hepato-renal disorder<sup>5</sup>. The Moringa gum is obtained from the bark of the tree. The obtained gum is powdered and used further. It is used to treat fever, asthma, dysentery, intestinal cancer, syphilis and rheumatism. It is also used as a diuretic and astringent<sup>6</sup>.

## 2. Materials and Methods

### 2.1 Collecting and Processing of Ingredients

For the preparation of MOG, (*Moringa oleifera* gum powder) incorporated juice the ingredients such as orange, watermelon and sugar were brought from the

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**Figure 1.** Processing of Moringa gum.

local market in Tirupur. The MOG was collected from the tree, then cleaned and used for further processing (Figure 1).

## 2.2 Determination of Percentage of Yield

The gum was taken from the tree (one time) and weighed, and then the bark and the other dust particles were removed and weighed. Now the gum was ground thoroughly and sieved. The sieved powder weight was measured.

$\% \text{ sieving yield} = \left[ \frac{\text{Mass of grinded and sieved gum powder}}{\text{Mass of gum obtained from the tree}} \right] \times 100$

**Table 1.** Formulation of orange juice

Ingredients	Standard(o)	MOG incorporated into orange juice		
		1 g/40 ml	2 g/40ml	3 g/80ml
Orange	2 medium	2	2	2
Sugar	15 g	15 g	15 g	15 g
Water Soaked MOG powder	-	10 ml	25 ml	40 ml

## 2.3 Evaluation of Physicochemical Properties of Gum

The following evaluation of the physico-chemical properties of MOG was done

Hydrogen ion concentration (pH)

- Swelling index
- Swelling power
- Bulk and tap densities
- Determination of ash
- Determination of water holding capacity
- Determination of oil holding capacity

## 2.4 Quantitative Analysis of Nutrients in Moringa Gum Powder

- Vitamin-A
- Crude Fiber
- Total antioxidants
- Phytochemical-flavonoids
- Calcium
- Iron

## 2.5 Formulation of Juices

The formulation of orange and watermelon juices are given in the following Tables 1 and 2 respectively.

## 2.6 Sensory Evaluation

Sensory evaluation is a scientific discipline used to evoke, measure, analyze, and interpret reactions to the characteristics of food and materials as they are perceived by the sense of sight, smell, taste, touch and mouth feel. Sensory evaluation was done for the appearance, colour, flavour, taste and consistency of the incorporated juices.

**Table 2.** Formulation of watermelon juice

Ingredients	Standard (O)	MOG incorporated in watermelon juice		
		1 g/40 ml	2 g/40 ml	3 g/80 ml
Watermelon	125 g	125 g	125 g	125 g
Sugar	10 g	10 g	10 g	10 g
Water-soaked MOG powder	-	10- ml	25 ml	40 ml

The organoleptic evaluation was done to study the acceptability, using 9 points hedonic rating scale.

### 2.7 Cost Calculation

The cost of the standard and incorporated juices was calculated for the 200 ml of juice.

### 2.8 Popularization

Popularization of the health benefits of Moringa and Moringa gum powder was imparted to adult girls between the age of 20-25 years through questionnaires and pamphlets.

## 3. Results and Discussion

### 3.1 Percentage of Yield

The percentage of yield discovered was 75.3% (one time)

### 3.2 Physico-Chemical Parameters of Soaked MOG Powder Water

The Physico-chemical parameters like pH, swelling index, swelling power, bulk density, tap density, Hauners ratio, Carr's compatibility index, ash content, oil holding capacity, water holding capacity and total solids of soaked

**Table 3.** Physico-chemical properties of soaked MOG powder

Parameters	Values
Ph	5.77
Swelling index (1 g)	2 ml
Swelling power (2 g)	10
Bulk density (2 g)	0.712
Tap density (2 g)	0.9090
Hauners ratio (2 g)	1.272
Carr's compatibility index (2 g)	21.480
Ash content (4 g)	0.24 g
Oil holding capacity (0.5 g)	4.2
Water holding capacity (0.5 g)	5.506
Total solids (100 g)	60%

MOG water were found to be 5.77, 2 ml, 10, 0.712, 0.9090, 1.272, 21.480, 0.24 g, 4.2, 5.506 and 60% respectively and displayed in Table 3.

### 3.3 Nutrient Analysis of Water-Soaked Moringa Gum and Incorporated Juices

Nutrient analysis of soaked Moringa gum water is done for the nutrients like crude fibre, calcium, iron, vitamin A, total antioxidants and phytochemical flavonoids and in 1 g/40 ml was

found to be 0.04 g, 0.6 mg, 0.4 mg, 35.6 µg, 26 µg and 5 mg respectively in 2 g/60 ml was noticed as 0.08 g, 21.2 mg, 0.8 mg, 77.12 µg, 52 µg, and 10 mg and in 3 g/80 ml was 0.12 g, 32 mg, 1.2 mg, 107 µg, 80 µg and 15 mg and the nutrients can be compared among the variations in Table 4.

#### 3.3.1 Nutrient Content of Orange Juice (Grape Variety) Incorporated with Water-Soaked MOG Powder

The nutrients like Crude fibre, calcium, iron, vitamin A, total antioxidants and phytochemical flavonoids in sample O1 were recorded as 0.04 g, 18.6 mg, 0.8 mg, 43.6 µg, 26 µg and 5 mg respectively in sample O2 it was noted as 0.08 g, 39.2 mg, 1.2 mg, 79.2 µg, 52 µg and 10 mg respectively and in the sample of O3 it was recognized as 0.12 g, 50 mg, 1.6 mg, 115 µg, 80 µg and 15 mg respectively which is given in Table 5.

#### 3.3.2 Nutrient Content of Watermelon Juice Incorporated with Water-Soaked MOG Powder

The nutrient content of watermelon juice incorporated with water-soaked MOG powder in W1 was found to be crude fiber 0.04 g calcium 42.6 mg, iron 1.28 mg, vitamin A 649.6 µg, total antioxidants 26, phytochemicals flavonoids 5 mg, in W2 it was observed as crude fiber 0.08 g, calcium 53.2 mg, iron 1.68 mg, vitamin A 686 µg, total antioxidants 52 µg, Phyto-chemicals flavonoids 10 mg and in W3 it was noted as Crude fiber 0, calcium 64 mg, iron 2 mg, vitamin A 721 µg, total antioxidants 80 µg, phytochemicals flavonoids 15 mg which is tabularized in Table 6.

### 3.4 Organoleptic Evaluation of Incorporated Juices

#### 3.4.1 Mean Acceptability Score for Water Soaked Moringa Gum Incorporated Orange Juice

It is noted that O3 received the maximum score for all the parameters like appearance, colour, flavour, taste and consistency. O1 and O2 variations also showed higher overall acceptance when compared to the standard in appearance, flavour, colour, taste and consistency. Among the test variations, O3 received the highest mean overall acceptability score. Statistical analysis of the t-value between O, O1, O2 and O3 showed a null set of significant

**Table 4.** Nutrient analysis of water-soaked Moringa gum

Nutrient	Variation I 1 g/40 ml	Variation II 2 g/60 ml	Variation III 3 g/80 ml
Crude fiber (g)	0.04	0.08	0.12
Calcium (mg)	0.6	21.2	32
Iron (mg)	0.4	0.8	1.2
Vitamin A (µg)	35.6	77.12	107
Total Antioxidants (µg)	26	52	80
Phytochemical Flavonoids (mg)	5	10	15

**Table 5.** Nutrient content of orange juice (grape) incorporated with water soaked MOG powder

Nutrient	StandardO	1 g/40 mlO1	2 g/60 mlO2	3 g/80 mlO3
Crude fibre (g)	-	0.04	0.08	0.12
Calcium (mg)	18	18.6	39.2	50
Iron (mg)	0.4	0.8	1.2	1.6
Vitamin-A (µg)	8	43.6	79.2	115
Total antioxidants (µg)	-	26	52	80
Phytochemical-flavonoids(mg)	-	5	10	15

**Table 6.** Nutrient content of watermelon juice incorporated with water soaked MOG powder

Nutrient	Standard W	1g /40 mlW1	2 g/60 mlW2	3 g/80 mlW3
Crude fibre (g)	-	0.04	0.08	0.12
Calcium (mg)	32	42.6	53.2	64
Iron (mg)	0.88	1.28	1.68	2.0
Vitamin -A(µg)	-	649.6	686	721
Total antioxidants (µg)	-	26	52	80
Phytochemical –flavonoids (mg)	-	5	10	15

differences. The mean overall acceptability score for standard and 1 g/40 ml (O1), 2 g/60 ml (O2), and 3 g/80 ml (O3) water-soaked Moringa gum incorporated juices are given in Table 7.

### 3.4.2 Mean Acceptability Score for Water Soaked Moringa Gum Incorporated Watermelon Juice

W and W2 were superior to W1 and W3, obtained equal scores for appearance and W3 received the highest score for Appearance and colour compared to W, W1 and W2. W and W3 were more acceptable than the other samples. Among these variants standard (W) received a high rate of acceptability interns of flavour, taste and appearance.

The overall acceptability is the same for both W and W2. Statistical analysis of the, t<sup>u</sup> value of the variants W1, W2 and W3 are significant at 1%, 5% and 5% which is given in Table 8.

### 3.5 Product Cost Calculation

The 200 g of Moringa gum has been priced to be Rs.700. Therefore the cost of 1 g of powder was found to be Rs.3.5 and the price of an orange (grapefruit) is Rs.66, the price of 125 g of watermelon is Rs.5 and 10 g of sugar cost about 1 rupee (approximately). The cost calculation for Moringa gum water incorporated orange (grape) and watermelon juice is as follows in Tables 9 and 10 respectively.

**Table 7.** Mean acceptability score for water-soaked Moringa gum incorporated orange juice

Sensory parameters	Orange juice mean± standard deviation	Water-soaked Moringa Gum Incorporated orange juice		
		Mean ± standard deviation		
	Standard(O)	1 g/40 ml (O <sub>1</sub> )	2 g/60 ml (O <sub>2</sub> )	3 g/80 ml (O <sub>3</sub> )
Appearance	8.8 ± 0.5	8.8 ± 0.3	8.8 ± 0.3	9 ± 0
Colour	8.8 ± 0.5	8.9 ± 0.2	8.8 ± 0.3	8.9 ± 0.2
Flavour	8.6 ± 0.5	8.7 ± 0.4	8.5 ± 0.3	8.7 ± 0.4
Taste	8.8 ± 0.4	8.7 ± 0.4	8.6 ± 0.5	8.8 ± 0.4
Consistency	8.6 ± 0.5	8.6 ± 0.5	8.8 ± 0.3	8.8 ± 0.3
Overall acceptability	8.7 ± 0.06	8.8 ± 0.09	8.7 ± 0.1	8.8 ± 0.1
Group compared		O & O <sub>1</sub>	O & O <sub>2</sub>	O & O <sub>3</sub>
"t" value		0.97 <sup>NS</sup>	0.08 <sup>NS</sup>	-1.9 <sup>NS</sup>

**Table 8.** Mean acceptability score for water-soaked Moringa gum incorporated

Sensory parameters	Watermelon juice mean ± standard deviation	Water-soaked Moringa Gum incorporated watermelon juice		
		Mean ± standard deviation		
	Standard (W)	1 g/40 ml (W <sub>1</sub> )	2 g/60 ml (W <sub>2</sub> )	3 g/80 ml (W <sub>3</sub> )
Appearance	8.8 ± 0.5	8.6 ± 0.4	8.7 ± 0.4	8.8 ± 0.3
Colour	8.7 ± 0.5	8.8 ± 0.4	8.8 ± 0.4	8.8 ± 0.4
Flavour	8.8 ± 0.3	8.6 ± 0.5	8.7 ± 0.4	8.6 ± 0.7
Taste	8.7 ± 0.4	8.4 ± 0.6	8.6 ± 0.5	8.2 ± 0.7
Consistency	8.8 ± 0.4	8.6 ± 0.5	8.7 ± 0.4	8.6 ± 0.5
Overall acceptability	8.7 ± 0.06	8.6 ± 0.11	8.7 ± 0.06	8.6 ± 0.5
Group compared		W&W <sub>1</sub>	W&W <sub>2</sub>	W&W <sub>3</sub>
"t" value		5.6*	2.6**	3.2**

\* Significance at 1% \*\* significance at 5%

### 3.5.1 Cost Calculation- Orange Juice

### 3.5.2 Cost Calculation- Watermelon Juice

**Table 9.** Cost calculation- orange juice

Ingredient	Standard (200 ml) (Rs)	1 g/40 ml (Rs)	2 g/60 ml (Rs)	3 g/80 ml (Rs)
Orange (grape)	66	66	66	66
Sugar	1	1	1	1
Moringa gum powder	-	3.5	7	10.5
Total	67	70.5	74	77.5

**Table10.** Cost calculation- watermelon juice

Ingredient	Standard (200 ml) (Rs)	1 g/40 ml (Rs)	2 g/60 ml (Rs)	3 g/80 ml (Rs)
Watermelon	5	5	5	5
Sugar	1	1	1	1
Moringa gumpowder	-	3.5	7	10.5
Total	6	9.5	13	15.5

### 3.6 Product Popularization

The soaked Moringa gum water incorporated in selected juices was popularized among adult girl students. The method of preparation of juice and the health benefits of *Moringa oleifera* gum are included and popularized among 25 adult girls between the age of 20-25 years through questionnaires and pamphlets.

During this programme, participants have shown much interest to know about incorporated juices. After collecting the oral feedback it was revealed that participants gained more knowledge about the health benefits of Moringa gum and soaked Moringa gum water. After this programme, participants learned about the health benefits and the methods of using it in juices.

## 4. Conclusion

The *Moringa oleifera* gum is not utilized wisely when it can be processed easily and can be incorporated into

juices and various recipes. MOG was found to be rich in Vitamin A, Calcium, Crude fibre, Iron, Antioxidants and phytochemicals. By comparing, the incorporated samples of orange juice sample O3 were found to be highly acceptable and incorporated in the samples of watermelon juice the sample W2 was highly acceptable. no. By comparing, all the incorporated samples of orange juice and watermelon juice the sample O3 was found to be admissible.

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