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Formulation and nutritional quality evaluation of value added squash from *Citrullus lanatus*

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Abstract
Water melon, red grapes and beetroot have high amount of nutrients especially minerals. But their consumption among children becomes less either due to its seasonal availability or due to the preferences in taste. So, it's important to provide them the fruits and vegetable in a different form that attract children to consume them. The watermelon squash was value added with a fruit (red grapes) and a vegetable (beetroot) and was formulated in three different variations. Its sensory and nutritional analysis was carried out. Results showed that variation (V1G) and variation (V2B) was highly acceptable and VIG was rich in calcium and phosphorous and V2B was rich in phosphorous and iron.

Keywords: nutritional quality, water melon, red grapes and beetroot

Introduction
India is the second largest producer of fruits and vegetables in the world next to China. India has been bestowed with wide range of climate and geographical conditions which ensures availability of most kind of fruits and vegetables, contributing 12.6 per cent and 14 per cent of the total world production of fruits and vegetables (www.fao.org and www.nhb.gov.in). Out of the total production of fruits and vegetables nearly 76 percent is consumed in fresh from, while wastage and loses account for 20 to 22 per cent. Only two per cent of vegetables production and four per cent of fruit production are being processed (www.foodprocessingindia.co.in). Fruits and vegetables are an important source of vitamins, minerals and fibre. A diet rich in fruit and vegetables may reduce the risk of heart disease and some types of cancer (Perez and Claudio, 2002).Watermelon, grape and beetroot are highly nutritive and is rich in minerals and vitamins but their consumption is low either because it is a seasonal fruit or due to the taste preference, especially beetroot where children tend to avoid vegetables in their diet. So the objective of this study is to formulate a squash that is rich in nutrients and also tastes better. And also, to make them available throughout the year by preserving it in the form of squash.

Methodology
Selection of Ingredients
The ingredients used for watermelon squash and value added watermelon squash is watermelon, beetroot, grapes and sugar. These ingredients have been procured from a local fruit shop in the city. Watermelon was selected based on its quality like firmness, symmetrical and free of major bruises or scars. The surface should be waxy and bright in appearance. Red grapes were selected based on its quality like firmness, color and that has correct amount of sweetness were brought. Grapes should be very clean, devoid of surface abrasions and free of foreign dust particles. Beetroot was selected based on its quality like color, firmness, texture and freshness. Beetroots that are clean, free from farm dust, soil, bruises and abrasions were selected. Quality brand of sugar that is well crystallized and refined was selected. The sugar must be very hygiene and clean that are free from any foreign matters and insects are used.

Formulation and sensory evaluation of the value added watermelon squash
The ingredients selected for the formulation of value added watermelon squash were formulated into three different variations. The proportions of the value added watermelon squash for variations V1, V2 and V3 are tabulated below.

Table 1: Formulation of value added watermelon squash

S. No	Ingredients	Variation 1	Variation 2	Variation 3
1.	Watermelon	50 ml	60 ml	70 ml
2.	Grapes	50ml	40ml	30ml

S. No.	Ingredients	Variation 1	Variation 2	Variation 3
1.	Watermelon	50 ml	60 ml	70 ml
2.	Beetroot	50 ml	40 ml	30 ml

Formulation of grape added watermelon squash
The watermelon was washed, cut into pieces and ground in mixer into pulp. Similarly, grapes were also cleaned and ground into pulp. From the pulp, the juice is extracted using a strainer which removes of the seeds, skin and other unwanted substances. Then the juice was cooked for few minutes. In another pan sugar syrup was made by dissolving 100 g of sugar in 100 ml of water, heated and cooled. The juice of watermelon and red grapes was mixed in different proportions (50:50, 60:40 and 70:30) and poured into the sugar syrup. The contents are mixed thoroughly and made into squash.

Formulation of beetroot added watermelon squash
The watermelon is cut into pieces and ground in mixer into a pulp. Similarly beetroot is also ground into a pulp. From the pulp, the juice is extracted using a strainer which removes of

the seeds, skin and other unwanted substances. Then the juice was boiled for few minutes to remove of the raw smell. In another pan, sugar syrup was made by dissolving 100 g of sugar in 100ml of water by heating. The application of heat is stopped when the sugar syrup is at required consistency and then cooled. The juice of watermelon and beetroot was mixed in different proportions (50:50, 60:40 and 70:30) and poured into the sugar syrup. The contents are then mixed thoroughly and made into squash

Sensory evaluation of the formulated value added watermelon squash

The formulated watermelon squash has been made into RTS and evaluated for it acceptability by sensory qualities using a group of 20 members by administering a score card consisting of five sensory characteristics like, color and appearance, taste, flavor, texture and overall acceptability. The scores obtained from the sensory evaluation were calculated and average score was taken to find the most acceptable product.

Nutrient calculation of the selected value added watermelon squash

The nutritive content of the formulated squash has been calculated using ICMR – Nutritive value of Indian Foods (2014). Nutrients like energy, phosphorous, protein, fat, calcium, iron, vitamin A, Vitamin B1, B2, B3 and Vitamin C was calculated.

Results and Discussions

Sensory evaluation of formulated value added watermelon squash

The sensory evaluation scores of the formulated value added watermelon squash has been given in Table

Table 2

Criteria	Control	Variation 1		Variation 2		Variation 3	
		V1G	V1B	V2G	V2B	V3G	V3B
Colour and appearance	4.2	4	4.15	3.95	4.6	3.65	4.5
Flavour	3.85	4.45	4.05	3.65	4.25	3.85	4.25
Consistency	4.3	4.3	4.35	4.45	4.25	4.25	4.1
Taste	3.75	4	4.25	4.25	4.45	4.15	4.1
Overall acceptability	3.95	4.17	4.28	4.03	4.38	3.98	4.31

V1G, V2G, V3G - Variations of watermelon grape squash
V1B, V2B, V3B- Variations of watermelon beetroot squash

The color and appearance of V1G and V2B was highly acceptable with the average score of 4 and 4.6. The flavor of V1G and V2B has high average of about 4.45 and 4.25 respectively. The consistency of V2G and V1B has high average about 4.45 and 4.35 respectively. The taste of the variation V2G and V2B was highly acceptable with the average score of 4.25 and 4.45.The overall acceptability is high for V1G and V2B with an average of about 4.17 and 4.38. Therefore, among the formulated watermelon grape squash, variation 1 (V1G) is highly acceptable whereas variation (V2B) is also highly acceptable. The brix value of the selected variations-V1G and V2B is 45º B and 41ºB respectively.

Nutritive value of the selected value added watermelon squash

Table 3

Nutrients	Watermelon grape squash (V1G)	Watermelon beetroot squash (V2B)
Quantity(g)	250 ml	250ml
Energy(kcal)	410.5	430.8
Protein(g)	2.50	1.216
Fat (g)	1.40	1.54
Calcium(mg)	**28.00**	5.095
Phosphorous(mg)	**19.70**	**17.4**
Iron(mg)	5.155	**26.6**
Vitamin A	1.5	1.20
Vitamin B1	0.032	0.028
Vitamin B2	0.039	0.036
Vitamin B3	0.07	0.14
Vitamin C	0.60	1.00

Both the variations (V1G) and (V2B) have high calorific value of energy 410.5 and 430.8 respectively. In watermelon grape squash (V1G) Calcium content is high about 28.00 per 100 g. Similarly, variation (V1G) also has high amount of phosphorous of about 19.70 per 100g. The variation (V2B) is a good source of phosphorous and iron with a nutritive value of 17.4 and 26.6 respectively.

Conclusion and Recommendation

As stated before, the production of fruits and vegetables is increasing day by day. Also, fruits and vegetables take an important part in every human diet as it has numerous health

benefits. Many creative, innovative, healthy, delicious ideas are coming up in giving fruits and vegetables in more reliable form. As we know, many children are not fond of fruits and vegetables making them to skip the diet rich in fruit and vegetables. So presenting fruit and vegetable in a different manner as well as attractive look helps to consume them with interest which was the major objective of this study. Among the formulated watermelon grape squash, variation 1 (V1G) and variation 2 (V2B) is highly acceptable. They have a high calorific value of energy 410.5 and 430.8 and (V1G) was rich in Calcium and phosphorous of about 28.0 and 19.70 were as variation (V2B) is a good source of phosphorous and iron with a nutritive value of 17.4 and 26.6 respectively. A further investigation to determine the shelf-life of the produce is recommended. Also, tests for identifying the nutritional composition of the food can be carried out and be compared it with the values that is calculated theoretically.

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