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"Development and Standardisation of Edible Bowls by Utilization of Citrus Peel and Pulp"

Jaiswal Stuti [1] and Paul Virginia[2]
Research scholar[1], Professor[2], Department of Food, Nutrition and Public Health (SHUATS)

ABSTRACT
Orange and Mosambi peels are rich source of dietary fiber and antioxidants. In current life style scenario, people are becoming more aware of functional key ingredients and thus the demand of functional foods is increasing. Oranges and Mosambi were washed thoroughly, peeled and the fruit peels were cut into small pieces and oven dried (50±5 C) and ground to a fine powder. Developed Edible Bowl was evaluated for sensory characterstics using 9-point hedonic scale. Edible Bowl were analysed for proximate composition, antioxidants and phytochemicals by using standard methodology. Statistically data were analysed by ANOVA and T-test. Results revealed that before imparting awareness education through audio and visual video, majority of the respondents were having inadequate knowledge and post exposure their knowledge was raised. Orange and Mosambi peel powder had been successfully utilized upto 10 percent for the development of Edible Bowl without affecting sensory attributes.

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I. INTRODUCTION

Fruits are an important supplement of human diet as these possess several nutritional components required for the growth and development of the human body. 70 percent of the total population of oranges and mosambi is used for the manufacture of derived products, but 30 percent of processed fruits are converted into citrus peels waste, so these wastes contain many nutrients. **Anna,(2019).** The value added Edible Bowls were basically prepared by using Wheat flour, Gram flour, Semolina and Finger millet that is a very good source of natural iron, and its consumption helps in recovery of anemia. The Ragi based foods are highly suited for expectant mothers and elderly due to their high calcium and iron content. Finger millet consumption helps in relaxing body naturally. The bowl was prepared and then organoleptically evaluated and tested in the laboratory with the basic variation and there were positive evaluations regarding the quality, taste, and chemical analysis were performed. To minimize the use of plastic based utensils made of polystyrene foam, thermocol sheets and various harmful chemicals affecting the environment and human health. By the development of eco-friendly and biodegradable Edible utensils those destructions can be minimized up to an extent. These utensils had been developed from different food groups as like cereals, pulses, stem, roots and tubers, etc. White sugar had been replaced by jaggery to make it more nutritious and tastier. The various pigment providing agents had been added to make it more attractive and thus also enhances it's nutritional value. Experimental product has very low porosity and hence used even in liquid foods which can be hot or cold. The Baking, frying or deep-frying methods can be used for the preparation of the product by providing the shape according to the need which can be done at commercial level also. For enhancing the taste different flavors had been added like-Savory, mint-ginger, hot 'n' spicy, sweet etc. The various pigment providing agents had been added to give it a more attractive look and nutritive quality had been enhanced by fortification with other nutritional inputs. The average cost for the experimental product can be high as company to plastic utensils. Developed and Standardized value added products i.e.Edible Bowls, Assessed sensory acceptability by 9-point hedonic scale, and Analysis of phytochemical compounds and antioxidant properties and calculated the cost of Edible Bowl for all three treatments.

II. MATERIALS AND METHODS

The study entitled "**Development and standardization of Edible Bowls by utilization of citrus peel and pulp**". It was conducted in the Department of Food, Nutrition and Public Health, Ethelind College of Home Sciences, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P). All required raw material like Wheat flour, Gram flour, Semolina, Butter, Carom seeds, fennel seeds, and vegetables were purchased from the local market of Prayagraj. Fruits (Orange, Mosambi and Amla) had been blanched. After the blanching fruit peel and pulp dehydrate at 50°-60° C for 24 hours. Fruit peel and pulp were separately grinded and stored in an air tight container. **R.P, Srivastava and Kumar (2009)**

The control (T0) and three different treatments were prepared in which control was prepared by using 70 percent wheat flour and 30 percent of Semolina. While three other treatments were prepared by Wheat flour, Semolina, Ragi, Gram flour, Orange and Mosambi peel powder and pulp in three different ratios. The experiment was replicated three times to get an average value. The score card based on nine-point hedonic scale. **Srilakshmi(2009)**

Proximate compositions were done by employing the standard method of AOAC (2005).Determination of Calcium and Iron were done by titration method. The antioxidant activity i.e., DPPH free radical was determined by the method followed by Blois (1958). Determination of polyphenol was done by Folin-Ciocalteumphenol reagent and Estimation of total flavonoid content done by Aluminium Chloride Colorimetric Method. The cost of the prepared products were determined on the basis of raw ingredients at the prevailing market price.

III. RESULT AND DISCUSSION

The results of various experiments conducted during the study period are summarized below.

Table 1: Average sensory score of control and treated sample of Edible Bowls

Control and Treatments	Colour and appearance	Body and texture	Taste and flavor	Overall acceptability
T_0	8.5	8.5	8.6	8.3
T_1	7.33	7.16	7.16	7.5
T_2	8.66	8.66	8.5	8.83
T_3	7.2	7.83	8.6	7.33
F_{Cal} (5%)	5.60	18.58	1.96	19.23
F_{Tab} (5%)	4.76	4.76	4.76	4.76
CD(≤0.05)	1.00	0.56	0.7	0.62
S.A.	S*	S*	NS**	S*

***S=Significant, **NS=Non-Significant**

The table 1, shows the mean of sensory scores obtained for Edible Bowls illustrated that according to Overall acceptability of product treatment T_2(8.83) ,was more acceptable and other treatment T_0(8.3) T_1(7.5), and T_3(7.33) so that T2 was more acceptable by the panel members followed by Colour and appearance, Body and Texture, Taste and Flavor using nine-point hedonic scale. Hence, from the ANOVA table of Edible Bowl, it was evident that the calculated value of F is greater than the tabulated value on 3 and 6 degree of freedom at 5% of probability level so there was significant difference between treatments regarding on all sensory attributes of the Edible Bowls.

Table 2: Comparative analysis of Proximate composition of control (T_0) with best treatment (T_2) of Edible Bowls per 100gm by using T-test :

Nutrients	Control (T_0)	Best treatment (T_2)	Difference (T_0-T_2)	't' Cal	't' Tab	S.A
Moisture %	8.79	9.86	1.07	20.63	4.76	*S
Ash %	3.26	2.23	1.03	2.95	4.76	**NS
Protein (g)	10.18	11.71	1.53	17.28	4.76	*S
Fat(g)	1.51	2.18	0.67	7.12	4.76	*S
Crude fiber(g)	1.06	2.07	1.01	14.65	4.76	*S
Carbohydrates(g)	48.75	59.49	10.74	59.01	4.76	*S
Iron (mg)	3.80	4.58	0.78	4.57	4.76	**NS
Calcium (mg)	11.05	44.61	33.56	453.3	4.76	*S
DPPH %	8.91%	10.7%	1.79	10.10	4.76	*S
Flavonoids (mg)	61.1	71.3	10.2	8.31	4.76	*S
Polyphenol (mg)	20	25	5	8.6	4.76	*S

***Significant,**Non-Significant,S.A=Statistical analysis**

In the comparative analysis between control (T_0) and best treatment (T_2) shows that Moisture content was 9.86%, Ash 3.37%, Protein 11.71g, Fat 1.51g, Crude fiber 2.07g, Carbohydrates 59.49g, Iron 4.58mg, and Calcium 44.61mg in *Edible Bowl* per 100gm.It was increased due to incorporation of orange and mosambi peel for the preparation of *Edible Bowl.*

The total cost of *Edible Bowls* per 100g for treatment T_0 was Rs. 3.01, T_1 is Rs.1.72, T_2 is Rs.1.29 and T_3 is Rs.0.86. It is therefore concluded that the treatment T_3 20g of Wheat flour, 30g Gram flour 5g Finger millet with 25g Semolina) has the low cost and T_1 (40g of Wheat flour,20g of Gram flour,15g of Finger millet and 15g of Semolina) has high cost.

IV. Conclusion

The research had been conducted with the aim to utilize Orange, Mosambi peel. On the basis of findings, it was concluded that the Sensory evaluation done by 9-point hedonic scale was found best treatment .i.e., T_2, and were acceptable by the panel members. Chemical composition of the best treatment (T_2) in Edible Bowls, the Moisture content was 9.86%, Protein 11.71g,Fat,1.51g, Crude fiber 2.07g,Carbohydrates 59.49g, Iron 4.58mg, and Calcium 44.61mg.

Cost calculation of *Edible Bowls* slightly decreased in three treatments i.e, T_1 (Rs 7.0) to T_2 (Rs 6.23) and T3 (5.47).

V. Recommendation:

Finger millet was being used as key ingredient as it has a lot of calcium that helps in strengthening bones and teeth. Edible Bowls is a new and nutritionally healthy option to be chosen rather than thermocol. By the development of eco-friendly and biodegradable Edible utensils those destructions can be minimized up to an extent and a business can be set up at mass level.

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