

NUTRITIVE VALUE, ACCEPTABILITY, ANTIOXIDANT ACTIVITY AND STORAGE STABILITY OF HIBISCUS ROSA SINENSIS INCORPORATED READY TO EAT POWDERS

NISHA P.*, S. SHEELA

*II Msc. Food Science and Nutrition, **Assistant Professor, Department of Nutrition and Dietetics, Dr. NGP Arts and Science College, Coimbatore, India
Email: nishanichu91@gmail.com

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ABSTRACT

Objectives: Hibiscus rosa sinensis possess many properties and this plant may procured at large scale for providing herbal alternative to many diseases. The study was planned to prepare value added ready to eat powders by incorporation of Hibiscus rosa sinensis. The flowers of Hibiscus were processed and dried powder was incorporated into commonly prepared ready to powders namely Chutney powder, Avalose powder and Prawn powder at a ratio of 10%, 20% and 30% respectively.

Methods: Organoleptic and quantitative analysis was screened in Hibiscus incorporated ready to eat foods.

Results: Evaluation of organoleptic of the formulated powders showed that the incorporation of hibiscus at 10% was highly acceptable in terms of appearance, colour, flavour, texture and taste. The increase in nutrient content on incorporation of hibiscus at 10% was found to be 3.83 kcal, 16.57 kcal and 0.25 kcal of energy; 0.24g, 1.18g and 0.58g of protein; 1.85g, 1.76g and 0.33g of fat in chutney powder, prawn powder and avalose powder respectively. The minerals were also increased by incorporating hibiscus at 10% which was found to be 4 mg, 12 mg and 1.06 mg of calcium; 8.02 mg, 14 mg and 8.22 mg of phosphorus; 0.8 mg, 1.35 mg and 1.65 mg of iron; 4.33 mg, 5 mg and 18 mg of potassium and 0.6 mg, 1.2 mg and 0.5 mg of vitamin C in chutney powder, prawn powder and avalose powder respectively. Avalose powder had maximum phenolic content (1.04 mg/100g) compared with chutney powder (1.57 mg/100g) and prawn powder (1.04 mg/100g) and flavanoid content is high in chutney powder (2.96 mg/100g). The ready to eat powders had good shelf life at room temperature for a period of 30 d in LDPE.

Conclusion: The incorporation of hibiscus at 10% was found to improve the nutrient content like energy, protein, fat, calcium, phosphorus, potassium, iron, vitamin c and antioxidant like total phenol and flavanoid. The shelf life of ready to eat powders stored in LDPE was good for 30 d. The bacterial growth was less in LDPE packaging.

Keywords: Hibiscus rosa sinensis, RTE powders, Antioxidant, Evaluation, Organoleptic.

INTRODUCTION

The Herb Hibiscus rosa sinensis Linn (Malvaceae) is a glabrous shrub widely cultivated in the tropics as an ornamental plant and has several forms with varying colours of flowers. The Hibiscus genus contain several species, many of which have been used medicinally and is comprises of about 275 species in the tropics and sub-tropics and most Hibiscus species have a remarkable colour pattern with the base of corolla forming a deep coloured heart [1]. Hibiscus rosa sinensis said to be originated from India. Old Moorish (Arabic) sources mention Hibiscus being originated in Spain. Many sources claim that it is not a natural species, but a collection of manmade hybrids. The word Hibiscus derived from the ancient Greek "hibiskos", the name of a plant known as marsh mallow or white mallow [4]. Hibiscus rosa sinensis Linn is an annual or perennial herbaceous bush growing to 2.5m and has several forms with varying colours of flowers. The flowers are considered emollient and an infusion of the petals is used as a demulcent and refrigerant drink in fevers, its decoction is given in bronchial catarrh in India. Leaves of hibiscus are simple, lobed, alternate or spiral and have paired stipules [6]. Hibiscus packs a bounty of healthful properties. It is rich in vitamin C and has been widely used for controlling high blood pressure, tempering fevers, alleviating digestive problems, as well as improving circulatory disorder [3]. The bioactive compounds of the Hibiscus plant contain various secondary metabolites such as phenol, tannins, alkaloids, flavanoids, steroids and glycosides in appreciable quantities. The effective

inhibitory potency observed with the plants parts proves that the inhibitory compounds were extractable by the employed solvents against the tested pathogenic isolates [3].

Formulation of ready to eat powders

Eating a healthy diet is a way of living a healthy lifestyle. Commercially prepared food is designed for ease of consumption. Products designated as convenience or ready to eat foods are often prepared food that can be sold as hot, ready to eat dishes; as room-temperature, Shelf-stable products; or as refrigerated or frozen products that require minimal preparation. Chutney powder is a continent from the Indian state of Kerala. For the preparation of Chutney powder, A known quantity of coconut is cut into small pieces and roasted in a pan without oil. Garlic, Red chilli, Pepper, Ginger, Curry leaves and Tamarind was added during roasting. The salt is added to it and ground into a fine powder. Stored in LDPE packaging. Avalose powder (Roasted Rice Powder) originates from the state of Kerala. This snack is usually eaten along with sugar or honey. A known amount of rice is roasted in a pan. Coconut is roasted in another pan. Both are mixed together and grounded. Sugar is added to it. Prawn powder originates from the state of Kerala this ready to eat powders is usually eaten along with rice. A known quantity of dry prawn is roasted in a pan for few minutes. Coconut is grated and roasted in another pan. Both roasted prawn and other ingredients are mixed along with the salt. Then grounded into a fine powder. Stored in LDPE packaging.

Table 1: Variation of ready to eat powders and hibiscus rosa sinensis

Ratio variation	Chutney powder	Hibiscus	Prawn powder	Hibiscus	Avalose powder	Hibiscus
Variation 1	90	10	90	10	90	10
Variation 2	80	20	80	20	80	20
Variation 3	70	30	70	30	70	30

Organoleptic evaluation of formulated ready to eat powders

Sensory evaluation is the process of evaluating according to the knowledge acquired via human senses like sight, taste, touch, flavour.

The sensory characteristics like appearance, colour, flavour, texture, taste and overall acceptability were evaluated through 5 point scale from 25 semi trained panel membrane. The variations (90:10), (80:20) and (70:30) for three ready to eat powders (Hibiscus: chutney powder). (Hibiscus: avalose) and (Hibiscus: prawn powder) were subjected to sensory evaluation and compared them with its respective controls. From the three variations of each combination one variation which is most acceptable is selected. A total of two best variations each belonging to a combination was selected for further analysis.

Nutrient analysis of ready to eat powders

The most acceptable variations of all ready to eat powders along with their controls were used for the analyses of different nutrients. The

Energy was estimated by oxy bomb calorimeter and protein by kjeldhal nitrogen analyser. The moisture was analysed by vacuum oven procedure. For calcium estimation, It was precipitated as oxalate, dissolved in sulphuric acid and titrated against potassium permanganate. Iron was determined colorimetrically making use of the fact that ferric iron gives a blood red with potassium thiocyanate. Phosphorous analysis was carried out by measuring the blue colour, which is formed when the ash solution was treated with ammonium molybdate. The phosphomolybdate thus formed was reduced and read calorimetrically. The potassium content is calculated using flame photometer [2]. The vitamin C content was estimated titrimetrically by reducing it with the dye 2, 6 dichlorophenol indo phenol.

Antioxidant activity of formulated ready to eat powders

Antioxidant activity was determined by the DPPH method. Total phenol and flavanoid content of hibiscus incorporated ready to eat powders were analysed by the standard method.

Table 2: Nutrient content of ready to eat powders

Parameters	Chutney powder		Prawn powder		Avalose powder	
	Control	Variation	Control	Variation	Control	Variation
Energy(kcal)	532.46	536.29	458.32	474.89	435.16	435.41
Protein(g)	11.12	11.36	23.68	24.86	9.28	9.86
Fat(g)	33.21	35.06	19.07	20.83	7.05	7.38
Moisture(g)	3.47	3.57	4	4.93	2.94	3.47
Calcium(mg)	228.0	232.0	308.0	320.0	38.94	40.0
Phosphorous(mg)	99.98	108.0	206.0	220.0	277.98	286.20
Iron(mg)	6.0	6.80	14.65	16.0	12.68	14.33
Potassium(mg)	63.67	68.0	158.0	163.0	110.0	128.0
Vitamin C (mg)	1.40	2.0	6.80	8.0	3.30	3.80

RESULTS AND DISCUSSION

The organoleptic evaluation of Avalose powder variation 1 in which hibiscus at 10% has got the highest acceptability compared to others. The variation 1 of avalose powder has got highest score for all sensory attributes namely appearance (4.68±0.55), colour (4.6±0.57), flavour (4.64±0.63), texture (4.76±0.43), taste (4.6±0.57) and overall acceptability (4.3±0.48). The other two variations had lesser sensory score than variation 1 in its appearance, colour, flavour, texture, taste and overall acceptability. The difference is statistically significant.

The organoleptic evaluation of Prawn powder variation1 in which hibiscus at 10% has got the highest acceptability compared to others. The variation 1 of prawn powder has got highest score for all sensory attributes namely appearance (4±0.5), colour (4.48±0.58), flavour (4.44±0.50), texture (4.08±0.57), taste (4.36±0.48) and overall acceptability (4.52±0.54). The other two variations had lesser sensory score than variation 1 in its appearance, colour, flavour, texture, taste and overall acceptability. The difference is statistically significant.

The organoleptic evaluation of Chutney powder variation 1 in which hibiscus at 10% has got the highest acceptability compared to

others. The variation 1 of chutney powder has got highest score for all sensory attributes namely appearance (4.8±0.65), colour (3.84±0.74), flavour (4.36±0.56), texture (4.36±0.56), taste (4.24±0.52) and overall acceptability (4.6±0.57). The other two variations had lesser sensory score than variation 1 in its appearance, colour, flavour, texture, taste and overall acceptability. The difference is statistically significant.

The increase in nutrient content was found to be high in prawn powder by incorporation of hibiscus at 10% compared to other ready to eat powders. Energy content of chutney powder variation is 536.29 kcal comparing to the chutney powder control (532.46kcal). The variation 1 of chutney powder is maximum than the control. Fat content is also found to be high in chutney powder of variation1 (35.06g) than the control (33.21g). Protein content was maximum in prawn powder variation 1 (24.86g) than the control (23.68g). The minerals like calcium was also maximum in variation 1 (320 mg) than the control (308 mg); Phosphorous was high in variation 1 (220 mg) than the control (206 mg) and the potassium was also maximum in variation 1 (163 mg) than the control (158 mg). The vitamin C was found to be high in prawn powder (8 mg) than the control (6.8 mg).

Table 3: Total phenol and flavanoid content of ready to eat powders

RTE powders parameters	Chutney powder		Prawn powders		Avalose powder	
	Control	Variation	Control	Variation	Control	Variation
Total phenol(mg/100g)	0.801	1.571	1.284	1.408	1.884	1.965
Flavanoid (mg/100g)	1.038	2.96	1.204	2.862	0.048	1.309

The total phenolic content is maximum in avalose powder when compared with chutney powder and prawn powder. The variation had maximum when compared to the control. This shows an increase in phenol content on incorporation of hibiscus rosa sinensis.

The flavanoid content was found to be maximum in chutney powder variation 1 compared to control and other ready to eat powders. This shows an increase in flavanoid content on incorporation of hibiscus rosa sinensis

Table 4: Total antioxidant activity of ready to eat powders

DPPH	Ready to eat powders					
	Chutney powder		Prawn powder		Avalose powder	
	Control	Variation	Control	Variation	Control	Variation
	29.98%	60.08%	9.866%	35.07%	45.18%	68.46%

DPPH antioxidant activity was estimated using the DPPH Radical Scavenging protocol. In the present study the DPPH activity was found to be maximum in avalose powder variation 1 (68.46%) and control (45.18%) when compared with chutney powder and prawn powder.

Table 5: Microbial count of ready to powders in LDPE

Microbial count ready to eat powders	Initial	15 Days	30 Days
Chutney powder			
• Control	5 x 10 ³ cfu/gm	11 x 10 ³ cfu/gm	17 x 10 ³ cfu/gm
• Variation	4 x 10 ³ cfu/gm	9 x 10 ³ cfu/gm	13 x 10 ³ cfu/gm
Prawn powder			
• Control	12 x 10 ³ cfu/gm	19 x 10 ³ cfu/gm	27 x 10 ³ cfu/gm
• Variation	10 x 10 ³ cfu/gm	17 x 10 ³ cfu/gm	28 x 10 ³ cfu/gm
Avalose powder			
• Control	4 x 10 ³ cfu/gm	8 x 10 ³ cfu/gm	13 x 10 ³ cfu/gm
• Variation	3 x 10 ³ cfu/gm	6 x 10 ³ cfu/gm	10 x 10 ³ cfu/gm

The bacterial growth of chutney powder, prawn powder and avalose powder in the initial day was high in control (5 x 10³ cfu/gm),(12 x 10³ cfu/gm) and 4 x 10³ cfu/gm) compared to variation (4 x 10³ cfu/gm), (10 x 10³ cfu/gm) and 3 x 10³ cfu/gm).

The bacterial growth of chutney powder, prawn powder and avalose powder in the 15th day was high in control (11 x 10³ cfu/gm),(19 x 10³ cfu/gm) and (8 x 10³ cfu/gm) compared to variation (13 x 10³ cfu/gm),(28 x 10³ cfu/gm) and (10 x 10³ cfu/gm).

The bacterial growth of chutney powder, prawn powder and avalose powder in the 30th day was found to be high in control (17 x 10³ cfu/gm),27 x 10³ cfu/gm) and (13 x 10³ cfu/gm) compared to (13 x 10³ cfu/gm),(28 x 10³ cfu/gm) and 10 x 10³ cfu/gm).

Table 6: Organoleptic evaluation of ready to eat powders durin LDPE storage

Storage period	Chutney powder		Prawn powder		Avalose powder	
	Control	Variation	Control	Variation	Control	Variation
Initial	4.47±0.54	4.52±0.50	4.52±0.58	4.6±0.57	4.42±0.50	4.46±0.68
15 th day	4.39±0.4	4.47±0.5	4.47±0.51	4.59±0.69	4.47±0.51	4.33±0.50
30 th day	4.28±0.51	4.31±0.51	4±0.42	4.47±0.51	4±0.60	4.24±0.48

The ready to eat powders stored in LDPE are highly acceptable in the initial and slightly decreasing during the period of storage.

CONCLUSION

The study was carried out to find out the nutrient content, antioxidant and microbial count of the Hibiscus incorporated ready to eat powders. The incorporation of hibiscus at 10 % was found to improve the nutrient content like energy, protein, fat, calcium, phosphorous, potassium, iron, vitamin c and antioxidant like total phenol and flavanoid. The shelf life of ready to eat powders stored in LDPE was good for 30 d. The bacterial growth was less in LDPE packaging.

CONFLICT OF INTERESTS

Declared None

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