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Sensory and Nutritional Evaluation of Biscuit Supplemented with *Hibiscus Rosasinensis* Flower

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ABSTRACT

The objective of the present study was to develop value added products by incorporating the dehydrated flower powder to increase the consumption of edible flowers in the daily diet. Three different variations of biscuit were prepared by incorporating dehydrated hibiscus powder. The proportion of refined wheat flour and hibiscus flower powder were 95:5, 90:10, 85:15. Sensory and nutritional properties were evaluated. Biscuit with 10 percent variation was found to be most acceptable. Supplemented biscuit contained higher content of fat, fibre, ash, vitamins and minerals when compared with control.

KEYWORDS: *proportion, supplemented, dehydrated, variation*

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INRODUCTION

Hibiscus rosa sinensis (Family:Malvaceae) is a shrub widely cultivated in the tropics areas as an ornamental plant. It is the native of Asia, specifically China, India and the Pacific islands (M. Sugumaran *et al.*, 2012). Out of 160 species about 40 occur in India. (Lalit *et al.,* 2012). *Hibiscus rosa-sinensis* is commonly known as Hawaiian hibiscus or Chinese hibiscus. It is cultivated throughout India and has several forms with varying colors and flowers.

Hibiscus rosa-sinensis flower contains 89.80 g of moisture, 0.064 g of nitrogen, 0.36 g of fat, 1.56 g of crude fibre, 4.04 mg of calcium, 26.68 mg of phosphorus, and 1.69 mg of iron, 4.90 mg ascorbic acid per 100 g of flowers. All the parts of *Hibiscus rosa-sinensis* and their respective chemical constituents are used for their antiovultory, anti-tumor, spasmolytic, antifertility, antipyretic, hypoglycaemic, anti-inflammatory, analgesic, antimicrobial, CNS depressant, and hypertensive activity (Jadhav *et al.*, 2009).

Value addition to food products has assumed importance in recent days. Value is added to the food products in order to enhance their nutritional value. Thus, the present investigation is an attempt to formulate value added products from the flowers and to analyze the nutritional composition of value added products.

Materials and Methods: Refined wheat flour, sugar, milk, ghee and baking powder used for biscuit making were purchased from local market in sonipat (India). The Hibiscus flowers were collected from University campus.

Drying method: Hibiscus flowers were cut and air dried at room temperature 3-5 days. The dried flowers were ground in an electric grinder to fine powder and sieved with a 2mm sieve. The dried powder was kept in air tight containers at room temperature for incorporation in sample.

Sample preparation: Ingredient required for biscuit are given in Table 1. Refined wheat flour was replaced with hibiscus powder at the levels of 5%, 10% and 15%.

Table.1 Composition of biscuit with incorporation of hibiscus flower powder

Ingredients	Control	I	II	III
Refined wheat flour (g)	100	95	90	85
Hibiscus flower powder (g)	-	5	10	15
Milk (g)	25	25	25	25
Ground sugar (g)	60	60	60	60
Ghee (g)	40	40	40	40
Sodium bicarbonate	2	2	2	2

Method: Refined flour and hibiscus flower powder were sieved and sugar and ghee were creamed. Sodium bicarbonate and some flour were added and creamed again. Added the flour and hibiscus flower powder and made a dough using milk. Rolled thick on the board and cut into the biscuits with the help of biscuit cutter. Baked the biscuits at180 ^{0}C until brown and store in air tight container.

Organoleptic evaluation: Sensory properties were determined by using 9 point hedonic scale.

Nutritional evaluation of accepted products: Proximate composition and vitamins were estimated by AOAC method and minerals were estimated by Atomic Absorption Spectrophotometer method proposed by Lindsey and Norwell (1969).

Statistical analysis: The obtained data were statistically analysed applying ANOVA.

Result

Sensory analysis of biscuits: Mean scores of colour, appearance, texture, taste and overall acceptability of Flower powder based biscuits are presented in Table 2. Biscuit prepared 100% refined flour was served as control. Mean score of control sample were same in respect of colour, appearance and overall acceptability was 7.90 and 8.00 in terms of texture and taste. Mean scores of colour (8.00), appearance (8.00), texture (8.10), taste (8.10) and overall acceptability (8.05) in Type I biscuit was rated as 'liked very much. Mean scores of colour, appearance, texture, taste and overall acceptability in Type II biscuits were in the category of 'liked very much 'whereas the mean scores of Type III biscuit were in the category of 'liked moderately' and values were 7.70, 7.70 , 7.60, 7.60 and 7.70 in terms of colour, appearance, texture, taste and overall acceptability respectively.

Table2: Mean scores of organoleptic acceptability of Biscuit based on hibiscus flower powder

Level of supplementation	Colour	Appearance	Texture	Taste	Over all acceptability
Control (RF: 100%)	7.90±0.12	7.90±0.16	8.00±0.16	8.00±0.16	7.90±0.05
Type I (95:5)	8.00±0.16	8.00±0.18	8.10±0.16	8.10±0.12	8.05±0.09
Type II (90:10)	8.10±0.16	8.20±0.16	8.20±0.22	8.10±0.16	8.10±0.08
Type III (85:15)	7.70±0.12	7.70±0.12	7.60±0.18	7.60±0.18	7.70±0.08
CD (P<0.05)	0.66	0.62	0.36	0.44	0.31

Values are mean ± SE of ten independent determinations RF= Refined flour

Nutritional analysis

Proximate composition: The data regarding proximate composition of biscuit based on hibiscus flower powder are given in Table 3.

The moisture content of control, Type I and Type II biscuit was 2.57 percent, 2.51 percent and 2.45 percent, respectively. Moisture content decreased non-significantly (P<0.05) in Type I and Type II hibiscus flower based biscuit.

The control biscuit exhibited a value of 10.44 percent protein, which decreased significantly (P<0.05) in supplemented biscuits. The protein content in Type I and Type II was 10.26 percent and 10.07 percent, respectively. Significantly (P<0.05) maximum protein content was observed in control biscuit.

Fat content of hibiscus flower powder based biscuit was more than control biscuit. The fat content of control biscuit was 25.18 percent, Type I biscuit was 25.22 percent and Type II was 25.26 percent. Type II biscuit showed non-significantly (P<0.05) higher fat content as compared to control and Type I biscuit.

The control biscuit had 0.25 percent crude fibre which increased significantly (P<0.05) in hibiscus flower based biscuit. The value for fibre in Type I and Type II biscuits were 0.53 percent and 0.81 percent, respectively. Maximum amount of fibre was found in Type II biscuit.

Ash content of hibiscus flower powder based biscuit was more than the control biscuit. The ash content of three Types of biscuit were 0.42 percent, 1.19 percent and 1.97 percent, respectively in control, Type I and Type II, respectively. Type II biscuit showed significantly (P<0.05) higher ash content as compared to control and Type-I biscuit.

Table3: Proximate composition of *biscuit* based on hibiscus flower powder (%, dry weight basis)

Samples	Moisture %	Protein %	Fat %	Fibre %	Ash %
Control	2.57±0.03[a]	10.44±0.01[a]	25.18±0.01[a]	0.25±0.01[c]	0.42±0.01[c]
Type I	2.51±0.02[a]	10.26± 0.01[b]	25.22±0.01[a]	0.53±0.02[b]	1.19±0.02[b]
Type II	2.45±0.03[a]	10.07±0.02[c]	25.26±0.02[a]	0.81±0.01[a]	1.97±0.01[a]
CD (P<0.05)	0.07	1.97*	0.07	1.87*	4.38*

Values are mean ± SE of three independent determinations; abcd Unlike superscripts in the column differ significantly (P<0.05); Control (RF 100%) Type-I (RF:HFP 95:05) Type-II (RF:HFP 90:10); RF= Refined flour HFP= Hibiscus Flower Powder

Vitamins

Significant (P<0.05) differences were observed in β-carotene content of control and hibiscus flower powder based biscuit. In control biscuit, β-carotene content was found 141.09µg/100gm which increased to 196.07µg/100gm in Type II and 168.15 µg/100 gm in Type I biscuit.

Vitamin C content increased significantly (P<0.05) in both Type of biscuit based on hibiscus flower powder. Maximum vitamin C was found in Type II biscuit (1.72mg/100g) and followed by Type I biscuit (0.86mg/100g). Control biscuit did not have vitamin C content.

Table4: Vitamins content of biscuit based on hibiscus flowers powder (g/100g, dry matter basis)

Samples	β-carotene (µg)	Vitamin C (mg)
Control	53.76±0.03[c]	0
Type I	168.15±0.01[b]	0.86±0.02[b]
Type II	283.19±0.04[a]	1.72±0.02[a]
CD (P<0.05)	2.1*	3.34*

Values are mean ± SE of three independent determinations; abcd Unlike superscripts in the column differ significantly (P<0.05); Control (RF 100%) Type-I (RF:HFP 95:05) Type-II (RF:HFP 90:10); RF= Refined flour HFP= Hibiscus Flower Powder

Minerals

The control biscuit exhibited a value of 2.75 mg/100g iron, which increased significantly (P<0.05) in hibiscus flower powder based biscuit. Iron content in Type I and Type II biscuit were 3.24 and 3.73mg/100g, respectively. Significantly (P<0.05) highest content of iron was found in Type II biscuit.

The zinc content of control biscuit differed significantly (P< 0.05) from biscuit developed with incorporation of hibiscus flower powder. Maximum amount of zinc was exhibited by Type II biscuit (1.55mg/100g) followed by Type I biscuit (1.46mg/100g) and control biscuit (1.37mg/100g).

A significant (P<0.05) difference was seen in the biscuit for manganese content. Type II biscuit had significantly (P<0.05) higher manganese content (1.14mg/100g) followed by Type I biscuit (0.61mg/100gm) and control biscuit (0.08mg/100g).

Significant (P<0.05) differences were observed in calcium content of different types of biscuit. Calcium content of control, Type I and Type II biscuit were 40.54, 101.11 and 162.76 mg/100g, respectively. However, it was observed to be highest in Type-II biscuit whereas it was the lowest in control biscuit.

Table5: Minerals content of biscuit based on hibiscus flowers powder (g/100g, dry matter basis)

Samples	Iron (mg)	Zinc (mg)	Manganese (mg)	Calcium (mg)
Control	2.75±0.02[c]	1.37±0.01[b]	0.08±0.01[c]	40.54±0.02[c]
Type I	3.24±0.02[b]	1.46±0.03[b]	0.61±0.02[b]	101.11±0.01[b]
Type II	3.73±0.01[a]	1.55±0.02[a]	1.14±0.02[a]	162.76±0.01[a]
CD (P<0.05)	2.61*	0.01*	1.2*	1.98*

Values are mean ± SE of three independent determinations; abcd Unlike superscripts in the column differ significantly (P<0.05); Control (RF 100%) Type-I (RF:HFP 95:05) Type-II (RF:HFP 90:10); RF= Refined flour HFP= Hibiscus Flower Powder

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