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Sensory and Nutrition Evaluation of Soups Supplemented with Fresh Hibiscus rosa sinensis Flowers

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ABSTRACT

Medicinal plants have been beneficial to human since the Vedic era in India. Because of their exceptional biological and pharmacological applications, they are being continuously exploited by man for their well beings. Soup was prepared with 5,10 and 15 percent addition of Hibiscus rosa sinensis flowers. It was shown that control soup fell in the category of desirable in terms of colour, appearance, texture and over all acceptability and it was moderately desirable in taste. Soup prepared by using 5% and 10% hibiscus flower was desirable in all attributes. Incorporation of hibiscus flower 15% level came down the scores for all sensory attributes and rated moderately desirable. Nutritional evaluation showed that both supplemented samples had significantly higher β-carotene content than control sample. The vitamin C content in control soup was 15.02%, while it was decreased in supplemented soup. Results of nutrient evaluation of *soup* revealed that protein content was higher in type II hibiscus flower base soup whereas, control soup had maximum content of moisture (5.69%), fat (58%), fibre (5.78%) and ash (1.54%). Type II soup had significantly higher amount of β-carotene (0.95 ug) while, vitamin C was higher in control soup (15.02mg). Highest iron (0.75mg/100g), zinc (0.21mg/100g) and manganese (0.21mg/100g) content was found in type II soup. Calcium content was observed to be higher in control soup. The study showed that hibiscus flowers are rich in phytochemicals. Acceptable value-added products like biscuit, Namakpara, Idli, Cake, Muffins etc can be developed from hibiscus to enhance nutritional value and enrich therapeutic benefits.

Key words: Medicinal, Hibiscus, Evaluation, Phytochemicals

Introduction

Traditional systems of medicine for various herbal preparations, namely Ayurveda, Siddha and Unani, use only 2,000 plants out of the total 17,000 flowering plants. 4,500 to 5,000 plant species are used by Indian traditional rural healers, whereas; The oral tradition of the villagers uses 5,000 plants for medicinal purposes. Over the past decade, tribes and other traditional communities in India use more than 8,000 wild plant species to treat various health ailments. (Chandra, 2016) Medicinal plants can be divided in three important sectors: (1) modern medicines that use about 30 to 35 medicinal plants (2) traditional medicines that are with written treatise texts such as Ayurveda, Siddha, Unani, Amchi and Tibetan systems of medicine that utilize about 1,200 to 2,000 medicinal plant species and (3) local health traditions that are based on traditions practiced by villagers, vaidyas, folk healers and tribal people who use more than 8,000 species of medicinal plants for primary health care purposes (khristi and Patel, 2016). With 80% of the population still dependent on traditional medicines for their primary health care in the world, this clearly demonstrates the important role played by traditional medicine in treating various infectious diseases. About 65% of the population in rural India use traditional medicines for the purpose of primary healthcare.
Hibiscus rosa-sinensis is common among ornamental shrubs and are the favorite flowering shrubs found in most homes. It is the regional plant of China and national blossom of Malaysia the genus Hibiscus belongs to the family malvaceous. There are 300 species of hibiscus widely distributed in tropical and subtropical parts of the world. Four species of them are mainly used for their ornamental values, that is, *hibiscus rosa-sinensis* L.,

hibiscus sizopopetalus hook, *hibiscus mutabilis* L. and *hibiscus syriacus* L. Hibiscus are found to grow independently in Indian condition and they produce flowers throughout the year and are therefore preferred over other flowering shrubs. Its attractive flowers find space in home gardens, facades, golf courses and public spaces such as schools, parks and resorts. These plants can also be used as a cottage plant, fence or hedge plant and landscape shrub (Magdalita, *et al*. 2017).

It is found that the leaves of *hibiscus rosa-sinensis* have many of pharmacological benefits. The leaves of *hibiscus rosa-sinensis* were used for the treatment of diarrhoea and dysentery. Leaves were also used as abortifacient and to stimulate expulsion of placenta after childbirth. Young leaves were used in headache (Esmail, 2018). The effect of ethanolic extract of *hibiscus rosa-sinensis* leaves was studied on androgenic alopecia. Animals treated with finasteride and ethanolic extract of *hibiscus rosa-sinensis* did not become alopecic. The crude methanolic extract of the leaves of *hibiscus rosa-sinensis* possessed strong concentration dependent antioxidant activity. The methanolic extract of leaves also showed high ferric reducing antioxidant power (Divya, *et al*. 2013). *Hibiscus rosa-sinensis* Linn has shown a significant hair growth promoting activity through its petroleum ether extract of leaves.

In India, hibiscus flowers and leaves are used to treat various diseases and are a part of Indian folk medicine. In southern India, flower petals are crushed and applied to hair to stimulate hair growth and improve hair blackness. The Khani tribe of Thirunelveli district in the Western Ghats of India believe that the intake of petals of *hibiscus rosa-sinensis* will strengthen the heart. They have also reported that the intake of hibiscus petals in combination with Lawsonia inermis, Bauhinia malabarica and Costus Specios will help improve immunity in children. In a traditional folk medicine system of Sagar taluk in Karnataka, the leaf paste of *hibiscus rasa-sinensis* is mixed with cow's milk and given to women suffering from menstrual disorders. Due to its high flavonoid and terpenoid content, it exhibits significant antioxidant and anticancer activities.

Procurement of material

Procurement

The hibiscus leaves and flowers required for the study were procured from campus of B.P.S. Girls University. Hibiscus leaves and flowers were cleaned and washed under tap water to remove dirt and dust. The washed flowers and leaves were spread over plain paper to expel extra water. At that point cut in small pieces and incorporated in products.

Plate 1: Hibiscus flower and leaves

Preparation of Soup

Ingredients	Control	I	I	I
Tomatoes (g)	100	95	90	85
Fresh hibiscus flower (g)	-	5	10	15
Onion (g)	5	5	5	5
Garlic (g)	3	3	3	3
Black pepper (g)	2	2	2	2
Salt (g)	2	2	2	2

Method

- Heated oil in the pan and added garlic and onion.
- Then added chopped tomatoes and cooked until tomatoes become completely mushy.
- Placed a sieve over bowl and sieved it.
- Boiled filtrate again for some time and added sugar.
- Cooked until it reached a thick consistency

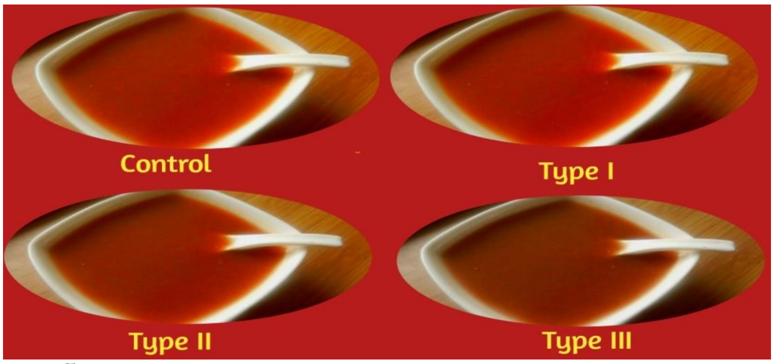

Plate 4: Fresh hibiscus flower soup

Control = 100% Tomato
Type I = 95% Tomato + 5% Fresh hibiscus flower
Type II = 90% Tomato + 10% Fresh hibiscus flower
Type III = 85% Tomato + 15% Fresh hibiscus flower

Sensory evaluation of Soup

The data in the Table (1) show that the control soup fell in the category of desirable in terms of colour, appearance, texture and over all acceptability and it was moderately desirable in taste. Soup prepared by using 5% and 10% hibiscus flower was desirable in all attributes. Incorporation of hibiscus flower 15% level came down the scores for all sensory attributes and rated moderately desirable. Abdal and Rahman (2018) developed ketchup by using hibiscus sabdariffa by products as raw material instead of tomatoes. There were no significant differences between hibiscus ketchup and market tomato ketchup concerning taste, odour, consistency and overall acceptability. Gupta *et al.* (2017) reported that kachnar leaves soup was best acceptable at 15% level. Fasoyiro *et al.* (2005) observed hibiscus extract drinks flavoured with different fruits: was acceptable in terms of flavour, taste and overall acceptability.

Table 1: Mean scores of organoleptic acceptability of soup based on hibiscus flowers

Level of supplementation	Colour	Appearance	Texture	Taste	Over all acceptability
Control (TO:100%)	8.00±0.21[ab]	8.10±0.23[ab]	8.00±0.14[ab]	7.90±0.14[b]	8.05±0.12[ab]
Type I (95:5)	8.10±0.17[a]	8.20±0.24[a]	8.10±0.23[a]	8.00±0.14[a]	8.10±0.10[a]
Type II (90:10)	8.20±0.13[a]	8.30±0.15[a]	8.20±0.20[a]	8.10±0.17[a]	8.20±0.09[a]
Type III (85:15)	7.90±0.17[b]	7.60±0.22[b]	7.90±0.17[ab]	7.80±0.20[c]	7.80±0.12[b]
CD ($P<0.05$)	0.66	0.12	0.72	0.66	0.10

Values are mean ± SE of ten independent determinations O= Tomato

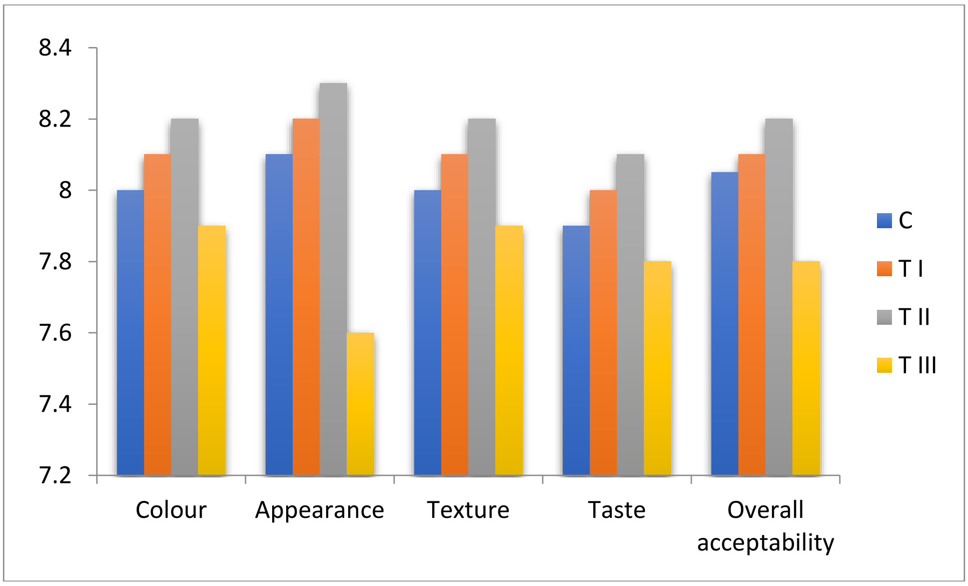

Fig. 1: Mean scores of organoleptic acceptability of soup based on hibiscus flowers

Proximate composition

The Table 2 shows moisture, protein, fat, fibre and ash content in *hibiscus rosa-sinensis* flower based soup
Moisture: The moisture content of control soup was 5.69% while it was 5.63 and 5.57% in 5 and 10% supplemented soup, respectively.
Protein: There was non-significant difference in protein content of control and supplemented soup. Protein content of control soup was 0.67 which increased slightly in 5 and 10% supplemented soup.
Fat: The fat content of Type I and Type II soup was 0.56 and 0.54%, respectively; which were lower than in control sample (0.58%).
Fiber: The fiber content in control soup was 5.78% while it was 5.57 and 5.36% in 5 and 10% supplemented soup, respectively. There was a significant difference between the fiber content of control and supplemented soup.
Ash: There was a non-significant difference in ash content of control and *hibiscus rosa-sinensis* supplemented soup. Ash content was 1.54% in control soup and it was 1.53 and 1.52%, respectively in Type I and Type II soup. Gupta *et al.* (2017) observed that as the quantities of leaves increased, the crude protein content of tomato soup was increased.

Table 2: Proximate composition of soup based on hibiscus flower (%, dry weight basis)

Samples	Moisture	Protein	Fat	Fibre	Ash
Control	5.69±0.02[a]	0.67±0.02[a]	0.58±0.03[a]	5.78±0.01[a]	1.54±0.02[a]
Type I	5.63±0.02[ab]	0.71±0.01[a]	0.56±0.03[a]	5.57±0.02[ab]	1.53±0.02[a]
Type II	5.57±0.02[b]	0.75±0.02[a]	0.54±0.03[a]	5.36±0.01[b]	1.52±0.01[a]
CD (P<0.05)	0.03*	0.09	0.67	1.32*	0.66

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

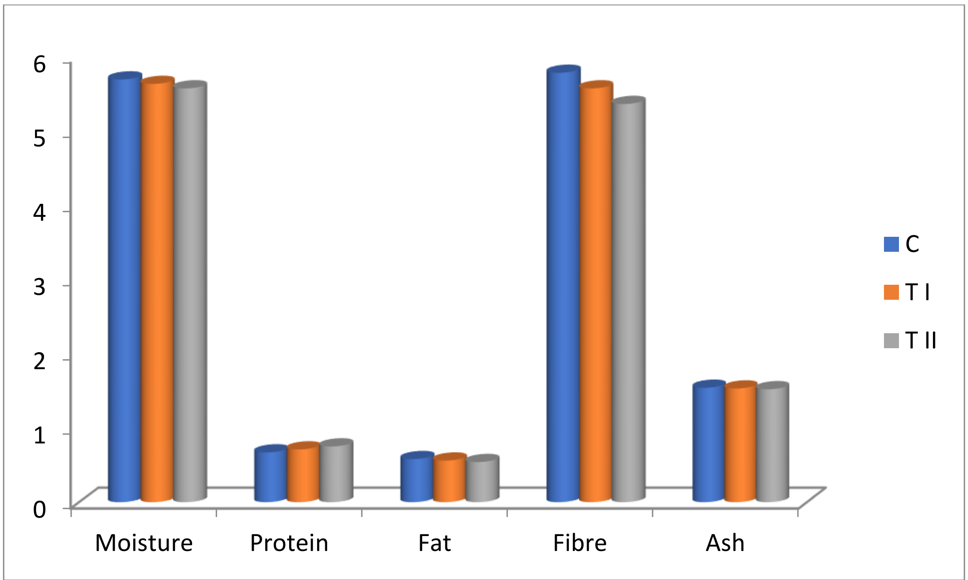

Fig. 2: Proximate composition of soup based on hibiscus flower (%, dry weight basis)

Vitamins

It is clear from the Table 3 that both supplemented samples had significantly higher β-carotene content than control sample. The vitamin C content in control soup was 15.02%, while it was decreased in supplemented soup. There was a significant difference between the vitamin C content of control and *hibiscus rosa-sinensis* supplemented soup. Abdal and Rahman (2018) reported that ketchup was prepared with hibiscus by product had lower content of vitamin C compared with tomato ketchup.

Table 3: Vitamins content of soup based on hibiscus flowers (g/100g, dry matter basis)

Samples	β-carotene (µg)	Vitamin C (mg)
Control	0.19±0.01[c]	15.02±0.01[a]
Type I	2.65±0.02[b]	14.63±0.02[b]
Type II	5.31±0.02[a]	14.25±0.02[c]
CD (P<0.05)	1.5*	9.06*

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

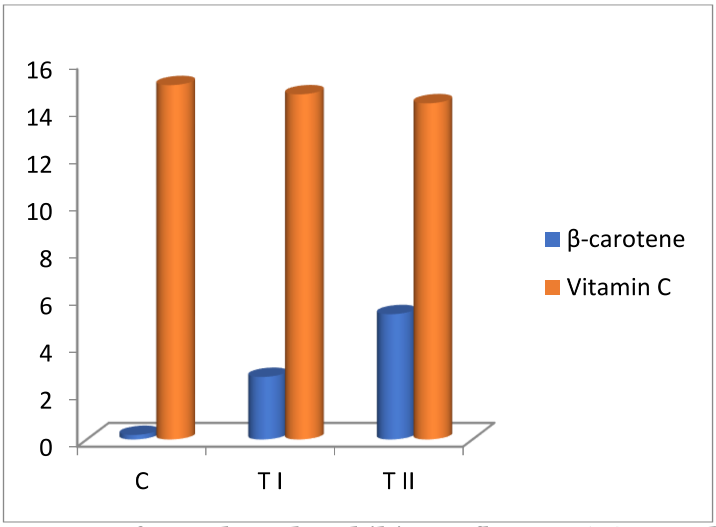

Fig. 3: Vitamins content of soup based on hibiscus flowers (g/100g, dry matter basis)

Minerals content of Soup

The iron content of control, Type I and Type II samples was 0.67, 0.71 and 0.75 mg/100 g, respectively. Iron content of supplemented samples was higher than the control. There is non-significant difference between the zinc content of control and supplemented samples. The increases in the zinc content in supplemented samples as compared to control. The supplemented flower soup (Type II) had significantly higher manganese content than control sample. The calcium content of supplemented soup was 11.71 and 11.34 mg/100 g in 5 and 10% hibiscus supplemented soup, respectively, which were lower than in control soup (12.09 mg/100 g). Similarly, Gupta *et al*. (2017) reported that soup was developed with addition of leaves showed increasing levels of leaves increased the minerals content in tomato soup.

Table 4: Minerals content of soup based on hibiscus flowers (g/100g, dry matter basis)

Samples	Iron (mg)	Zinc (mg)	Manganese (mg)	Calcium (mg)
Control	0.67±0.02^{a}	0.13±0.02^{a}	0.11±0.01^{b}	12.09±0.01^{a}
Type I	0.71±0.01^{a}	0.17±0.02^{a}	0.16±0.01^{ab}	11.71±0.02^{b}
Type II	0.75±0.02^{a}	0.21±0.01^{a}	0.21±0.02^{a}	11.34±0.02^{c}
CD (P<0.05)	0.10	0.09	0.01*	1.03*

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

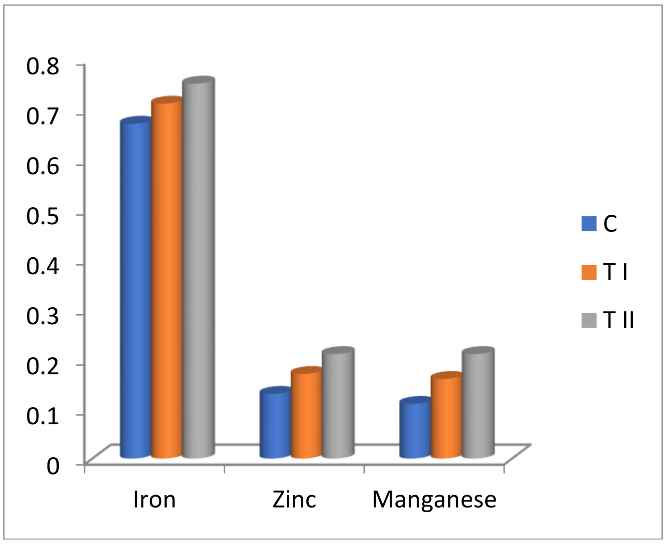

Fig. 4: Minerals content of soup based on hibiscus flowers (g/100g, dry matter basis)

Results of nutrient evaluation of *soup* revealed that protein content was higher in type II hibiscus flower base soup whereas, control soup had maximum content of moisture (5.69%), fat (58%), fibre (5.78%) and ash (1.54%). Type II soup had significantly higher amount of β- carotene (0.95 ug) while, vitamin C was higher in control soup (15.02mg). Highest iron (0.75mg/100g), zinc (0.21mg/100g) and manganese (0.21mg/100g) content was found in type II soup. Calcium content was observed to be higher in control soup. The study showed that hibiscus flowers are rich in phytochemicals. Acceptable value-added products like biscuit, Namakpara, Idli, Cake, Muffins etc can be developed from hibiscus to enhance nutritional value and enrich therapeutic benefits. Thus, with further modification, hibiscus flowers can very well be exploited for value addition and consumption and it is very helpful for our body.

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