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Sensory And Nutritional Evaluation Of *IDLI* Incorporated With *Hibiscus* Rosa-Sinensis Flower

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Abstract

Hibiscus rosa-sinensis is an edible flower "The edible flower is defined as innocuous and non-toxic flowers with many health benefits included in human diet" (Lu, *et al.* 2016). The flowers of this plant are employed to develop a famous beverage in Egypt and are also used to formulate medicines. Different parts of the plant are also added in the development of jams, spices, soups and sauces. In foods and beverages, *hibiscus rosa-sinensis* is mostly used as a flavouring agent. It is additionally used to enhance the odour and appearance in multiple recipes. In this study ,the product named *idli* was developed by using fresh hibiscus flowers was subjected to sensory analysis. The panel members evaluated the samples for different sensory attributes. Nutritional composition of Fresh hibiscus flower based *Idli* also has been done for different parameters. The result showed that type II idli based on hibiscus flower had highest value of moisture, fibre and ash (4.14, 1.02 and 2.87 %, respectively), whereas, protein (10.75 %) and fat (3.57%) were higher in control idli. β- Carotene and vitamin C content was highest in type II hibiscus flower based idli. Iron (1.37 mg), zinc (0.11mg) and manganese (0.11mg) content were found maximum in type II idli based on hibiscus flower, while, control idli had maximum content of calcium (133.05 mg) In Akwa Ibom State of Nigeria the young leaves of hibiscus are commonly consumed as vegetable and add into functional foods (Udo, *et al*. 2016). Hibiscus flowers are highly used after harvesting and one such use is the extract of pigment from flowers. Fresh flowers are used as food coloring and as a component of vegetable salads.

Key words: *Hibiscus rosa-sinensis, sensory, nutritional, idli*

Introduction

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. Edible flowers have unique and powerful flavour, colour and aroma and therefore have gained popularity in the culinary world as an innovative ingredient (Jadhav, *et al.* 2009). *Hibiscus rosa-sinensis* has a wide range of applications. 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.

Herbal medicine is the oldest form of healthcare known to mankind. Herbs had been used by all cultures throughout history. As a result of accumulated experience from the past generations, today, all the world's cultures have an extensive knowledge of herbal medicine. Plants are a valuable source of a wide range of secondary metabolites, which are used as pharmaceuticals, agrochemicals, flavours, fragrances, colours, biopesticides and food additives (Esmail, 2018)

Procurement

The hibiscus 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

3.1.1 Development of powder

Hibiscus leaves and flowers cut and air dried at room temperature 3-5 days. The dried flowers and leaves were grounded in an electric grinder to fine powder. The dried powders were kept in air tight containers at room temperature for addition in recipes.

Plate 2: Hibiscus flower and leaves powder

Organoleptic acceptability of*Idli*

The *idli* developed by using fresh hibiscus flowers was subjected to sensory analysis. The panel members evaluated the samples for different sensory attributes. The result of sensory analysis is presented in Table 1. Control sample was rated desirable in terms of colour, appearance, taste and overall acceptability and texture rated moderately desirable. Addition of fresh flowers (5%) increased the score of the sample in respect of colour, texture, taste and overall acceptability. However, *idli* prepared by incorporating 10% fresh hibiscus flower, there was increase in sensory scores of all attributes as compared with 5% and 15% incorporated *idli*. Overall acceptability of Type II *idli* scored 8.15 as compared to Type I and Type III which scored 8.07 and 7.90, respectively. The result is agreed with the study of Rani and Vijayarani (2019), who reported that 15% addition of M. oleifera flower in *idli* powder scored excellent for colour, appearance, texture, flavor, taste and

overall acceptability. Nazni and Vigneshwar (2014) reported that okra stem and hibiscus leaves powder based *idli* was desirable in terms of colour, flavour, texture and taste.

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

Level of supplementation	**Colour**	**Appearance**	**Texture**	**Taste**	**Over all acceptability**
Control (SE:100%)	8.00 ± 0.20^{ab}	8.10 ± 0.16^{a}	7.90 ± 0.14^{ab}	8.00 ± 0.20^{b}	8.00 ± 0.12^{ab}
Type I (95:5)	8.10 ± 0.17^{a}	8.10 ± 0.27^{a}	8.00 ± 0.21^{a}	8.10 ± 0.17^{a}	8.07 ± 0.10^{a}
Type II (90:10)	8.20 ± 0.20^{a}	8.20 ± 0.20^{a}	8.10 ± 0.17^{a}	8.20 ± 0.13^{a}	8.15 ± 0.08^{a}
Type III (85:15)	7.90 ± 0.17^{b}	7.90 ± 0.10^{b}	7.80 ± 0.20^{b}	7.80 ± 0.13^{c}	7.90 ± 0.08^{b}
CD ($P<0.05$)	0.72	0.64	0.72	0.38	0.34

Values are mean ± SE of ten independent determinations SE= Semolina

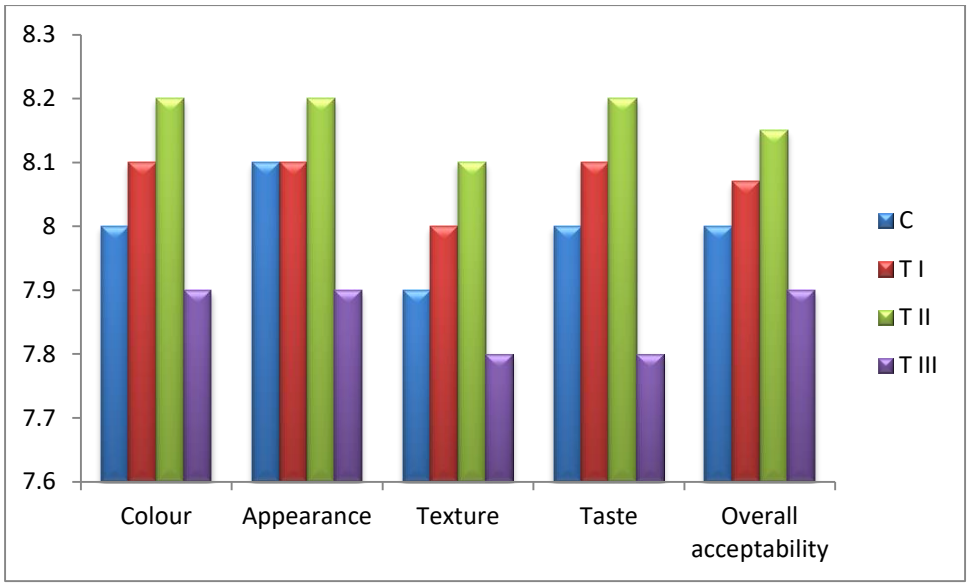

Fig. 1: Mean scores of organoleptic acceptability of *idli* based on hibiscus flowers

Nutritional composition of Fresh hibiscus flower based *Idli*

Proximate composition

Moisture: The moisture content of control *idli* was 4.06% while it was 4.10 and 4.14% in 5 and 10% supplemented *idli*, respectively. No significant difference was observed in control and supplemented *idli*.

Protein: There was non-significant difference found between protein content of control and supplemented *Idli*. The protein content of control and supplemented *idli* were 10.75, 10.70 and 10.66%, respectively.

Fat: The fat content of control *idli* was 3.57% and 10% supplemented *idli* had 3.51% content of fat.

Fibre: When the nutrients content of *idli* was considered, a significant increase was observed in the fibre content of the supplemented *idli*. The fibre content of control was 0.68% while it was 1.02% in 10% incorporated *idli* (Table 1)

Ash: The ash content of supplemented *idli* was 0.85 and 1.11% and that of control was 0.57%. The difference between the ash content was greatly significant.

Similar results were reported by earlier workers in respect that incorporation of *moringa oleifera* flower in *idli* increased the moisture, crude fibre and ash content reported by Rani and Vijayarani (2019). Protein content was highest in control *idli* same result was reported by Amandeep Kaur *et al*. (2015).

Table 2. Proximate composition of *Idli* based on fresh hibiscus flowers (%, dry weight basis)

Samples	Moisture	Protein	Fat	Fibre	Ash
Control	4.06±0.01[a]	10.75±0.03[a]	3.57±0.02[a]	0.68±0.01[b]	0.57±0.02[b]
Type I	4.10±0.01[a]	10.70±0.01[a]	3.54±0.01[a]	0.85±0.02[ab]	0.85±0.02[ab]
Type II	4.14±0.02[a]	10.66±0.03[a]	3.51±0.01[a]	1.02±0.01[a]	1.11±0.03[a]
CD (P<0.05)	0.05	0.07	0.17	5.85*	2.87*

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

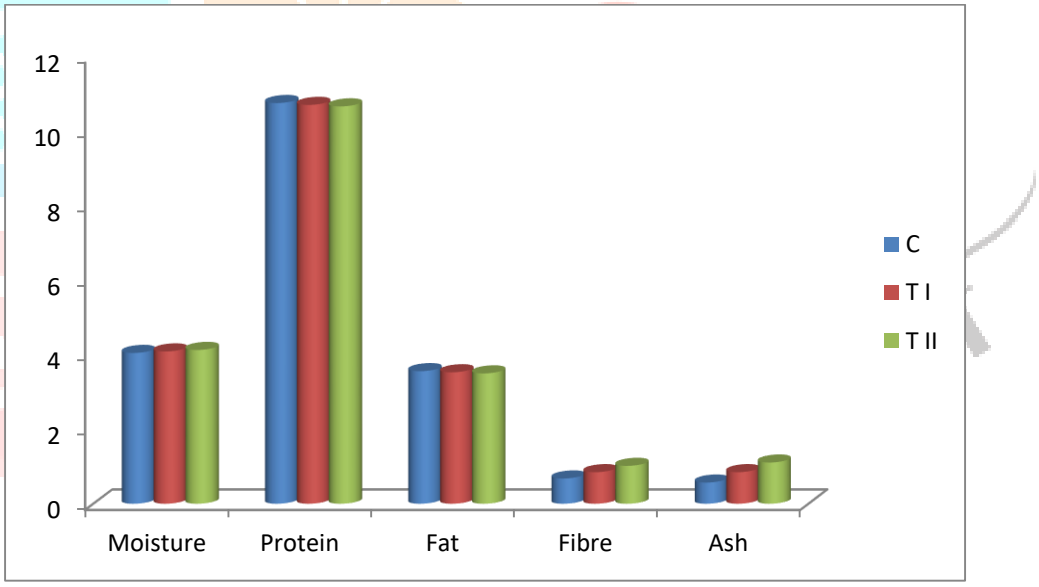

Fig.2 Proximate composition of *Idli* based on fresh hibiscus flowers (%, dry weight basis)

Vitamins

The β-carotene content was observed to increase highly in hibiscus flower *idli* as compared to control. β-carotene content of supplemented *idli* was 2.61 and 5.28 µg/100 g, which were significantly higher from control sample. The increase in vitamin C content was significant. The vitamin C content was 0.35 and 0.74 mg/100 g in 5 and 10% supplemented *idli*, respectively.

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

Samples	β – carotene µg/ 100g	Vitamin C mg/100g
Control	0.09±0.02^{c}	0.05±0.02^{c}
Type I	2.61±0.04^{b}	0.35±0.01^{b}
Type II	5.28±0.02^{a}	0.74±0.02^{a}
CD (P<0.05)	4.1*	1.56*

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

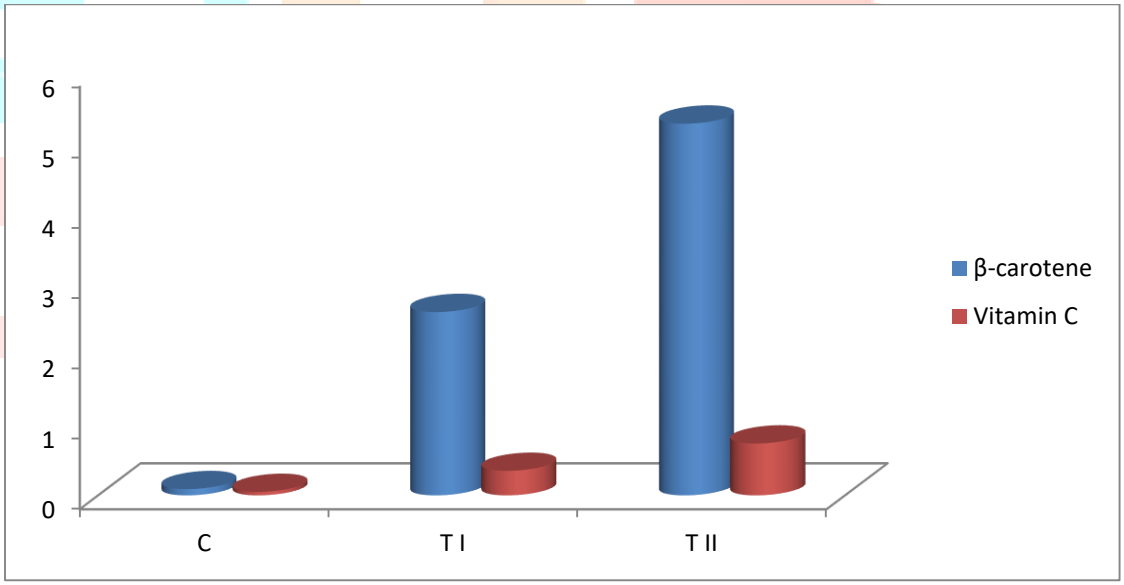

Fig. 3: Vitamins content of *Idli* based on hibiscus flowers (g/100g, dry matter basis)

Minerals

There was increase in the iron content of *idli* with addition of hibiscus flowers. It was found that 10% supplemented *idli* was rich in iron (1.37 mg/100 g), as compared with control (1.22 mg/100 g). The Table 4.17 shows significant increase in the zinc content of supplemented *idli* as compared to control sample. Zinc content of supplemented *idli* was 0.07 and 0.11 mg/100 g and the control *idli* had 0.03 mg/100 g content of zinc. The

manganese content was increased supplemented in *idli*. The calcium content decreased significantly after addition of hibiscus flowers. The content of calcium was 135.42 mg/100 g in control and 134.05 and 133.05 mg/100 g in 5 and 10% supplemented *idli*, respectively. Similar results were also observed by Rani and Vijayarani (2019) who reported that mineral content of flower supplemented products was higher than their control products.

Table 4 Mineral's content of *Idli* based on hibiscus flowers (mg/100g, dry matter basis)

Samples	Iron	Zinc	Manganese	Calcium
Control	1.22±0.02^{b}	0.03±0.01^{b}	0.01±0.00^{b}	135.42±0.01^{a}
Type I	1.29±0.02^{ab}	0.07±0.01^{ab}	0.05±0.02^{ab}	134.05±0.01^{b}
Type II	1.37±0.02^{a}	0.11±0.02^{a}	0.11 ± 0.02^{a}	133.05±0.02^{c}
CD (P<0.05)	0.01*	0.02*	0.01*	4.07*

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

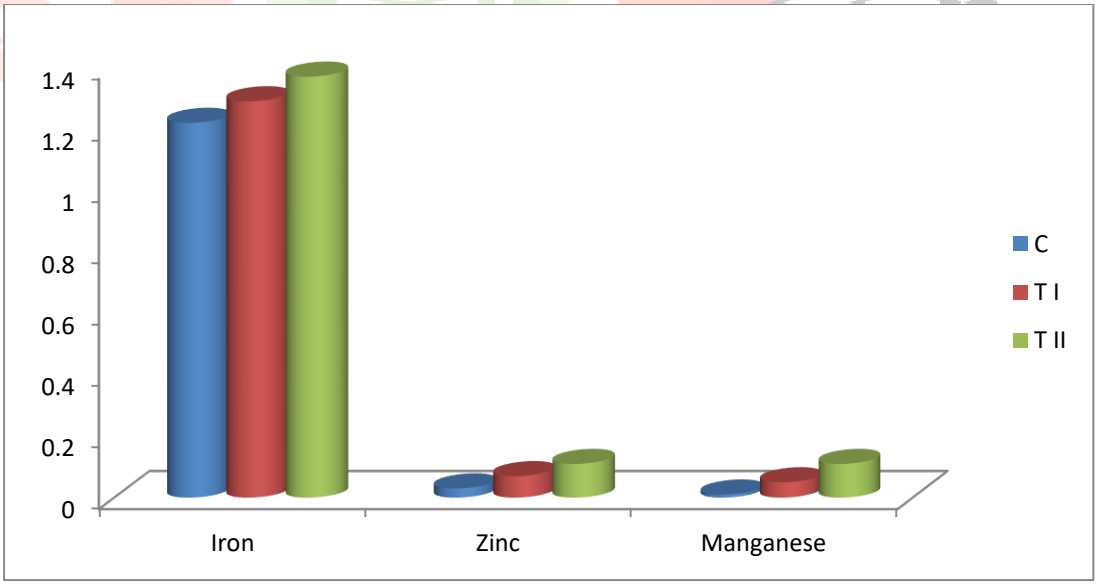

Fig 4. Minerals content of *Idli* based on hibiscus flowers (mg/100g, dry matter basis)

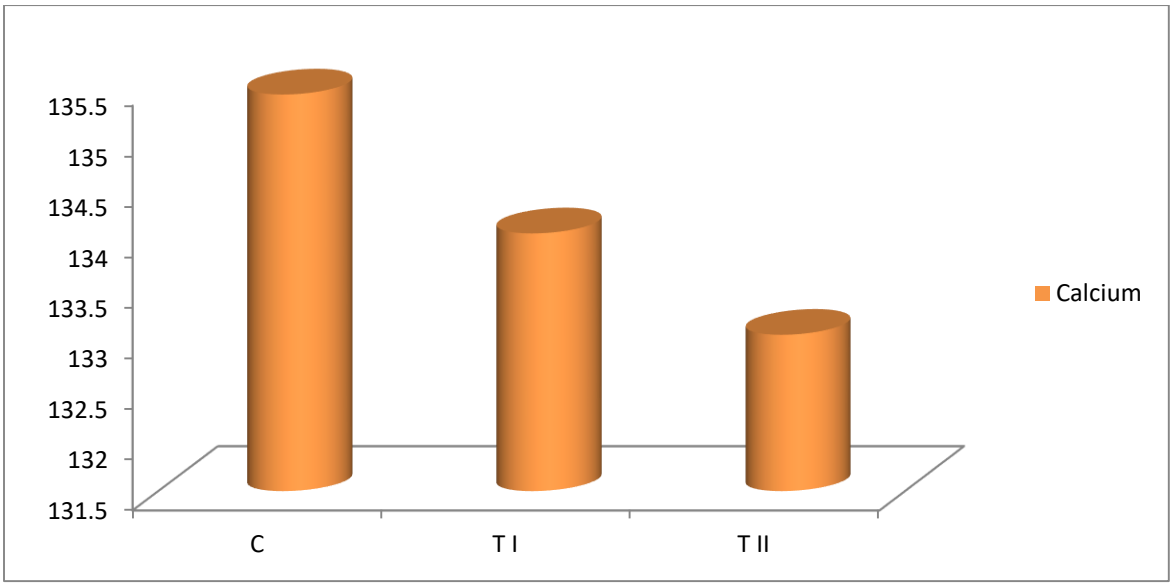

Fig.5 Calcium content of *Idli* based on hibiscus flowers (mg/100g, dry matter basis)

Conclusion: Consumption of alternative medicines and especially phytochemicals is increasing rapidly worldwide. Since herbal medicines are less harmful than synthetic drugs, they have better compatibility, which improves patient tolerance even on long-term use. Synthetic drugs are associated with a number of side effects, which are hyperuridemia, diarrhea, nausea, myositis, gastric irritation, flushing, dry skin, and abnormal liver function.

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used for ages in Ayurveda to cure many ailments. The plants have the natural health benefit that can be used to cure diseases naturally. World health organization also advocated that traditional medicines as safe remedies for treatment of disease.

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