



Formulation & Nutritional Composition of Sugar Candy incorporated with Curry Leaves Powder

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Abstract: *Murraya koenigii* (curry leaves) is one of the most common and popular leaf spice used in very small quantities in almost all foods for its distinct aroma and their ability to improve digestion. But still, people neglect to consume it. In view of this, an attempt was made to utilize (curry leaves) in order to develop low cost iron rich product as it contains high iron content. These leaves are also rich source of protein, dietary fibre, iron and other vital nutrients. In the present study, curry leaves have been incorporated to sugar candy in three different proportions (20:15:10) followed by calculation of nutritional composition and cost analysis. Among the variations, V-II scored highly in acceptability and was proceeded with nutritional composition and cost analysis. Incorporation of curry leaves has shown statistical increase in iron content and other essential nutrients respectively. The cost of the formulated sugar candy was found to be Rs.20/100g. Thus, it can be concluded that utilizing these curry leaves, rich natural sources of micro nutrients can be feasible, inexpensive food based approach for combating micronutrient malnutrition which is prevalent in populations, especially in developing countries.

Keywords: *Murraya koenigii*, Sugar candy, Iron rich, Product Formulation.

1. INTRODUCTION :

Sugar Candy is a sweet delicacy that is made from fruits or vegetables by impregnating them with sugar syrup, draining the extra syrup, and then drying the finished product to a state that will keep it fresh for a long time. Candies have been made from fruits and vegetables such as apples, ginger, guava, and carrots. Instead of creating new food products, the current nutritional situation requires investigating the feasibility of adding innovative ingredients in frequently consumed foods. It is desirable to make efforts to improve the nutritional value of sugar sweets considering the current state of nutritional quality of candies and the rising demand for nutrient dense diets (Zaker *et al.*, 2012). The most prominent and commonly used leaf spice is curry leaf. In Indian cuisine, its leaves are frequently used to flavour dishes. The leaves have a little pungent, bitter, and weakly acidic flavour, and even after drying, they maintain these flavours. They are valuable sources of micro nutrients like carotene, iron, zinc, folate, and other trace elements. They can be added to conventional products to increase their sustainability and attractiveness for supplying nutritional security (Sheetal *et al.*, 2011).

Anand and Allen, 2006 stated that Food Fortification is a medium-term, cost-effective strategy that, once established, is sustainable for improving micronutrient status. It is the main means of enhancing diet quality, combating malnutrition, and avoiding nutritional deficiencies. The foundation of this strategy is to boost food production, consumption, and body absorption, especially of foods high in micronutrients. Khatoon *et al.*, 2011 in his study reported that the concentration of calcium, iron, and beta-carotene in curry leaves incorporated products has increased as the incorporation levels increased. Hence, to increase the nutritious content of various food products, dehydrated curry leaves can be used in their production. Thus, incorporating curry leaves in the sugar candy would be an innovative approach to enhance the micronutrient level in order to prevent malnutrition and child mortality.



2. MATERIALS & METHODS :

The raw materials used for the formulations were Rice, Black gram dhal (urad dhal), Curry leaves, Sugar. These raw materials have been procured from the local super market in Coimbatore. Pre- preparations have been made which includes preparation of curry leaves powder, urad dhal & rice (idly) batter and sugar syrup. For making curry leaves powder, curry leaves were cleaned and washed in running tap water, after 2-3 minutes the curry leaves were dry roasted in a pan and then after cooling, it was grinded in a mixer and sieved to get the fine curry leaves powder. Rice & urad dhal batter was prepared by soaking of rice and urad dhal for 5-6 hours, then the skin was removed in urad dhal. After cleaning, rice and urad dhal were grinded into batter separately without adding water to it. And the sugar syrup was prepared by boiling of equal amount of sugar and water until total soluble solids reached to 65-70° Brix by following the FSSAI specifications.

Formulation of the Product:

In a bowl add idly batter along with curry leaf powder and mix thoroughly



Now heat the oil in a pan



Make a round shaped balls with batter and deep fry the balls in the heated oil



Once the balls are fried, take it out and put the balls into the sugar syrup



Leave it for 5 minutes in the sugar syrup and serve at room temperature



Fig 1 Preparation of curry leaves sugar candy

Fig 2 curry leaf sugar candy

The product formulated has been standardised for 100g in order to make it desirable in terms of taste, flavour, and acceptability. The variations for the formulated product were standardized in order to make it desirable in terms of taste, flavour and acceptability. Variations were brought about by incorporating the selected ingredients (curry leaf powder, rice, black gram dhal, sugar) at different proportions respectively. Control product was prepared without the addition of curry leaves powder. The below table represents the quantity of ingredients added for the preparation of variations in curry leaf incorporated sugar candy.

| S.NO | INGREDIENTS | VARIATION- 1 | VARIATION- 2 | VARIATION- 3 |
|------|--------------|--------------|--------------|--------------|
| 1 | Curry leaves | 20g | 15g | 10g |
| 2 | Rice | 20g | 15g | 10g |
| 3 | Black gram | 20g | 25g | 30g |
| 4 | Sugar | 40g | 45g | 50g |

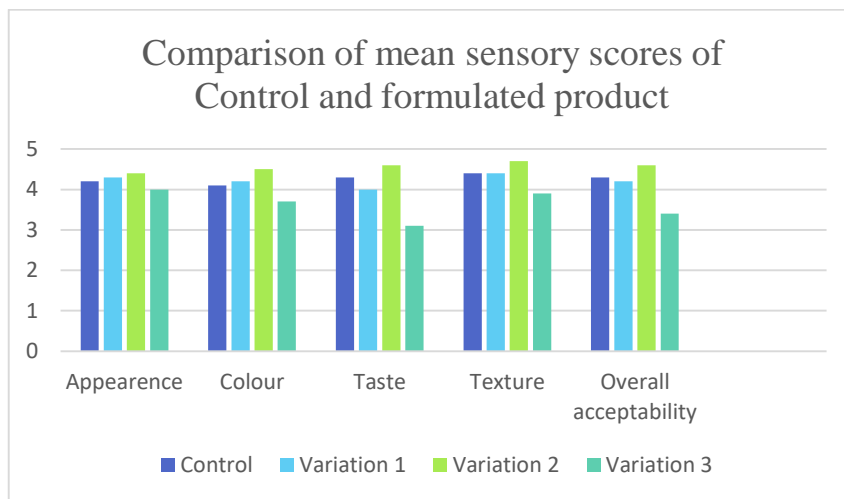
Sensory evaluation of the product was done by a panel consisting of twenty members using five-point hedonic scale. Each panellist was given a score card and asked to evaluate the samples for different attributes viz. appearance, colour, taste, consistency and overall acceptability for both control and sample variations. The variation which was most acceptable among the variations was selected and used for further analysis and cost effectiveness.

Nutritional composition of the formulated product were calculated using Indian Foods Composition Tables, IFCT BOOK, 2017 for 100g of the standardised and organoleptically well accepted variation and the results were interpreted in the table. The cost of the product was also calculated using the cost of raw materials, overhead charges and profit percentage to obtain the selling cost.



3. RESULTS AND DISCUSSION:

Figure-3 Comparison of mean sensory scores of control and formulated product



The result of the sensory analysis was represented in figure-3. In case of appearance and colour, the average value for V-II was higher as compared to V-I and V-III. Highest score values of 4.7 & 4.6 was awarded to V-II for its taste and texture respectively. So, the overall acceptability score of V-II was higher over other two variations while *Khatoon et al., 2011*, organoleptically found in his study that in the case of uttapam and lemon rice, 3% incorporation of dehydrated curry leaves (T1) scored best. In case idly, 4% incorporation of dehydrated curry leaves (T2) scored best with regard to colour and appearance, body and texture, taste and flavour, and overall acceptability. Thus, Among the formulated variations, it was noted that V-II has scored high in terms of colour, flavour, texture, taste and overall acceptability followed by V-I, V-III means that 15% of curry leaves and 15% of rice flour and 25% of black gram dhal incorporation makes the candy tastier.

Nutritional composition of dried curry leaves

| Nutrients | Value of Dried Curry Leaves/100g |
|--------------|----------------------------------|
| Protein | 12g |
| Fat | 5.4g |
| Carbohydrate | 64.31g |
| Calcium | 2040mg |
| Iron | 12mg |

Khatoon et al., (2011), Utilization of dehydrated curry leaves in different food products, Indian Journal of Natural Products and Resources.

Nutritional composition of control and curry leaves fortified sugar candy

| S.NO | NUTRIENTS | CONTROL | VARIATION-II |
|------|--------------|---------|--------------|
| 1 | Energy | 535kcal | 593.26kcal |
| 2 | Carbohydrate | 59g | 70g |
| 3 | Protein | 7g | 8.05g |
| 4 | Fat | 30g | 30.66g |
| 5 | Fibre | 3.4g | 6.06g |
| 6 | Calcium | 70mg | 300mg |
| 7 | Iron | 0.0mg | 3.58mg |

Control and Organoleptically highly accepted variation -II has been chosen and calculated for its nutritional composition using Indian Foods Composition Tables, IFCT BOOK, 2017.

The nutritional composition was interpreted in table and it was observed that there is a marked increase in the nutrients like Carbohydrate, protein, fat, fibre and iron. Carbohydrate content was high in V-II (70kcal/100g) when compared to



the control sugar candy. Protein and Fat content have showed slight increase in Variation-II while comparing to control, whereas Fibre content in the Variation –II was high (6.06g/100g) than the control due to the addition of curry leaves. Finally Iron has been fortified to the Variation-II of about (3.58mg/100g) whereas the control have negligible iron content. The above all nutrients (carbohydrate, protein, fat) will provide an energy of about 593Kcal/100g. Similar findings has been reported by Ranjitha and Sudha (2016) in their study showed that curry leaves incorporated curd have relatively good physicochemical and nutritional characteristics. Enriching curd with curry leaves have boosted the iron and other micronutrients which would alleviate many physiological disorders like anaemia, night blindness etc. Thus, Curry leaves incorporation in sugar candies have showed statistical increase in all nutrients especially fibre and iron content.

Cost calculation:

The cost of the product was calculated using the cost of raw materials, overhead charges and profit percentage to obtain the selling cost. The selling cost of the control sugar candy was calculated to be Rs.25/100g which was higher than the curry leaves incorporated sugar candies which was Rs.20/100g. Commercially available sugar candies may contain artificial colours, preservatives and flavouring agents. But the formulated candy does not have any preservatives or flavouring agents and also it is considered as superior in terms of nutrient content than the control and commercially available sugar candy.

4. CONCLUSION: The confectionery industry in India is growing at a very fast rate and the demand for health confectionery products is increasing. The development of value added products can be an alternative for commercial jellies in the market and it is a high-quality candy product that meet consumer demands in terms of sensory and micronutrient content. The nutritional composition of fortified sugar candy is higher than the control product and it is noted that the curry leaves fortified sugar candy has more iron content than the control product. Hence the results obtained in the study have shown the possibility of utilising the curry leaves into the foods can be done to improve the nutritional value of the food as it increased iron content in sugar candy. Hence, curry leaves can be incorporated into many products to combat iron deficiency in people as it is rich in iron content.

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