



A STUDY ON DEVELOPMENT AND NUTRITIVE ANALYSIS OF GULAB JAMUN MIX INCORPORATED WITH IVY GOURD

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Abstract: Ivy gourd *Coccinia grandis* is grown worldwide. In India it is commonly known as baby watermelon, gentleman's toes, and locally known as kundru is a tropical plant. It is one of the most beneficial medicinal herbs in traditional and ayurvedic medicine. Incorporate the kovakkai were tested to assess the suitability for the production of gulab jamun mix. It makes a classic Indian sweet made with milk, sugar, rose water and cardamom powder. Gulab jamun mix are dairy product, fried in hot oil to form sweet snacks. It can be of good quality and has a color, taste, texture, softness. The physio – chemical characteristics of kovakkai gulab jamun mix such as moisture were tested. The physical and chemical properties are analyzed and gave a result and discussion such as Bulk density, True density, Porosity, Water absorption capacity, Oil absorption capacity, Swelling capacity. The nutrients are been analyzed and given the value and its chart in results and discussion. The sensory evaluation is done by the mean and SD calculation. The cost calculation is used for the 500g of kovakkai gulab jamun mix. The packaging of kovakkai gulab jamun mix is made up of Tinplate metal. Tin is considered to be a sustainable packaging substrate because it is completely recyclable, meaning that it can be processed and returned to the production cycle without a loss of quality. Labelling of kovakkai gulab jamun mix contain Nutritional facts, Preparation method, Storage, Shelf life. Thus, it is concluded that gulab jamun mix made from kovakkai are acceptable to the consumer as they are obtained maximum score followed. Therefore, this study indicates that good quality gulab jamun mix could be prepared from kovakkai.

Key points: Ivy gourd, Gulab jamun, nutrient content, fried snack, oil absorption.

I. INTRODUCTION

Coccinia grandis belongs to family Cucurbitaceae, commonly known as Ivy gourd or little gourd also known as baby watermelon, gentleman's toes, and locally known as Kundru, is a tropical plant. It is native to Bengal and other parts of India. (Kumar M, Alok S, Chanchal DK, et al., 2018). Every part of the plant is beneficial in medicine and also in various preparations that have been mentioned in the indigenous system of medicine like the anti-inflammatory, analgesic and antipyretic activity of fruit and leaves have been studied so far and are found to be noteworthy. (Kumar M, Alok S, Jain SK, et al., 2013). The plant contains secondary metabolites such as saponins, flavonoids, sterols, and alkaloids (Kumar M, Alok S, Jain SK, et al., 2013).

Coccinia grandis, the ivy gourd, also known as scarlet gourd, tindora and kovai fruit, (Michel H. Porcher, 2011) is a tropical vine. It grows primarily in tropical climates and is commonly found in the Indian states, where it forms a part of the local cuisine. *Coccinia grandis* is cooked as a vegetable. In Southeast Asia, it is grown for its edible young shoots and edible fruits. (Linney, G.1986). Ivy gourd also known as *Coccinia grandis* is a member of Cucurbitaceae family in the order Violales. The *Coccinia grandis* (L) Voigt family comprises more than 900 species.

It is also known as baby melon or little gourd or sometimes tam lueng. It is a native plant of East Africa but also found in Asia, Australia, the Caribbean islands and Pacific islands. Ivy gourd is a tropical plant having ovoid shape fruit having green color during raw and turns to red color when ripen (Umamaheswari, 2008). The green fruit have number of nutrients such as calcium, protein, fiber and beta carotene, Vitamin. The shelf life of the fruit is 3-4 days at room temperature and 7 to 8 days at refrigerated temperature condition. Fruit color changes to pink during initial ripening and lose its weight during storage due to wilting. Leaves are aligned alternately to the stem and have heart to pentagon shaped.

The surface of the leaf is hairy on the lower and hairless on the upper side. The color of leaves is dark green in color. The flowers of ivy gourd are large and white in color having star like shape. The calyx has five sub cuticles with recurved lobes. Each lobe is 2-5mm long on the hypanthium. The ivy gourd flower has three stigma and its ovary is inferior. Generally, flowering occurs in the month of June to august. All the parts of the plant are beneficial in medicines preparation and treatment of various diseases. Whole plant has number of phytochemicals and possesses pharmacological properties.

II. OBJECTIVES

- ❖ To analysis the physical and functional properties of selected kovakkai powder, and cereal powder.
- ❖ To analysis the nutrient content of the developed kovakkai powder.
- ❖ To find the shelf life of the powder.
- ❖ To developed Gulab jamun using selected cereal and vegetable of kovakkai.
- ❖ To developed the health benefits of kovakkai Gulab jamun mix.
- ❖ To find the microbial count of the kovakkai gulab jamun mix.
- ❖ To find the shelf life of the kovakkai gulab jamun mix.
- ❖ To make a Packaging and labeling for our developed product.
- ❖ To evaluate the acceptability of the developed products by sensory evaluation.

III. METHODOLOGY

3.1. COLLECTION OF INGREDIENTS:

All the raw material are procured from the local market. Good quality of vegetable, cereals are selected, cleaned and graded. Milk powder are stored at closed container, kept at room temperature. Cereals product of wheat flour and maida are procured from the local market.

The following ingredients were used to develop Kovakkai gulab jamun.

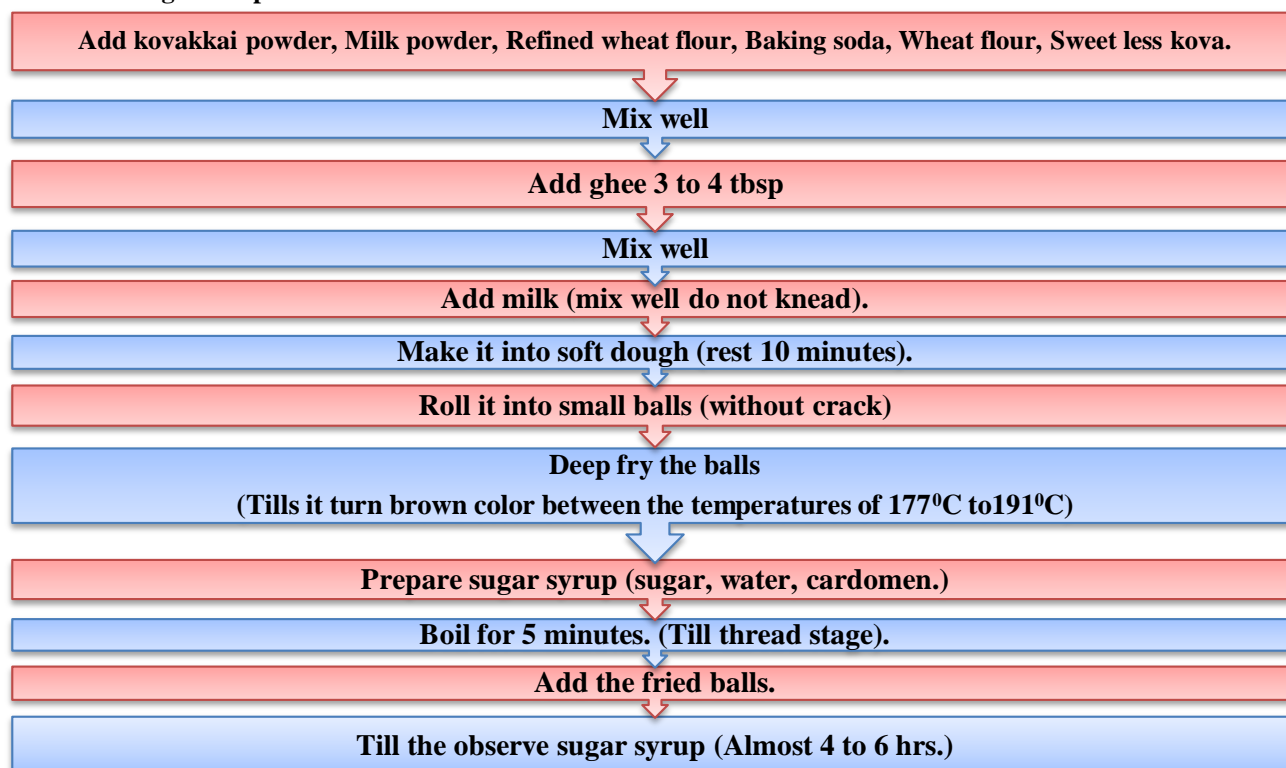
Kovakkai powder, Wheat flour, Maida, Milk powder, Ghee, Milk, Baking soda and sweet less kova

3.2 PROCESSING OF THE PRODUCT

3.2.1 Pre processing



3.2.2 Processing of the product:



3.3 PHYSICAL PROPERTIES AND FUNCTIONAL PROPERTIES OF PRODUCT:

3.3.1. LENGTH, BREADTH, THICKNESS:

The three-principal dimension such as length (L) (MM), breadth (B) (MM) and thickness (T) (MM) and of the selected kovakkai gulab jamun powder, measured using a vernier caliper with an accuracy of mm,

3.3.2. MOISTURE CONTENT ANALYSIS:

Moisture content was determined by drying 5g of sample for 15min in a Carter-Simon oven set at 155C. The dried sample was weighed and the differences in weighed before and after drying were assumed to be moisture loss. The ratio of moisture loss to weight of dried flour percentage was recorded as moisture content dry basis. (*Simon- Carter Co., Minneapolis, MN*)

3.3.3. BULK DENSITY:

Bulk density is the weight of a volume unit of kovakkai gulab jamun powder and is usually expressed in g/cm³, kg/m³, or g/100 ml. Bulk density is usually determined by measuring the volume of 100 g of kovakkai gulab jamun powder in a 250 ml graduated cylinder after exposure to compaction by standardized tapping (*S.D. Kalyankar, S.S. Deosarkar, 2016*)

3.3.4 TRUE DENSITY:

True density is the quotient of mass over the volume of a kovakkai gulab jamun powder, without considering pores in the sample (true volume). In the case of granular sample, the terms particle density and particle volume are used.

3.3.5. POROSITY:

Porosity of kovakkai gulab jamun mix was determined the formula (*Thompson and ISSAC, 1976*).

3.3.6. WATER ABSORPTION CAPACITY (WAC):

The water absorption characteristic represent the ability of a product to associate with water under condition water is limiting, in order to improve its handling characteristic and dough making potentials one gram of kovakkai gulab jamun flour was weighed (a) into a measuring centrifuge tube and content was weighed (b). The one gram of flour, 10ml distilled water was added and mixed well until the flour thoroughly wetted. The tube was kept in a water bath at 30c for 30 minutes and centrifuged at 2000 rpm minutes. The measured supernatant was to cross check the results. The weight of centrifuge tube with soaked sediment was noted (*Wang et al., 1976*). The WAC of kovakkai gulab jamun flour was calculation.

3.3.7. OIL ABSORPTION CAPACITY (OAC):

The first absorption is attributed mainly to the physical entrapment of oil ant the binding of fat to a polar chain of protein. One gram of kovakkai and gulab jamun mix was weighed (ws) into a measuring centrifuge tube and the content was weighed (wi). One gram of flour, 10ml of refined groundnut oil was added and mixed well until the flour thoroughly wetted. The tube was kept in a water bath at 30c for 30 minutes and the centrifuged at 2000 rpm for 20 minutes. The weight of centrifuged tube with soaked sediment was noted (wf) (*Takshi et al., 1988*). AOAC of kovakkai gulab jamun mix was calculated.

3.4. FORMULATION AND DEVELOPMENT OF KOVAKKAI GULAB JAMUN MIX:

The standardization was done using the 9-point hedonic scale card. The rating scale contains three different ratios (V1, V2, and V3) of the formulated gulab jamun mix. The healthy individuals are selected for the evaluation each recipe. Kovakkai was cleaned by water and then cutting into small pieces. After cutting into small pieces at different shapes for sun drying. It is dried for about 3 -5 days for remove moisture. Grind the dried ingredients separately and sieve the powder to get the fine powder. Add wheat flour, Maida, Milk powder mix well. And add ghee as required or 3 to 4 tbsp. Then added milk as required to make a soft dough rest in 10 minutes. Roll it into small balls without crack and deep fry the balls till it turn brown. Prepare sugar syrup with sugar, water, and cardamoms. Boil for 5 minutes till thread stage. Add the fried balls till the observe sugar syrup almost for 4 – 6 hours.

The ingredients selected for the development and organoleptic evaluation of gulab jamun were formulated into 3 variations, such as V1, V2, V3 flow chart of plot and standardization table variation

Proportion of Kovakkai Gulab Jamun Mix

S.NO	INGREDIENT	QUANTITY(g)
1.	KOVAKKAI POWDER	10
2.	MILK POWDER	50
3.	WHEAT	10
4.	MAIDA	30

Table 3.1

TABLE: 3.2

Proportion of Basic Ingredients Used for the Preparation of Kovakkai Gulab Jamun Mix

INGREDIENTS	CONTROL	V-1	V-2	V-3
MILK POWDER	50	50	50	50
WHEAT	25	10	10	10
MAIDA	25	35	30	25
KOVAKKAI POWDER	-	5	10	15

3.5 ORGANOLEPTIC EVALUATION OF KOVAKKAI GULAB JAMUN:

Sensory evaluation is the process of evaluation of the knowledge acquire to human senses like appearance, taste, texture, odor, flavor and color. The formulated variation (V1, V2, and V3) of kovakkai gulab jamun and the control were assessed for sensory evaluation using 25 – 30 semi trained panel members. A nine-point hedonic scale was used for the assessment of sensory evaluation was developed on the basis of numerical rating scale (like extremely – 9, like very much – 8, like moderately – 7, like slightly – 6, neither like or dislike – 5, dislike slightly – 4, dislike moderately – 3, dislike very much – 2, dislike extremely – 1.)



Plate 3.1 Variation of Kovakkai Gulab Jamun

3.6. NUTRIENT ANALYSIS OF KOVAKKAI GULAB JAMUN MIX:

The selected sample of kovakkai gulab jamun mix were analyzed for various principle energy method was analyzed by calorimeter, protein by Lowry's method, CHO by Anthrone method, Fat by Soxhlet method also the product is analyzed for nutrient such as Iron, Phosphorous, Fiber, Calcium, Vitamins, Glycemic index, Ash moisture by AOAC method of evaluation.

3.7. MICROBIAL ANALYSIS OF KOVAKKAI GULAB JAMUN MIX:

The kovakkai gulab jamun mix were analyzed for the microbial growth and total bacteria count of yeast, fungi and mold at initial and end of the study period (7 days) at room temperature which were than subjected to microbial analysis using standard procedure.

3.8. SHELF LIFE OF KOVAKKAI GULAB JAMUN MIX:

The formulated kovakkai gulab jamun mix was packed in the tin containers and placed in refrigeration for shelf life. The kovakkai gulab jamun mix can also be stored in aluminum; Tin coated steel, Electrolytic chromium coated steel and placed in a room temperature. The overall quality of the food depends on its several characteristic and shelf life is the most important aspects.

3.9. COST CALCULATION:

The cost calculation was done to recognize the price of the product for merchandise and selling. Cost of the selected variation of development and organoleptic evaluation of kovakkai gulab jamun has been calculated using a standard price list from the farmer's market.

3.10. PACKAGING AND LABELLING:

Tinplate container is used for packaging. Tinplate metal is primarily steel with a very thin tin coating. Tin is widely used for plating steel cans used as food containers, in metals used for bearings, and in solder. Tin is considered to be a sustainable packaging substrate because it is completely recyclable, meaning that it can be processed and returned to the production cycle without a loss of quality.

3.11. STATISTICAL ANALYSIS:

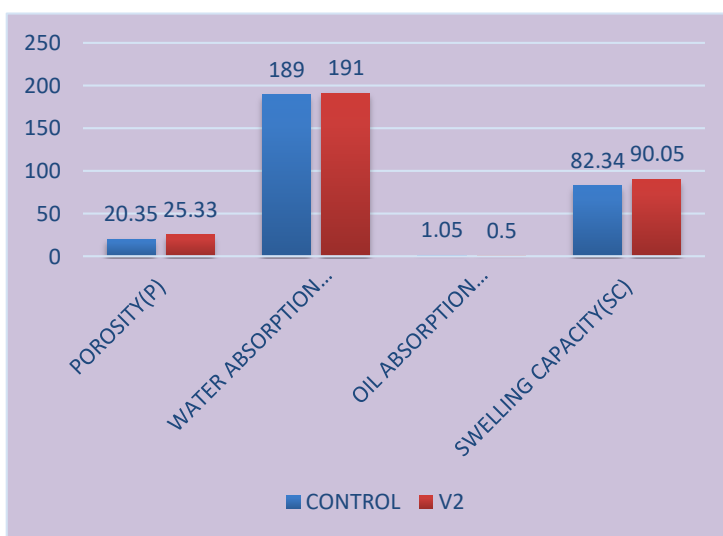
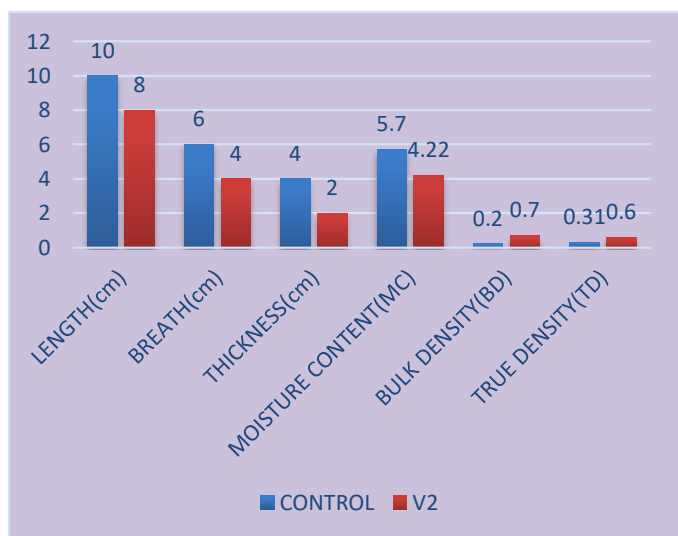
The data was obtained for each variation was statically calculated as Mean \pm SD and t-test analysis been carried out to find the level of significance.

IV. RESULTS AND DISCUSSION

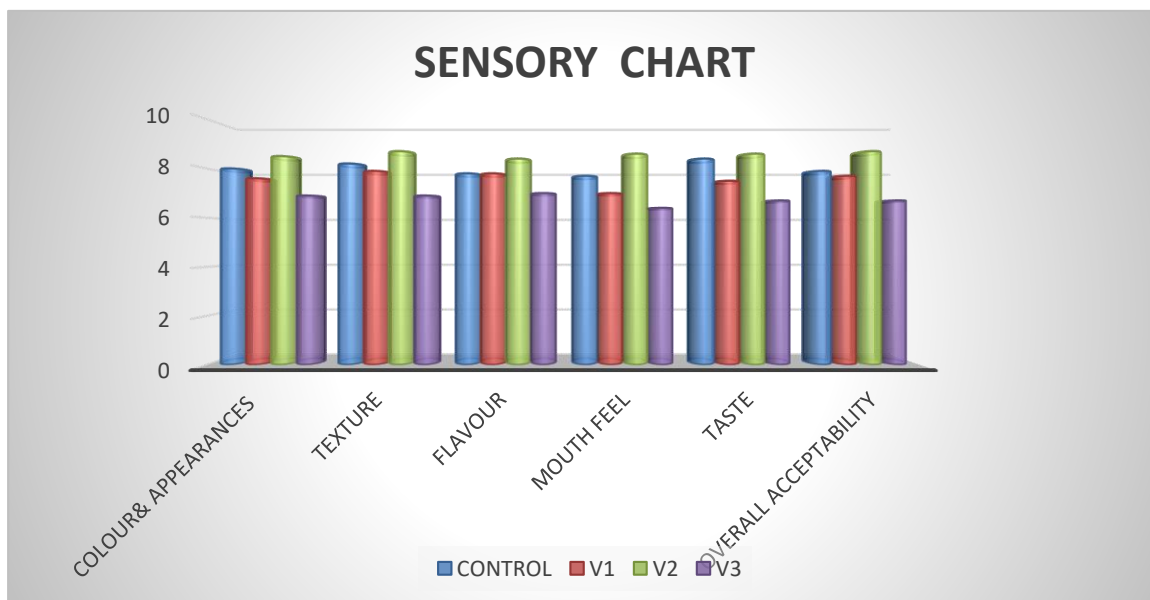
4.1 PHYSICAL AND FUNCTIONAL CHARACTERIZATION OF THE CONTROL AND ACCEPTED VARIATION OF KOVAKKAI GULAB JAMUN MIX:

Table: 4.1
Physical and Functional values Kovakkai Gulab Jamun Mix

PROPERTIES	CONTROL	V2
LENGTH (cm)	10cm	8cm
BREADTH (cm)	6cm	4cm
THICKNESS (cm)	4cm	2cm
MOISTURE CONTENT(MC)	5.74	4.22
BULK DENSITY(BD)	0.24g/ml	0.726 g/ml
TRUE DENSITY(TD)	0.31g/ml	0.65 g/ml
POROSITY(P)	20.35	25.33
WATER ABSORPTION CAPACITY(WAC)	189g/ml	191 g/ml
OIL ABSORPTION CAPACITY(OAC)	1.05g/ml	0.50 g/ml
SWELLING CAPACITY(SC)	82.34	90.05



4.2 Statistical analysis of kovakkai gulab jamun



CHARACTERISTICS	CONTROL	Variation -1	Variation -2	Variation – 3
COLOUR & APPEARANCE	8 ± 0.66	7.6 ± 0.516	8.5 ± 0.527	6.9 ± 0.737
TEXTURE	8.2 ± 0.63	7.9 ± 0.875	8.7 ± 0.483	6.9 ± 0.875
FLAVOUR	7.8 ± 0.918	7.8 ± 0.421	8.4 ± 0.516	7 ± 0.816
MOUTH FEEL	7.7 ± 0.948	7 ± 0.66	8.6 ± 0.516	6.4 ± 0.699
TASTE	8.4 ± 0.516	7.5 ± 0.849	8.6 ± 0.516	6.7 ± 0.674
OVERAL ACCEPTABILITY	7.9 ± 0.316	7.7 ± 0.483	8.7 ± 0.483	6.7 ± 0.823

4.3. NUTRIENT ANALYSIS OF THE ACCEPTED VARIATION OF GULAB JAMUN

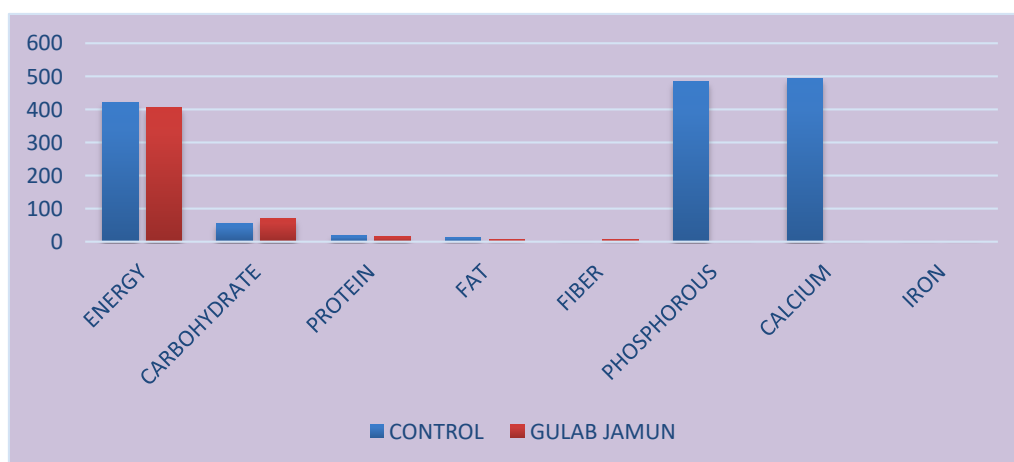
From the result of sensory evaluation, it was observed that 10g of kovakkai powder incorporated gulab jamun (Variation 2) was highly acceptable and hence the nutrient analyses for variation 2 were done.

Table: 4.5

Nutritive value of accepted variance

NUTRIENT	CONTROL	GULAB JAMUN
ENERGY	420.25	406.11
CARBOHYDRATE	54.82	69.65
PROTEIN	17.775	15.45
FAT	14	7.31
FIBER	0.55	7.17
PHOSPHOROUS	484	0.610
CALCIUM	492.75	0.088
IRON	2.2	1.578

Gulab jamun provide Energy 406.11kcal, Carbohydrate 69.65g, Protein 15.45g, Fat 7.31g, Fiber 7.17mg, phosphorous 0.610mg, Calcium 0.088mg, Iron 1.578mg.



4.4. MICROBIAL ANALYSIS OF THE ACCEPTED VARIATION OF GULAB JAMUN MIX:**Microbial Load for Bacteria:**

The microbial load (bacteria) of kovakkai gulab jamun mix sample tested through dilution 10-6 and 10-7 were determined and the result are presented below.

Microbial Load (Bacteria) of Kovakkai Gulab Jamun Mix

Type of Food	Time	Dilution	Number of Colony	Total Plate count (TPC)
Kovakkai Gulab Jamun Mix	Initial (1 st Day)	10 ⁻⁶	02	02x10 ⁻⁶
		10 ⁻⁷	01	01x10 ⁻⁷
	Final (7 th Day)	10 ⁻⁶	04	04x10 ⁻⁶
		10 ⁻⁷	03	03x10 ⁻⁷

Microbial Load for Fungi:

The microbial load (fungi) of kovakkai gulab jamun mix sample in tested through dilution 10-3 and 10-4 were determined and the result are presented below.

Microbial Load (Fungi) of Kovakkai Gulab Jamun Mix

Type of Food	Time	Dilution	Number of Colony	Total Plate count (TPC)
Kovakkai Gulab Jamun Mix	Initial (1 st Day)	10 ⁻³	Nil	Nil
		10 ⁻⁴	Nil	Nil
	Final (7 th Day)	10 ⁻³	Nil	Nil
		10 ⁻⁴	Nil	Nil

4.6. SHELF LIFE OF THE ACCEPTED VARIATION OF GULAB JAMUN MIX:

Kovakkai gulab jamun Mix can be judged by the eye, example- colour, size, shape, uniformity an absence of defect is the importance in food selected. Kovakkai gulab jamun mix was stored from the 4.2.2023 to .12.4.2023 days. The selected kovakkai gulab jamun mix sample is stored in various packaging material like Tinsplate Metal at room temperature and refrigerator. The stored kovakkai gulab jamun mix was good in all aspect like colour, texture, and aroma.

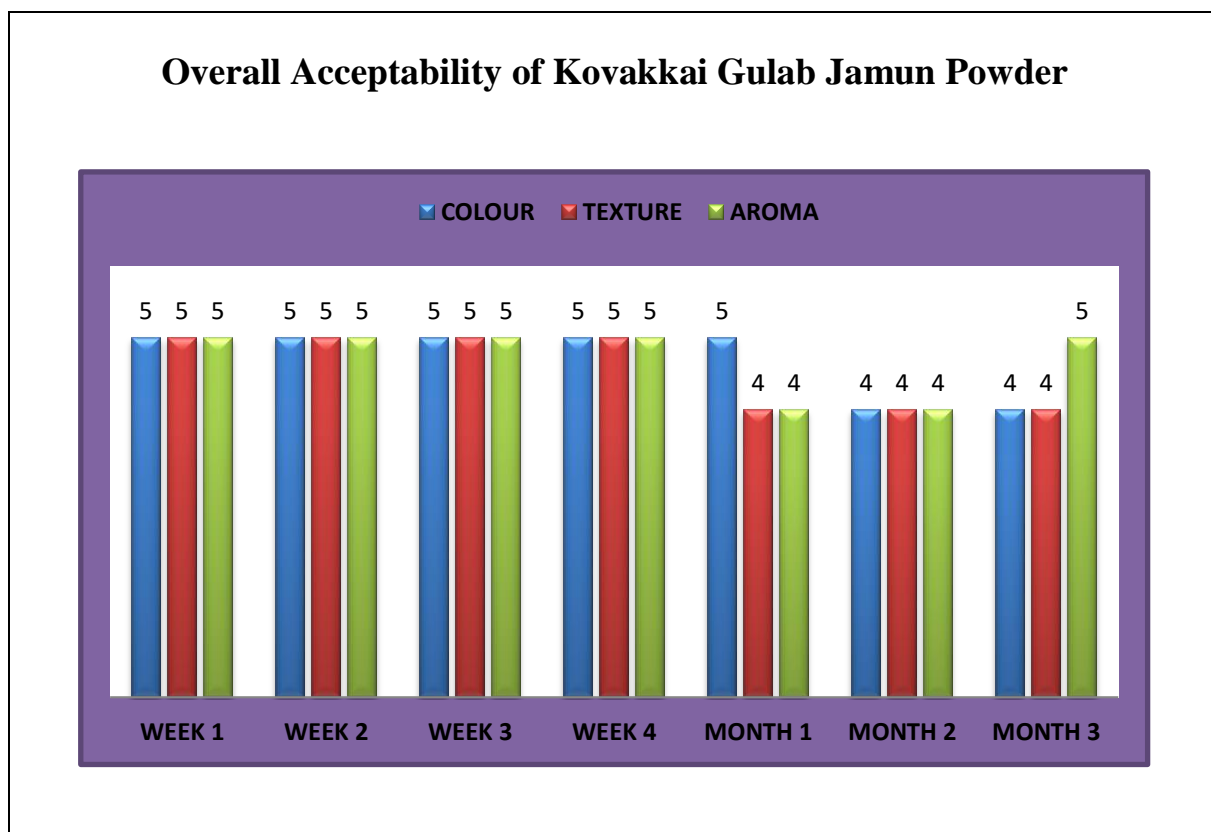
Overall Acceptability of Prepared Kovakkai Gulab Jamun Powder

	COLOUR	TEXTURE	AROMA	DURATION
1	5	5	5	Week 1
2	5	5	5	Week 2
3	5	5	5	Week 3
4	5	5	5	Week 4
5	5	4	4	Month 1
6	4	4	4	Month 2
7	4	4	5	Month 3

EXCELLENT – 5
 VERY GOOD – 4
 GOOD – 3
 FAIR – 2
 POOR – 1

The Tin metal packaging storage of kovakkai gulab jamun mix not be produce any changes in colour, texture and aroma. This packaging gives a good result of shelf life.

OVEEALL ACCEPTABILITY OF PREPARATION KOVAKKAI GULAB JAMUN POWDER



4.7. COST CALCULATION OF THE ACCEPTED VARIATION OF GULAB JAMUN MIX:

Cost Calculation of Kovakkai Gulab Jamun Mix

INGREDIENTS	QUANTITY 100g	PRIZE
Wheat	10g	0.592
Milk powder	50g	26
Maida	30g	3.12
Kovakkai powder	10g	0.6
Total	=	30Rs

The cost calculation of the product of 100g of each developed Kovakkai gulab jamun Mix revealed that the total each product cost (100g) was 30Rs. It was evident that the prepared Kovakkai gulab jamun mix were more economical and affordable when compared with commercial Gulab jamun available in the market.

Profit calculation:

$$= \frac{\text{cost of product} \times 60}{100}$$

$$= \frac{30 \times 60}{100}$$

Profit = 18

= Profit + cost of product

= 18 + 30

= 48

Therefore, the cost of the each Kovakkai Gulab Jamun mix for 100g is Rs. 48

4.8. PACKAGING AND LABELLING OF THE ACCEPTED VARIATION OF GULAB JAMUN MIX:



PLATE- 4.2

Packaging of Gulab Jamun Mix



PLATE: 4.3 Labelling of Gulab Jamun Mix

V. CONCLUSION:

This chapter deals with the description of summary and conclusion used to accomplished the experimental work done to attain the desired objectives to the study entitled “A Study on the Development and Nutritive Analysis of Gulab Jamun Mix Incorporated with Ivy Gourd”.

The study was undertaken to make sweet as gulab jamun mix. The formulation was developed by replacing the ingredients used in traditional gulab jamun mix making with kovakkai flour was developed with aim of enhancing the taste and improving the nutritional value of gulab jamun mix. To enhance of nutrients for gulab jamun mix had Kovakkai flour, Milk powder, Wheat flour, Refined wheat flour, Sweet less kova, were added.

Kovakkai was dried at normal room temperature because nutrient can be losses when dried at sun dry. Standardization of product was developed 3 variations. Each and every variation of product was standardization is differed in taste, texture, colour. Finally, variation 2 (10g) was selected and people also like.

Physical and Functional Properties of Kovakkai Gulab Jamun Mix is contain 8cm Length, 4cm Breadth, 2cm Thickness, and 0.50 % Oil Absorption Capacity. The Carbohydrate content of Kovakkai Gulab Jamun Mix is higher because Carbohydrate is converted into Energy in our body. Protein content of Kovakkai Gulab Jamun Mix is lower because vegetable contain low amount of Protein. Fat content of Kovakkai Gulab Jamun Mix is lower when compared to control because of adding vegetable there is low amount of fat level and oil absorption. Fiber content of Kovakkai Gulab Jamun Mix is higher when compared to control because the Dietary Fiber is the kind of eat so it is soluble, and it may help lower risk of heart disease.

They Finally the ivy gourd gulab jamun mix with enhanced nutritive value was undertaken for storage and nutrients content of kovakkai was not seems to be decrease. Kovakkai powder to be fresh and edible for more than three month at refrigeration condition.

The gulab jamun mix was packed with tinplate metal. The microbial action is not presented, because it has 4.22 % of moisture content.

FUTURE RECOMMENDATION:

The incorporated kovakkai gulab jamun mix can be introduced to public to improve good health supplementation study can be initiated.

Awareness program might be given about the combination of vegetable in their daily life.

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