

## DEVELOPMENT AND OPTIMIZATION OF PROCESSING TECHNIQUES FOR MUSKMELON GUMMIES

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### ABSTRACT

Gummies popularly known as confectionary snacks contain high levels of sugars and artificial additives, contributing to health concerns such as obesity and dental problems. The main study focuses on the development and standardization of healthier gummies by using muskmelon juice and orange concentrate as key ingredients. This research aims to formulate gummies with reduced sugar content while maintaining desirable taste, texture and nutritional quality. Muskmelon a popular fruit known for its sweet aroma and juicy flesh, as it is rich in vitamins, minerals, and antioxidant. It improves digestion; hydration and skin health. The research focuses on the recipe to achieve desired flavor, texture and shelf life stability. Sensory evaluations are conducted to assess the flavor intensity, sweetness, chewiness and overall palatability. The Aim of the present study is to develop a gummies with the formulating of musk melon juice and orange concentrate in different formulation and nutritional analysis of gummies and proximate composition of raw material. Gummies is made in different formulations Control, T1, T2, and T3 in different ratio. Gummies are popular confectionary food worldwide and different formulations have been developed to improve its chemical properties profile. The main purpose of this research is to develop and optimize the techniques for muskmelon gummies and to assess the shelf stability through quality and sensory evaluation during storage period.

## INTRODUCTION

Muskmelon is a commercially important fruit cultivated throughout the world, comprising tropical and sub-tropical regions. Muskmelon (*Cucumis melo* L.) commonly called as cantaloupe is a member of Cucurbitaceae family. Muskmelon is very popular in developed countries where the per capita consumption is high to beat the scorching summer heat (Salunke, Bolin, & Reddy, 1991). In India, muskmelon occupies an area of about 36.70 thousand hectare with annual production of about 760.81 thousand metric tones (Indian Horticulture Database, 2015). Consumer preference for this fruit is determined largely by its sweetness, flavor or aroma, texture and more recently as a rich source of phyto-nutrients. Musk melon is cultivated in the regions of Punjab and Rajasthan in India. Musk melon is easily spread into the forests as feral from cultivation. Natural habitats are near cultivated areas, townships and riverbeds. They grow well on a wide range of soil types. Medium-textured soils (loams) generally produce higher yields and better quality melons. In all cases the soil must exhibit good internal and surface drainage. The pH should be above 5.8 and preferably near 6. (P.Milind et al., 2011).

Confectionery products are widely consumed by both children and adults. In Portugal, 86.8% of children between 6 and 8 years consume these products at least three times a week. Jellies and gummies are particularly popular in the age group under 17 years due to their organic and chewy nature (Raji et al., 2018; Mabalaha, Mitei, & Yeboah, 2007). These products have a gel-like structure, containing fruits (a minimum of 45 g/100 g) and sugars (in the form of sucrose syrup and/or glucose, in concentrations of about 55 g/100 g), combined with gelling agents, acids (Venkatesan, et al., 2016), aromas, and food colorants. However, excessive and widespread consumption of jellies and gummies is thought to negatively impact public health due to their high contents in sugar and food additives, as well as the presence of non-desirable compounds generated by the heat treatment such as hydroxymethyl-2-furaldehyde or acrylamide (Edite Teixeira et al., 2021).

In addition, the variety of raw materials of collagen is outlined and briefly broached the plant hydrocolloids which have been labeled as 'veggie-gelatin'. With regard to the potential and market stability of gelatin, its recent studies are summarised in this paper. Accordingly, this paper focuses on assessing the general utilities of the various sources of collagen as gelatin derivatives (Asavasanti, Tantipaibulvut, Samaal, & Sanuksaen, 2018; Corzo & Gomes, 2004; Leistner, 1992). At that basis, the aim of this work is to provide an insight into gelatin in current applications, market value and progress in gelatin extraction (J. Alipal et al., 2011). The aim of this study is to develop healthy and palatable gummy jellies containing only natural ingredients such as muskmelon juice, orange concentrate and sugar. This is a preliminary approach to the problem, and in this stage, we have also evaluated these gummy jellies in terms of color, texture, microbiologic safety, and sensorial evaluation to demonstrate their health benefits while also preserving most of the desirable organoleptic properties of traditional gummies and jellies. In addition, the nutritional value of the produced gummy jellies was compared with commercial formulations.

### Materials and Methods:

The materials used to prepare the gummies are: Muskmelon juice, orange concentrate, flavor, gelatin, sugar, gummy shaped

**Table: 1 Formulations of gummy jellies in different proportions;**

Ingredients	T1	T2	T3
Muskmelon juice	80	100	100
Orange concentrate	30	20	--
Gelatin	10	10	10
Sugar	10	15	10
Lemon juice	--	5	--

Total soluble solids (TSS):

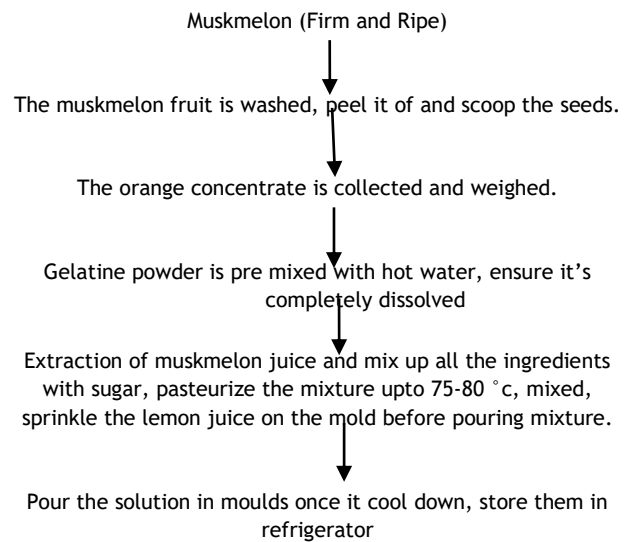
Total soluble solids expressed as g of total soluble solids contained in 100g or °Brix were determined by using digital refractometer with an accuracy of 0.01 °brix. The working range

mould. All the raw materials used in these experiments were purchased from local super markets. The orange concentrate used in the formulations was collected from the srini food park.

### Methods:

Several recipes were explored in this study using various formulations and additional components, such as a combination of orange concentrate and musk melon juice. However, following the initial screening process, several of the formulations were deemed unsatisfactory in terms of texture, look, or consistency. Slowly dissolved thickeners were added to heated liquids. The mixture was left in a water bath at a temperature of between 70 and 75 degrees Celsius for an extended period of time, allowing the ingredients to dissolve completely. The formulation was put to bear-shaped moulds once it had fully homogenised, yielding gums weighing around 6g. For approximately, these trays were kept at room temperature. Until cooling to reach temperature equilibrium, roughly thirty minutes. (Edite teixeria., 2011). They are then kept in a refrigerator at +4°C for a whole day. They were taken out of the moulds after a day and placed in a covered container that was refrigerated pending additional examination. After a week, no overall changes in appearance have been seen.

**Fig 1: Preparation of muskmelon gummies**



### Analysis determination:

Musk melon gummies is a complex mixture with several rheological properties. The muskmelon and orange concentrate gummies were formulated in different variations as shown in table .1 The total soluble solids, pH, acidity, color, viscosity and microbiological analyses were performed for each formulation of gummy jellies and for each sample .The formulated variations of muskmelon gummies was subjected to organoleptic evaluation and the gummies that was given most average scores will be selected for the further evaluation of nutrient content.

was upto 70 °Brix .A 2mm thick sliced sample was located in the visor for the measurements. All three samples were performed.

### Acid Base level test (pH):

pH was measured by using a micro pH 2001 meter equipped with a glass combined electrode the samples were cut into slices , mixed with hot water 1;3 w ;w and constantly stirred until their complete dissolution the hot solution was tempered at 25 °c prior to measuring the pH Ranganna (1999). All the three samples were performed .The pH value of the product is measured by observing at pH value listed on the pH meter. pH is used so that the durable in storage because it is acidic.

### Titrateable acidity:

Titrateable acidity measurements deal with the total acid concentration of a food also called as (total acidity). The

gummies was weighed and dissolved in the distilled water and it was made upto 100 ml with distilled water, through few drops of phenolphthalein indicator colour turns to slight pink which denotes the amount of acidity present in the weighed sample.

Organoleptic test (Hedonic scale):

The hedonic test involves panel list respond by indicating the product is whether to consumed or not the different formulations of sample is prepared and which were presented as coded so as not to influence their judgment (Chitra, 2002). In this both the Male and female, age between 22 to 30 were took the test. In descriptive test panelists were asked to rate the samples for a number of attributes on a hedonic scale from 1 to 9, where 1 was dislike and 9 was excellent attribute characteristic. In this test the following parameters were evaluated. Colour Taste [sweet ,bitter, sour ] Flavor / odor [ astringent, floral ] Texture [ firmness, granular, softness ] Over all acceptability Hedonic scale : Excellent 9 Very Good 8 Good 7 Slightly like 6 Neither like /dislike 5 Dislike 4 Dislike moderately 3 Dislike very much 2 Dislike 1

Color:

A device spectrophotometer is used to measure the amount of light observed by the sample at the various wave lengths. The color value of the gummies can be measured in terms of hue, saturation and brightness. Muskmelon gummies generally have color value that falls within the green - yellow to orange - yellow spectrum, reflecting the natural color of muskmelon (lightness) it lies between 50 and 80/ a\* ( red or green ) -10 to 10/ b\*( yellow or blue ) 20 and 40 These values varies from the specific formulations , dyes and processing methods used in the production of gummies.

Vitamin c (ascorbic acid):

Redox titration method is used for the determination of the amount of ascorbic acid present in sample. Few grams of sample is diluted and then titrated with the oxidizing agent iodine solution which reagents with the ascorbic acid .and at the final end point of the titration the changes in color can be observed.

Microbial activity;

Microbial analysis of gummies involves testing to detect and quantify the presence of microorganisms such as bacteria, yeast and molds that may affect the product safety and consumption due to their moisture and its sugar content .To determine the amount of aerobic bacteria present in the sample the TPC

procedure is used. The sterile equipments were used to avoid introducing external microbes.

Total plate count is also known as Aerobic plate count (APC) or Total viable count (TVC) is a microbiological test used to estimate the no : of viable bacteria in sample . This method is widely used in food safety to assess the overall level of microbial contamination.

Sample preparation:

Weigh the required amount of gummy samples nearly 10-15 grams and the sample is diluted and homogenized for the uniform suspension further serial dilution was performed. Transfer the 1ml of sample to 9ml of diluent to make a 10<sup>-1</sup> dilution. Continue the procedure to achieve desired range of dilutions (10<sup>-2</sup>, 10<sup>-3</sup>, 10<sup>-4</sup>) and each dilution is mixed evenly Plate count agar media:

Weigh the 23 grams of agar powder for the 1 liter of medium is prepared to perform TPC. add 1 liter of distilled water and mix it thoroughly until it is dissolve (stir it with stir bar or glass rod) and place the beaker in an autoclave for 121° c for 15 mins for 15 lbs pressure .after that the agar broth is allowed to cool about 40 -45 ° c before pouring to the sterile petridishes. Pour the agar broth before its starting solidifying. Up to 15-20 ml of broth is poured and allows it to solidify. Now transfer the 1ml of each dilution of sample in separate petri dishes and gently swirl the petri dishes to mix the inoculum with the agar .incubate the plates at 35 -37 ° c for 24-48 hrs. After incubation period the no: of colonies appeared on the plate is calculated.

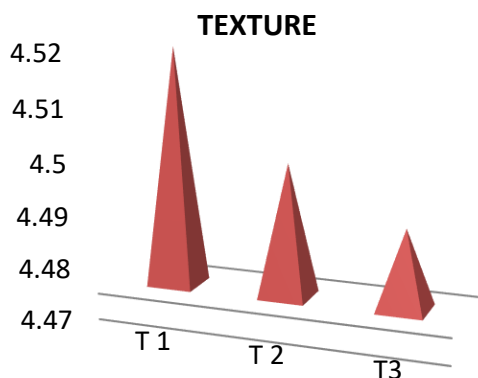
TPC (CFU/ml or CFU/g = No: of colonies × dilution factor / volume plate

#### RESULTS AND DISCUSSION:

The findings from the ongoing investigation, along with the pertinent discussion have been condensed into the following categories

Textural analysis:

The texture of muskmelon gummies was measured by adopting the method as given by Piga et al. (2005) with minor modifications. Puncture test was performed to measure the texture values with texture analyzer for analyzing the data. Intermediate level muskmelon samples were punctured to measure the firmness from external to internal surface tissue cells by placing the samples in the center beneath the needle probe.



Sensory attributes:

The gummies was prepared by the muskmelon juice , orange concentration , sugar , gelatin , lemon juice in proportions of 100 : 20 : 10 : 15: 5 , which was more acceptable over all the proportions , based on the sensory attributes the further organoleptic studies and storage studies was performed

Table 2: Mean sensory attributes scores of Muskmelon; sugar; orange concentrate ; gelatin ; lemon juice (during standardization).

S#	Muskmelon ;sugar ;orange concentrate ;gelatin ; lemon juice proportions	Mean scores	Sensory scores
1	80 : 30 : 10 : 10 : 00	7.59	
2	100: 20 : 10 : 15 : 05	8.55	
3	100: 10 : 00 : 00 : 10	7.15	

Table 3: Sensory Evaluation of Gummies.

Sensory Attributes	Control	T1	T2	T3
Colour	8	7.5	8.5	8
Taste	8	7	8	7
Flavor	8	7	8	7
Chewiness	8	7	8.5	7.5
Texture	8	7.5	8	7
Overall acceptability	8	7	8	7

Physical and chemical constituents of gummies:

The gummies were further analyzed for TSS, Acidity, PH, Spectrometer properties. The composition showed in table 4

Table 4: Chemical constituents of gummies

Parameters	Initial	After one week of storage at ambient temperature	After one week of storage at refrigerator
Acidity	0.19	0.22	0.20
TSS	44.50	44.51	44.50
PH	6.30	6.20	6.00
Color	0.67	0.60	0.65

Proximate analysis of gummies:

The gummies were analyzed for ash, moisture, protein, vitamin c, carbohydrates and energy value properties. The appropriate composition showed in table 5.

**Table 5: Proximate analysis of gummies:**

ANALYSIS	AMOUNT
Ash	0.5
Moisture	20
Protein	0.52
Vitamin c	20.5
Carbohydrates	12
Energy value	50.3

**Microbial count:**

The gummies were analyzed total viable count bacteria, yeast and mold, coli form count for the selected sample. The appropriate composition has shown in table 6

Parameters	Microbial count Initial	After one week storage of room and refrigerator
Tfu (cfu/ml)	0	0
Yeasts and molds ( cfu /ml)	0	0
Coliforms cfu/ml)	0	0

**CONCLUSION**

A novel gummies product having better storage stability was developed. Developed gummies of treatment 2 are considered best physic chemically and organoleptically. It has been established from the current investigation that to sustain life stability of muskmelon and enhance its marketability, we can dry them and add orange concentrate, flavor, gelatin and, sugar at specific level. Future explorations would be required in this respect to discover more unique methods and processing conditions. The finding concludes that, it is possible to prepare gummies that can be preserved for short time at room temperature but can be stored in refrigerator .The gummies with preservatives like sugar coated can be easily preserved in refrigerator temperature without any spoilage.

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