

**PREPARATION AND NUTRIENT ANALYSIS OF BOTTLEGUARD JAM
(Enriched with Prebiotic)
PROJECT WORK**

Submitted in partial fulfillment of the requirements for the award of
Bachelor of Science degree in Clinical Nutrition and Dietetics

By

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INSTITUTE OF SCIENCE AND TECHNOLOGY

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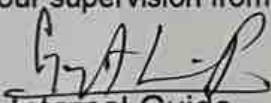
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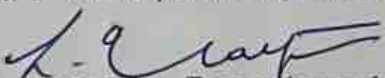
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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of, **JILLELA BHARATHI (41736005)**, **KARRU LIKHITHA REDDY (41736006)** who carried out the project entitled **PREPARATION AND NUTRIENT ANALYSIS OF BOTTLEGUARD JAM (Enriched with Prebiotic)** under our supervision from January 2024 to April 2024.

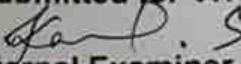

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DECLARATION

We KARRU LIKHITHA REDDY (41736006), JILLELA BHARATHI (41736005) hereby declare that the project Report entitled "**PREPARATION AND NUTRIENT ANALYSIS OF BOTTLE GUARD JAM (Enriched with Prebiotic)**" done by us under the guidance of Dr. Gayathri.P Assistant professor Internal guide, Department of Medical Laboratory Technology is submitted in partial fulfillment of the requirements for the award of Bachelor of Science degree in Clinical Nutrition and Dietetics.

DATE: 27-04-2024

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ABSTRACT

Bottle gourd and banana jam is an innovative fruit preserve that combines the nutritional benefits of both ingredients. This study investigates the nutritional composition and microbial content of bottle gourd and banana jam, while also providing detailed insights into the jam preparation process. Nutritional analysis reveals the rich presence of essential vitamins, minerals, and dietary fiber in both bottle gourd and banana, highlighting their potential health benefits. Microbial analysis ensures the safety and quality of the final product by evaluating the microbial load and identifying any potential contaminants. The jam preparation process involves selecting fresh bottle gourd and ripe bananas, followed by thorough cleaning and sanitization. The fruits are then chopped and cooked with sugar and lemon juice to enhance flavor and aid in preservation. The mixture is carefully monitored to ensure proper consistency and texture. The resulting jam exhibits a harmonious blend of sweetness from bananas and the subtle earthiness of bottle gourd, enhanced by natural pectin for a perfect texture. Nutrient analysis revealed significant levels of vitamins, minerals, and dietary fiber, making it a wholesome alternative to traditional jams. Overall, this innovative jam offers a delightful culinary experience while promoting health and sustainability.

Keywords: bottle gourd, banana, nutrient analysis, microbial analysis, traditional jams.

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LIST OF ABBREVIATIONS

ACS	American Chemical Society
ASTM	American society for testing materials
Ca	Calcium
CFU	Colony forming unit.
CNS	Central nervous system
CuSO ₄	Copper sulphate
DV	Daily Value
<i>E. coli</i>	<i>Escherichia coli</i>
EDTA	Ethylenediaminetetraacetic acid
g	Grams
GERD	Gastroesophageal reflux disease
HCL	Hydrogen chloride
H ₂ O	Hydrogen chloride
Kcal	Kilocalorie
KOH	Potassium hydroxide
LDL	Low-density lipoprotein
M EDTA	Metal ethylene diamine tetra acetic aid
Mg	milligrams
N	Nitrogen
NaOH	Sodium hydroxide
pH	Potential of hydrogen
spp	Species
TPC	Total plate count
TSS	Total soluble solids

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CHAPTER-1

INTRODUCTION

Lagenaria siceraria, known as bottle gourd in English and Lauki in Hindi, is a common vegetable in India. Bottle gourd has been used traditionally to help with many health conditions like fever, cough, pain, and asthma. It has been used since ancient times for its benefits. It is also considered a good source of vitamin B, C, and other nutrients. It is known for its shape, a bottle, dumbbell, or oval shape. (Kumar A *et.al.*, 2012)

Bottle gourd indeed holds a significant place in traditional Indian medicine, known as Ayurveda, for its various health benefits (Singh, 2017). Its rich nutrient profile, including vitamins B and C, makes it a valuable addition to the diet (Goyal, 2016). Its unique shape also adds to its charm and versatility in culinary preparations. It's important to approach any potential treatment or supplement with caution, especially when it comes to liver health. While animal studies suggest that bottle gourd (Singh *et.al.*, 2013) might have properties beneficial for the liver (Singh R. e., 2019), it's crucial to consult with a healthcare provider before incorporating it into the regimen, particularly if have any liver-related concerns or conditions.

It's important to note that while bottle gourd may have potential benefits for memory and CNS activity, consulting with a healthcare provider before using it is crucial to ensure it's safe and appropriate for individual health conditions and potential interactions with medications or existing treatments. (Singh K & Sharma *et.al.*, 2018)

It's important to approach herbal remedies with caution and consult with a healthcare professional, especially when considering their potential as cancer treatments. While studies suggest that bottle gourd extract may have anticancer properties, further research is needed to understand its effectiveness and safety in humans. Always prioritize medical advice and informed decision-making when it comes to your health. (Gupta.s *et.al.*, 2019)

Incorporating bottle gourd into your diet can be beneficial for weight management due to its low calorie and high-water content, along with its rich dietary fibre. However, it's essential to consult with your healthcare provider before using any herbal remedy for weight loss to ensure it's safe and appropriate for your individual health needs. (Amanda *et.al.*, 2023)

It's true that bottle gourd has been traditionally used to aid in managing diabetes due to its low fat and high Fiber content. Animal trials have shown that bottle gourd extract can effectively lower blood glucose levels in diabetic animals. However, more research is needed to confirm these potential anti-diabetic benefits in humans. (Johnson *et.al.*, 2022)

It's important to acknowledge the potential benefits of bottle gourd for skin health, particularly its vitamin C and zinc content. However, further research is needed to fully understand and establish its effectiveness. (Smith *et.al.*, 2020)

1.1 BOTTLE GOURD AND ITS BENEFITS

Bottle gourd is a good source of vitamin C and zinc that may offer several skin benefits. Vitamin C is an essential vitamin for overall skin health. It may protect the skin from the damage caused by ultraviolet radiation. It may also help to prevent signs of skin ageing, such as skin sagging. It may also help strengthen the skin barrier by enhancing the production of skin barrier lipids. (Smith *et.al.*, 2021)



Fig 1.1: Benefits of bottle gourd

Though there are studies that show the benefits of bottle gourds in various conditions, these are insufficient, and there is a need for further studies to establish the true extent of the benefits of bottle gourds on human health. (Johnson *et.al.*, The Insufficiency of Studies on the Health Benefits of Bottle Gourd, 2022)

1.2 HOW TO USE BOTTLE GUARD

Using bottle gourd, also known as calabash or lauki, in various ways can be a beneficial addition to your culinary repertoire and daily routine. From its versatility in cooking to its potential health benefits, bottle gourd offers a wide range of uses that can enhance your diet and lifestyle.

Firstly, bottle gourd can be utilized in cooking in numerous ways. Its mild flavour and soft texture make it suitable for various dishes, including soups, stews, curries, stir-fries, and even desserts. In Indian cuisine, it is commonly used in dishes like lauki ki sabzi (bottle gourd curry), dal (lentil stew) with bottle gourd, and lauki kheer (bottle gourd pudding). Its ability to absorb flavors makes it a versatile ingredient that can be incorporated into both savoury and sweet recipes.

When preparing bottle gourd, it is essential to peel off the tough outer skin and remove any seeds before cooking. The flesh of the vegetable can then be diced, sliced, grated, or cubed, depending on the recipe requirements. Bottle gourd cooks relatively quickly, making it a convenient option for busy individuals or families looking for nutritious meal options.

In addition to its culinary uses, bottle gourd is also valued for its potential health benefits. It is low in calories and rich in essential nutrients, including vitamins C and K, potassium, and dietary Fiber. Consuming bottle gourd regularly may help support digestion, promote hydration, and aid in weight management due to its high-water content and Fiber. Moreover, it is believed to have cooled properties, making it a popular choice in hot climates or during the summer months.

To incorporate bottle gourd into your diet, consider adding it to your weekly meal plan in various ways. You can experiment with different recipes and cooking methods to discover your favourite way to enjoy this versatile vegetable. Whether prefer it in Savory dishes like soups and curries or in sweet treats like puddings and smoothies, there are plenty of options to explore.

Furthermore, can also preserve bottle gourd by pickling or drying it for later use. Pickled bottle gourd, also known as lauki ka achar, is a tangy and flavourful condiment

that pairs well with rice, bread, or as a side dish. Dried bottle gourd slices can be rehydrated and added to soups or stews for an extra burst of texture and nutrition.

In conclusion, bottle gourd is a versatile vegetable that can be used in various culinary applications to enhance flavour, texture, and nutritional value. By incorporating it into your diet regularly, you can enjoy its potential health benefits while exploring new and exciting recipes. Whether you're a seasoned cook or a beginner in the kitchen, bottle gourd offers endless possibilities for delicious and nutritious meals. (Patel *et.al.*, 2023)

1.3 NUTRITIONAL COMPOSITION OF BOTTLE GUARD

Bottle gourd is very health and easily available vegetable. It is composed of 96.1% moisture, 0.1% fat, 0.5% minerals, 0.6% Fiber, 2.5% carbohydrates, 12 kcal energy, 0.7 mg/100g iron, 0.03 mg/100g thiamine, 0.2mg/100g niacin and 0.01mg/100g riboflavin. It is a good source of antioxidant and phenols. It also contains 10.10 mg/100g ascorbic acid, 5.80g/100g total sugar, 5.22g/100g reducing sugar and 1.31 g/100g starch (Srivastiva *et.al.*, 2022), (Milind *et.al.*, 2011)

Table:1.1: Parameters of bottle gourd

PARAMETERS	BOTTLE GOURD (per 100g)
Moisture	96.1 %
Total sugar	5.80g
Reducing sugar	5.22g
Carbohydrates	2.5%
Fiber	0.6%
Fat	0.1%
Energy	12 kcal
Minerals	0.5%

The scientific name for banana is *Musa*, from the Musaceae family of flowering tropical plants, which distinctively showcases the banana fruit clustered at the top of the plant. The mild-tasting and disease-resistant Cavendish type is the main variety sold in the U.S. and Europe. Despite some negative attention, bananas are nutritious and may even carry the title of the first “superfood,” endorsed by the American Medical Association in the early 20th century as a health food for children and a treatment for celiac disease. (Smith *et.al.*, The Nutritional and Historical Significance of Bananas., 2021)

Bananas are one of the most widely consumed fruits globally, prized for their sweet taste, convenience, and nutritional value. This project aims to provide a thorough understanding of bananas, covering their origins, cultivation, nutritional composition, health benefits, economic significance, and environmental impact. (Smith *et.al.*, Understanding Bananas: Origins, Cultivation, Nutrition, Health Benefits, Economics, and Environmental Impact., 2023)

Bananas are also considered an easy-to-digest food that's part of a bland diet prescription for people experiencing gastrointestinal issues like gas, diarrhoea, or vomiting. A bland diet may be useful for people with gastrointestinal conditions such as gastrointestinal reflux disease or GERD, traveller's diarrhoea, diverticulosis, and for individuals recovering from gastrointestinal-related surgeries.

It's recommended that people consume between 22 to 34 grams (g) of Fiber per day, depending on their age and gender. Unfortunately, many Americans only consume half of this amount. Fiber, also known as roughage, is found in plant foods like fruits, vegetables, and whole grains, and is an important nutrient that helps support digestive and heart health. It may also play a role in reducing the risk of type 2 diabetes and certain types of cancer, such as colon cancer.

Adding more soluble Fiber to the diet, found in fruits, can lower LDL or 'bad' cholesterol, reducing the risk of heart disease and stroke. The way that soluble Fiber does this is by binding to cholesterol molecules in the small intestine and preventing their absorption.

In addition to Fiber, bananas contain potassium, an essential mineral that helps manage blood pressure according to the American Heart Association. A medium-sized

banana delivers 422 milligrams (mg) of potassium, meeting 9% of the recommended intake, or daily value (DV).

Bananas provide and support energy levels in a few ways. Firstly, they are a source of carbohydrates, the body's primary fuel source. The carbohydrate content in bananas is primarily starch when they're unripe and as they ripen, the starch content drops, and the sucrose (a type of simple sugar) content increases. Simple sugars are readily absorbed into the bloodstream, providing a quick burst of energy. (Smithet.al. .. , 2022)

Potassium intake increases urinary excretion of sodium. It also helps ease the tension in blood vessel walls, aiding in lowering blood pressure.⁷ This is important to note because excess sodium in the bloodstream pulls water into the blood vessels, increasing the blood flow and blood pressure. High blood pressure is a major risk factor for heart disease.

Banana (*Musa* sp.) is the second most important fruit crop in India after mango. Its year-round availability, affordability, varietal range, taste, nutritive and medicinal value make it the favourite fruit among all classes of people. Bananas and plantain are very important fruit crops in the tropical world. Banana constitutes a major staple food for millions of people and provides a valued source of income through local and international trade. Banana is a principal source of food, employment, and income in its major production areas.

1.4 NUTRITIONAL COMPOSITION OF BANANA

Banana is an excellent source of nourishment and a well-balanced diet to people of all ages ((Jyothirmayi, 2015). It is a cheap and energy-rich delicacy relished by both rich and poor alike. It forms the staple food for man villagers and tribal of eastern and southern India ((Shruthi., 2019). Bananas are considered as a rich source of vitamin A, vitamin B complex, vitamin C, manganese, potassium, and digestible food Fibers are present in the fruits in sizeable levels.

Table.1.2 Nutritional composition of banana

Constituents	Units	Banana
Energy	Kcal	89
Water	g	74
Protein	g	1.1
Total lipid	g	0.3
Carbohydrate	g	21.8
Dietary Fiber	g	2.0
Na	mg	1.0
K	mg	385.0
Ca	mg	8.0
Mg	mg	30
P	mg	22
Fe	mg	0.42
Cu	mg	0.11
Zn	mg	0.18
Mn	mg	0.2
Equivalent β carotene	μ g	68.0
Tocopherol (Vitamin e)	mg	0.29
Ascorbic acid (Vitamin c)	mg	11.7
Thiamine(Vitamin B1)	mg	0.04
Riboflavin(Vitamin B2)	mg	0.07
Niacin(Vitamin B3)	mg	0.61

Pantothenic acid(Vitamin B5)	mg	0.28
Pyridoxine(Vitamin b6)	mg	0.47
Total folate	µg	23.0
Serotonin	mg	3.3

Fruits are of great importance in human nutrition. However, due to their perishable nature and seasonal availability, they are generally processed into more stable forms such as jams, jellies, juices, pickles and many more products. Jam is a processed fruit product having an intermediate moisture content which is prepared by boiling homogenised fruit pulp with sugar, acid, and pectin. It may have some other ingredients like preservatives, flavouring or colouring compounds. It should have a proper consistency so that it could easily spread and should be firm enough so that it does not flow like a fluid. Jam should contain at least 68.5% total soluble solids (TSS), and the fruit should contribute at least 45% of the total weight of jam. (Gargettet.al., 2004)

CHAPTER-2

LITERATURE SURVEY

2.1 BOTTLEGOURD HISTORY

Lagenaria siceraria, the bottle gourd is a member of the Cucurbitaceae family. It goes by the name calabash, white flowered gourd, and lauki throughout the region. One of the first species that humans are said to have named is the bottle gourd. The bottle gourd is an annual herbaceous plant that grows in a prostrate manner. *Lagenaria siceraria*, the bottle gourd, is a member of the Cucurbitaceae family. It goes by the name calabash, white flowered gourd, and kado throughout the region. One of the first species that humans are said to have tamed is the bottle gourd. The bottle gourd is an annual herbaceous plant that grows in a prostrate manner. (Etthadul ummah *et.al.*, 2012) There are 118 general and 825 species Harika. (Harika *et.al.*, 2012).

LaGuardia breviflora, *Lagenaria rufa*, *Lagenaria sphaerica*, *Lagenaria Abyssinia*, and *Lagenaria guineensis* are the other five wild species that make up *Lagenaria*. wherein *Lagenariasiceraria* spp. are primarily grown. There are identified species of bottle gourd. *Lagenaria siceraria* species, including ssp. *siceraria* and spp. *asiatica*. The crop was first cultivated between 9 and 10,000 BP (before present) in America (the New World), between 6 and 10,000 BP in East Asia, and between 4 and 5000 BP in Africa. *LaGuardia breviflora*, *Lagenaria rufa*, *Lagenaria sphaerica*, *Lagenaria Abyssinia*, and *Lagenaria guineensis* are the other five wild species that make up *Lagenaria*. wherein *Lagenariasiceraria* spp. are primarily grown. There are identified species of bottle gourd. *Lagenaria siceraria* species, including ssp. *siceraria* and spp. *asiatica*. The crop was first cultivated between 9 and 10,000 BP (before present) in America (the New World), 6 and 10,000 BP in (Jamal uddin *et.al.*, 2014).

2.2 FERTILIZATION OF BOTTLE GOURD

The leaves of *L. siceraria* are asymmetrical and varied, with tendrils virtually always present. The blooms are monoecious, with the male and female flowers located on separate plant axes within the same plant. The leaves of *L. siceraria* are asymmetrical and varied, with tendrils virtually always present. The blooms are monoecious, with the male and female flowers located on separate plant axes within the same plant. (Etthadul ummah *et.al.*, 2012)

Cross-pollination is therefore very beneficial. There are wild or non-cultivated varieties of Bering hermaphrodite flowers that have both andromonoecious and dioecious sex. Bottle gourd sex ratio is extremely high. Cross-pollination is therefore very beneficial. There are wild or non-cultivated varieties of Bering hermaphrodite flowers that have both andromonoecious and dioecious sex. Bottle gourd sex ratio is extremely high. (Harika *et.al.*, 2012).

It has been demonstrated that the ratios of male to female flowers have a major impact on output. It has been demonstrated that the ratios of male to female flowers have a major impact on output. (Jamal uddin *et.al.*, 2014)

This ratio can be changed using a variety of growth regulators, such as auxin, ethylene, gibberellic acid, and others, as well as environmental factors like temperature, precipitation, and light intensity. The shape and size of bottle gourd fruits vary greatly, both within and between cultivars. *Lagenaria siceraria*, for example, shows the greatest variation in fruit shape; it can be long, cylindrical, necked, oblong flat or round, conical pyriform to club-shaped, and its skin can be smooth or warded. This ratio can be changed using a variety of growth regulators, such as auxin, ethylene, gibberellic acid, and others, as well as environmental factors like temperature, precipitation, and light intensity. The shape and size of bottle gourd fruits vary greatly, both within and between cultivars. *Lagenaria siceraria* is the cultivar with the greatest fruit shape variations; they might be long, cylindrical, necked (Etthadul ummah *et.al.*, 2012)

2.3 PROPOGATION OF BOTTLEGOURD

The desire of any farmer is to see the germination and growth of all seeds planted in a field. This way the farmer is assured to obtain reasonable yield if all growing conditions are optimal (Etthadul ummah *et.al.*, 2012)

Vegetables are short-duration crops that can be cultivated in constrained areas. Vegetables are short-duration crops that can be cultivated in constrained areas. (Harika *et.al.*, 2012).

The impoverished in both urban and rural areas will be able to afford vegetable costs as long as vegetable yield increases. Gourds are a crop that are grown extensively in

Pakistan and exported outside. The impoverished in both urban and rural areas will be able to afford vegetable costs as long as vegetable yield increases. Gourds are a crop that are grown extensively in Pakistan and exported outside. (Jamal uddin *et.al.*, 2014).

2.4 COMPOSITION OF BOTTLEGOURD

Bottle gourds are rich in calcium and vitamins C and K, have a cooling effect on the body, and even work well as a laxative. Because of their high-water content, they prevent dehydration in humans. To Treat patients with cardiac issues, urological conditions, and sleeplessness. It is also recommended due to its aphrodisiac and anti-diabetic qualities.

The pulp from bottle gourds helps treat constipation, cough, and night blindness. It also functions as an antidote for several poisons. For those who are lactose intolerant, its pulp makes a good alternative.

Beneficial in the treatment of numerous illnesses, such as hepatic and cardiac conditions. Because of its high potassium content, hypertension individuals' blood pressure is controlled. Because it has a high dietary fiber content and is low in fat and cholesterol, it can aid in rapid weight loss. A high concentration of choline found in bottle gourds helps to repair mental health conditions. (gupta *et.al.*, 2022).

When compared to other vegetables grown in India, the bottle gourd is the most reasonably priced and nutrient-dense vegetable option for a diet. Bottle gourds are bitter and eaten. (Pandravada&Sivaraj *et.al.*, 2022).

Additionally, this vegetable is very useful for maintaining heart health. Drinking lauki juice twice or three times a week will help to keep the heart healthy and control blood pressure. (Ganesh &G. Dhakad *et.al.*, 2022)

The various products that can be developed from bottle gourd fruit are pickles, chutney, juice, and sweets (Walters *et.al.*, 2022).

Bottle gourd candy is prepared by dipping bottle gourd cubes in sugar syrup (Ahmad *et.al.*, 2021).

2.5 NUTRITIVE COMPOSITION OF BANANA

All parts of the banana, including the skin, leaves, pulp, inflorescence, and banana seeds, are used to make food or non-food substances with nutraceutical qualities. Natural fiber is a source of micro- and macronutrients, physiologically active substances, and biofertilizers. (Padam & Abdullah *et.al.*, 2021).

A banana offers wholesome nutrients and instant energy. (Maraschin&Pereira *et.al.*, 2015).

This fruit has a high calorie content and is a good source of dietary fiber, minerals like manganese, potassium, and copper, and micronutrients like vitamin B6, vitamin C, and biotin. (Bhaskar & Salimath *et.al.*, 2011).

Bananas' antiallergic, antibacterial, and antinuclear qualities assist to heal dysentery, prevent ulcers in the intestines, and speed up the healing of allergic skin lesions. (Jyothirmayi &Zafar *et.al.*, 2011).

It contains significant levels of linoleic acid, sugar derivatives, fatty acids, sterols, and esters. which include long chain fatty alcohols, aromatic compounds, sterylglucosides, and diacylglycerols as the main replacements for lipophilic chemicals found in banana tissues. (Al-Mqbali & Hossain *et.al.*, 2019).

2.6 NUTRITIVE COMPOSITION OF BEETROOT

This vegetable is also extremely beneficial for keeping one's heart healthy. Consuming lauki juice twice or thrice in a week will support in maintaining a healthy heart and will also regulate blood pressure. (Shivani chauhan&karthik chamoli *et.al.*, 2020)

The Beetroot is the taproot portion of the plant. It is an excellent food which is important for development and growth of human body. It is a rich source of antioxidant and minerals. It also acts as fruits as well as vegetables. Fresh form of beetroot generally consumed as a salad. It contains beta lain essential for cardiovascular health. It plays another role as a natural color in the textile industries and as a medicinal plant to cure the various illnesses. (Shilpa sharma*et.al.*, 2020)

Beetroot pigment is used as a food dye. It changes color when heated so can only be used in ice-cream and other confectionary, but it is both cheap and has no known

allergic side effect. Beetroot juice is very potent, a beautiful rich ruby red color it is known to help purify the blood.

The use of seasoned remedies severally or together with customary medicines has been utilized in varied medical treatises for the cure of various malady, ailment or disease. Beetroot is one amongst the well-known edible plants and has substantial healthful properties because of the presence of distinctive natural edible substances. It contains antioxidant, vitamins and minerals varied vital antidepressant, antimicrobial and anti-carcinogenic. (Shivani chauhan *et.al.*, 2020)

CHAPTER 3

AIM AND OBJECTIVES

3.1 AIM:

To prepare bottle guard jam by adding prebiotics (banana) and to analyse its nutrient content.

3.2 OBJECTIVES:

- ❖ Preparation of bottle gourd for jam preparation.
- ❖ Preparing and adding banana to increase fibre content, quality and content of jam.
- ❖ Microbiological analysis of bottle gourd jam (Total plate count, Yeast and Mould, E. coli, Coliforms & Salmonella)
- ❖ Nutrient analysis of bottle gourd jam {energy, fat. total sugars, fat, protein}

CHAPTER-4

MATERIALS AND METHODS

4.1 COLLECTION OF RAW MATERIAL:

Bottle gourd, banana and beetroot was purchased from a local market in Chennai city. The general store ingredients such as sugar, butter, vanilla essence.

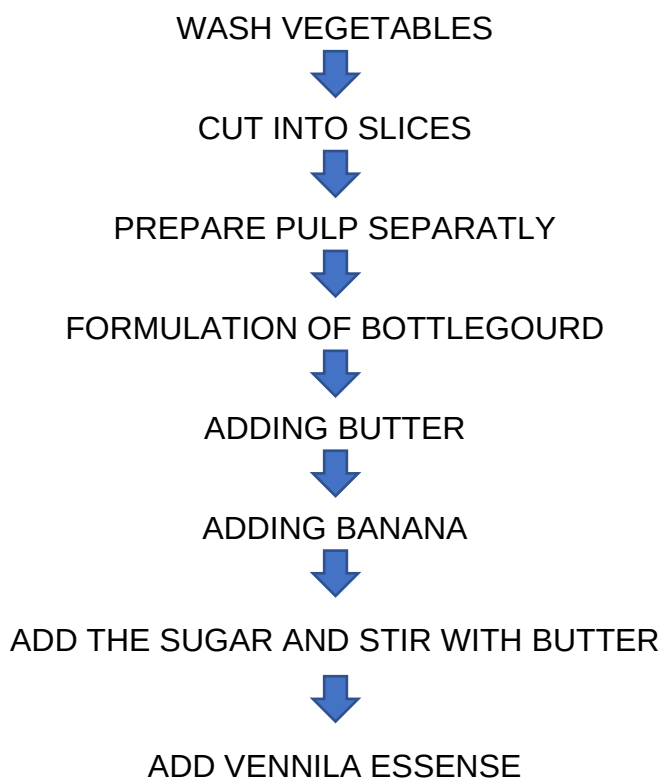
4.2 PREPARATION OF JAM:

The vegetables were sliced, and then the jam was made. Banana and beetroot extract, two varieties of vegetable and fruit bottle gourd, are added to the regular formulation after that.

In order to cook the bottle gourd pulp, 5 grammes of unsalted butter must be added at first, stirring continuously. After 5 minutes, the banana pulp must be added, stirring continuously, along with 5 grammes of unsalted butter, sugar, and two drops of vanilla essence and agar agar.

Beetroot extract will be added as a last step and left aside for a while.

4.3 STEPS FOR PREPARATION OF JAM



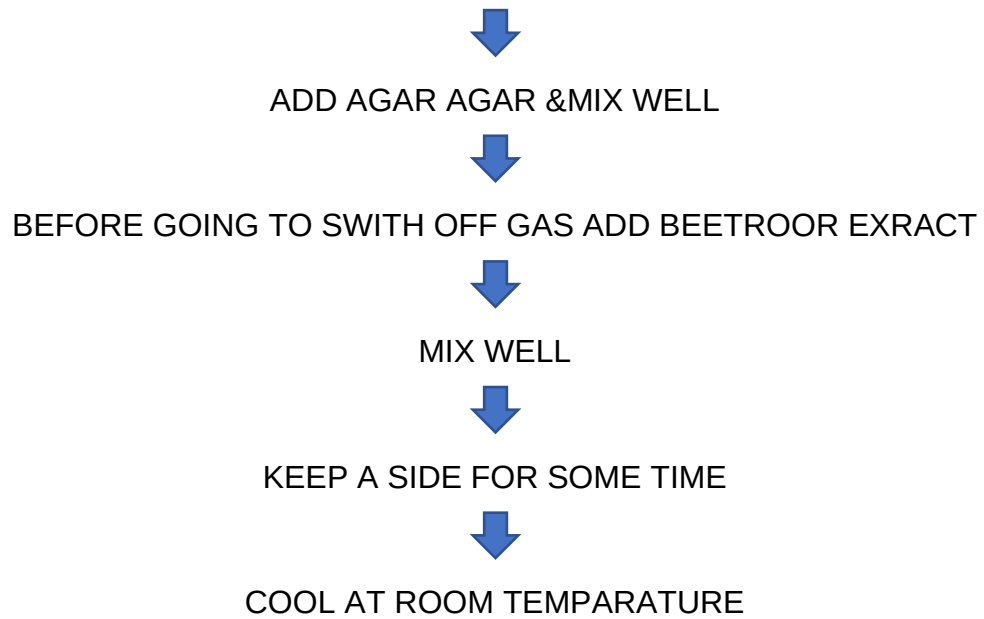
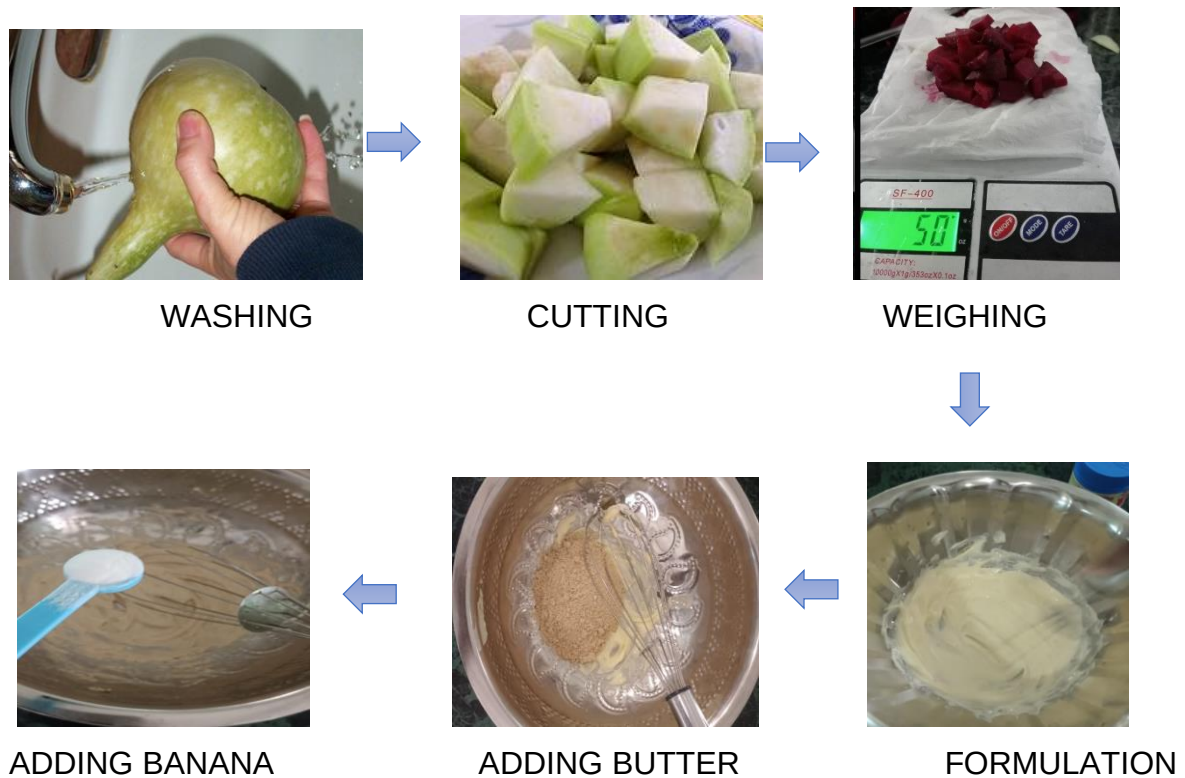


Fig 4.1: Flow diagram for preparation of bottle gourd jam





ADDING SUAGR



ADDING SUGAR &
VENNILA ESSENCE



ADDING BEETROOT
EXTRACT & KEEP
A SIDE



JAM

4.4 STANDARD FORMULATION OF BOTTLE GOURD:

Table 4.1: Standard formulation of bottle gourd jam

INGREDIENT	WEIGHT IN GM
Bottle gourd	200
Banana	100
Beetroot	50
Butter	5
Agar agar	5
Vanilla essence	0.1
Potassium sorbitol	0.1

4.5 NUTRITIONAL EVALUATION ANALYSIS:

4.5.1 ENERGY

The caloric value was calculated in kilo-calories per 100g (kcal/100g) by multiplying the crude fat, protein and carbohydrate values by at waterll factors of 37, 17 and 17 respectively. This method is represented by the following formula.

$$\text{Energy (KCAL/100g)} = (\text{Carbohydrate} \times 4) + (\text{protein} \times 4) + (\text{fat} \times 9)$$

4.5.2 TOTAL CARBOHYDRATES

The total carbohydrate content in the quinoa millet biscuit was calculated by difference method. This methodology separately assesses the quantities of various other constituents present in the food, including protein, fat, fiber, moisture, and ash. These values are then aggregated and subtracted from the overall weight of the food. This method is represented by the following formula:

$$\text{Carbohydrate (g/100g)} = 100 - [\text{Moisture (\%)} + \text{Ash (\%)} + \text{Total fat (g)} + \text{Protein(g)} + \text{Fiber(g)}]$$

FAT

Use method A or C for feed ingredients and mixed feeds other than baked or expended, dried milk products, containing urea or mixed feeds that have at least 20% of crude fat derived from baked and expanded or dried milk products.

- A. Indirect methods: determine moisture as in 934.01 or 920.36 then extract dried substance as in C And dried again. Report loss in weight as ether extract.

Direct methods:

- B. Reagents: Anhydrous ether: wash commercial ether with two or three portions H₂O, and solid NaOH or KOH, and let stand until most of H₂O is abstracted from the ether. Decant into Dry bottle, add small pieces of carefully cleaned metallic Na, and let stand until H₂ evolution ceases. Keep ether, thus dehydrated, over metallic Na in lossely stoppered bottles.
- C. Determination:(Large amounts H₂O – soluble components such as carbohydrates, urea, latucacid, glycerol and others may interfere with extraction of fat if present, extract 2 g test portions on small paper in funnel with five 20 mL portion H₂O prior to drying for ether extraction).
- D. Extract ca 2 g test portions dried as in 934.01 or 920.36 with anhydrous ether. Extraction period may vary from 4 h at condensation rate of 5 – 6 drops /s to 16 h at 2-3 drops/ s. Dry extract 30 min at 100°C, cool and weigh.

4.5.3 PROTEIN

Weight suitable test portion of sample into digestion flask. Add 10g of potassium sulphate or anhydrous sodium sulphate, about 0.4g CuSO₄ and 25mL or more, if necessary, of Conc.H₂SO₄ to the flask. Heat the flask for 90min for complete digestion. Cool, cautiously add 250mL H₂O and cool to room temperature. Add 100ml of 4% boric acid to the beaker, condenser tip will be sufficiently immersed. Add 3-4 drops of mixed indicator. Connect flask to distillation apparatus, add sufficient 45% NaOH solution, mix completely, such that mixture will be strongly alkaline and distil until 150ml distillate is collected in titration beaker. Titrate against 0.1N HCl solution. Correct for blank determination on reagents.

Calculation:

$$\%N (w/w) = (TVs-TVb) \times \text{Normality of standard HCl} \times 1.4007 / \text{Sample weight}$$

where, TVb = Titer value of blank; TVs = Titer value of sample

4.5.4 FIBER

Duplicate test portion of dried foods, fat extracted if containing > 10% fat, are gelatinized with termally (heat stable α - amylase), and then enzymatically digested with protease amyloglucosidase to remove protein and starch. (When analyzing mixed diets, always extract fat prior to determining total dietary fiber.) Four volumes of ethyl alcohol are added to precipitate soluble dietary fiber. Total residue is filtered, washed with 78% ethyl alcohol, 95% ethyl alcohol, and acetone. After drying residue is weighed. One duplicate is analyzed for protein, and other is Incinerated at 525°C and ash in determined.

CALCULATION

$$\text{Total dietary fiber} = \text{weight residue} - \text{weight (protein + ash)}$$

Apparatus

a) Fritted crucible- Porosity No. 2 (Pyrex No. 32940, coarse, ASTM 40-60 μ m; or Corning number and soak 529°C 36060 Buchner, fritted disk, Pyrex 60ML ASTM 40-60 μ m) Clean thoroughly heat 1 h at 525 °C and soak and then rinse in H₂O. Add

ca 0.5 g Celite to air-dried crucibles and dry at 130°C to constant weight ($\geq 1\text{h}$). Cool and store in desiccator until used.

b) Vacuum source- Vacuum pump or aspirator equipped with in-line double vacuum flask to prevent contamination in case of H_2O

c) Vacuum oven- 70°C . Alternatively, 105°C air oven can be used.

d) Desiccator

e) Muffle furnace

(f) Water baths – (1) Boiling (2) Constant temperature- Adjustable to 60°C , with either multi station shaker or multi station magnetic stirrer to provide constant agitation of digestion flasks during enzymatic hydrolysis.

(g) Beakers. Tall-form, 400 or 600 ml

(h) Balance. Analytical, readability to 0.1 mg.

(i) pH meter Standardized with pH 7 and pH 4 buffers.

Reagents

(a) 95% Ethanol-v/v. technical grade.

(b) 78% Ethanol - Place 207 mL H_2O into 1 L volumetric flask. Dilute to volume with 95% ethyl alcohol. Mix and dilute to volume again with 95% ethyl alcohol if necessary. Mix One volume HO mixed with four volumes 95% ethyl alcohol will also give 78% ethyl alcohol final concentration.

(c) Acetone.

(d) Phosphate buffer. -0.08 M. pH 6.0. Dissolve 1.400 g sodium phosphate dibasic, anhydrous (Na_2HPO_4) (or 1.753 g dihydrate) and 9.68 g sodium phosphate monobasic monohydrate ($\text{NaH}_2\text{PO}_4 \cdot \text{H}_2\text{O}$) (or 10.94 g dihydrate) in ca 700 mL H_2O . Dilute to 1L with H_2O . Check pH with pH meter.

(e) α -amylase (heat stable). Termamyl. (1) Store in refrigerator. Based on Nelson/Somogyi reducing sugar with soluble starch as substrate-10 000+1000 units/mL. (1 unit is defined as the amount of enzyme required to release 1 μmole reducing sugar equivalents/ min at pH 6.5 and 40°C). (2) Based on Ceralpha method using p-nitrophenyl-maltosaccharide as substrate in the presence of α thermostable α -glucosidase- 3000 + 300 Ceralpha units/ml. (1 unit of enzyme is required to release 1 μmole p-nitrophenyl/min at pH 6.5 and 40°C)

(f) Protease-Keep refrigerated. (1) Casein assay- 300-400 Units/mL. [1 protease unit is defined as the amount of enzyme required to hydrolyze (and solubilize in TCA) 1 μ mole tyrosine equivalents/min from soluble casein at pH 8.0 and 40°C]; 7-15 units/mg (1 unit will hydrolyze casein to produce color equivalent to 1.0 μ mole tyrosine/min at pH 7.5 and 37°C). Color by Folin-Ciocalteu reagent (2) Azo-casein assay-300-400 Units/mL. 1 unit endo-peptidase activity defined as the amount of enzyme required to hydrolyze (and solubilize in TCA) 1 μ mole tyrosine from soluble casein at pH 8.0 and 40°C]

(g) Amyloglucosidase-Keep refrigerated. (1) Strach / glucose oxidase -peroxidase 2000-3300 Units /mL (1 unit enzyme activity is defined as the amount of enzyme required to release 1 μ mole glucose/ min at Ph 4.5 and 40°C (p-nitrophenyl method-130-200 Units/mL. [1 unit enzyme (PNP unit) is the amount of enzyme, which in the presence of excess levels of B-glucosidase, will release 1 μ mole p-nitrophenyl from p-nitrophenyl β -maltosidase/min at 40°C)

The only enzyme which has been found to be significantly contaminated with interfering activities is amyloglucosidase. Thermostable α -amylase and protease from commercial sources have been found to be generally free of interfering enzymes. Low levels of β -glucanase have been detected in protease preparations, at levels well below that which would interfere with total dietary fiber analysis. The major contaminant in amyloglucosidase endo-cellulase and resulted in oats, endo-depolymerization of mixed-linkage β -glucan from barley and oats, with resultant underestimation of this dietary fiber component. The contamination of amyloglucosidase with endo- cellulase (β -glucanase) can be easily detected.

Alternatively, there are kits containing all three enzymes (pretested) available from a number of companies.

(h) Sodium hydroxide solution -0.275 M. Dissolve 11.00 g NaOH ACS in ca 700 mL H₂O in 1 L volumetric flask. Dilute to volume with H₂O.

(i) Hydrochloric acid solution - 0.325 M. Dilute stock solution of known titer, e.g., 325 mL 1 M HCl, to 1 L with H₂O.

(j) Celite Acid-washed.

D. Enzyme Purity

To ensure absence of undesirable enzymatic activity in enzymes used in this procedure, run materials listed in through entire procedure each time lot of enzymes is changed, or at maximum interval of 6 months to ensure that enzymes have not degraded.

E. Test Portion Preparation

Determine total dietary fiber on dried test sample. Homogenize test sample and dry overnight in 70°C vacuum oven, cool in desiccator, and dry-mill test sample to 0.3-0.5 mm mesh. If test sample cannot be heated, freeze-dry before milling. If high fat content (>10%) prevents proper milling, defat with petroleum ether (3 times with 25 mL portions/g test sample) before milling. Record loss of weight due to fat removal and make appropriate correction to final % dietary fiber found in determination. Store dry-milled test sample in capped jar in desiccator until analysis is carried out.

F. Determination

Run blank through entire procedure along with test portions to measure any contribution from reagents to residue.

Weigh duplicate 1 g test portions, accurate to 0.1 mg. into 400 mL tall-form beakers. Test portion weights should not differ >20 mg. Add 50 mL pH 6.0 phosphate buffer to each beaker. Check pH and adjust to $\text{pH } 6.0 \pm 0.2$ if necessary. Add 0.1 mL Termamyl solution. Cover beaker with Al foil and place in boiling water bath 15 min. Shake gently at 5 min intervals. Increase incubation time when number of beakers in boiling water bath makes it difficult for beaker contents to reach internal temperature of 95-100°C. Use thermometer to indicate that 15 min at 95-100°C is attained. Total of 30 min in water bath should be sufficient.

Cool solutions to room temperature. Adjust to $\text{pH } 7.5 \pm 0.2$ by adding 10 mL 0.275 M NaOH solution. Add 5 mg protease. [Protease sticks to spatula, so it may be preferable to prepare enzyme solution (50 mg in 1 mL phosphate buffer) and pipet 0.1 mL to each sample just before use]

Cover beaker with Al foil. Incubate 30 min at 60°C with continuous agitation. Cool. Add 10 mL 0.325 M HCl solution. Measure pH and dropwise add acid if necessary. Final pH should be 4.0-4.6. Add 0.3 mL amyloglucosidase, cover with Al foil, and incubate 30 min at 60°C with continuous agitation. Add 280 mL 95% ethyl alcohol preheated to 60°C (measure volume before heating). Let precipitate form at room temperature for 60 min.

Weigh crucible containing Celite to nearest 0.1 mg, then wet and redistribute bed of Celite in crucible by using stream of 78% ethyl alcohol from wash bottle. Apply suction to draw Celite onto fritted glass as even mat. Maintain suction and quantitatively transfer precipitate from enzyme digest to crucible.

Wash residue successively with three 20 mL portions of 78% ethyl alcohol, two 10 mL portions of 95% ethyl alcohol, and two 10 mL portions of acetone. Gum may form with some products, trapping liquid. If so, break surface film with spatula to improve filtration. Time for filtration and washing will vary from 0.1 to 6 h, averaging 0.5 h per sample. Long filtration times can be avoided by careful intermittent suction throughout filtration.

Dry crucible containing residue overnight in 70°C vacuum oven or 105°C air oven. Cool in desiccator and weigh to nearest 0.1 mg. Subtract crucible and Celite weight to determine weight of residue. Analyze residue from 1 test portion of set of duplicates for protein by using a conversion factor, except in cases where N content in protein is known,

Incinerate second test portion of duplicate 5 h at 525°C, Cool in desiccator and weigh to nearest 0.1 mg. Subtract crucible and Celite weight to determine ash.

G. Calculations

Determination of blank:

$$B = \text{blank, mg-weight residue} - P_B - A_B$$

where weight residue = average of residue weights (mg) for duplicate blank determinations; and P_B and A_B = weight (mg) of protein and ash, respectively, determined in first and second residues.

Calculate TDF as follows:

$$\text{TDF \%} = [(\text{weight residue} - P - A - B) / \text{weight test portion}] \times 100$$

4.5.5 SUGAR

where weight residue = average of weights (mg) for duplicate blank determinations, and P and A = weights (mg) of protein and ash respectively, in first and second test portion residues; and weight test portion = average of two test portion weights (mg).

Weigh accurately about 5 g sample, transfer to a 200 ml volumetric flask dissolve in warm water, dilute to about 150 ml. In case solution is not clear, add 5 ml of Carrez 1 solution followed by 5 ml of Carrez 2 solution. Make up to 200 ml. Filter through a dry filter paper. Titrate the solution obtained as such to determine % Reducing sugars.

PRELIMINARY TITRATION:

Pipet 5 ml each of Fehling A and B into 250 ml conical flask. Mix and add about 10 ml water and a few boiling chips or glass beads. Dispense solution. Heat the flask to boiling. Add 3 drops of methylene blue indicator. Continue the addition of solution dropwise until the blue colour disappears to a brick-red end point. (The concentration of the sample solution should be such that the titre value is between 15 and 50 ml). Note down the titre value.

FINAL TITRATION:

Pipet 5 ml each of Fehling A and B. Add sample solution about 2 ml less than titre value of the preliminary titration. Heat the flask to boiling within 3 minutes and complete the titration. Perform the titration duplicate and take the average.

CALCULATIONS:

Reducing sugars (%) = Dilution x Factor of Fehling (in gm) / Weight of sample x Titre value *100

4.5.6 CALCIUM

Take a suitable aliquot of the sample solution prepared as prescribed in the material specification and expected to contain approximately 5 to 20 mg of calcium as CaO, in a 500 ml conical flask, Add 25 ml of triethanolamine solution, 10 ml of hydroxylamine hydrochloride solution and 2 ml of potassium cyanide solution. Dilute to about 150 to 200 ml with water and adjust the pH to 12.5 to 13 with 20 per cent sodium hydroxide solution using a pH indicator paper or preferably a pH meter. Add approximately 0.1 g of Patton and Reeder's indicator mixture and stir to dissolve. Titrate with 0.01 M EDTA solution from a burette, till the colour changes from red to pure blue free from any violet tinge. Towards the endpoint, the colour turns a violet which on further drop-wise addition gives the pure blue endpoint. It is easier to note the endpoint by comparing the colour with that of a previously titrated solution having a pure blue endpoint, where a slight excess of EDTA has been added.

Calculation:

Calcium (Ca) per cent by mass = $V_1 \times 0.04008 \backslash M$

Where V_1 = Volume in ml of EDTX solution in titration; and

M = Mass in g of the sample in the solution for the test

CHAPTER-5

RESULT AND DISCUSSION

Bottle gourd, also known as *calabash* or *lauki*, is a versatile vegetable commonly used in various culinary preparations due to its mild flavor and high-water content. To enhance its culinary potential, this study explores the incorporation of banana into bottle gourd jam. By combining these two ingredients, we aim to create a jam with improved texture, flavor complexity, and nutritional value.

5.1 TEXTURE:

Adding banana to bottle gourd jam results in a smoother texture due to the natural binding properties of bananas. The jam will be less likely to have a stringy or fibrous texture commonly associated with bottle gourd.

5.2 FLAVOUR:

The addition of banana introduces a natural sweetness to the jam, reducing the need for excessive amounts of sugar. The flavor profile becomes more complex, with hints of both bottle gourd and banana complementing each other.

5.3 COLOUR:

The use of beetroot as a natural colorant in jam production offers a myriad of advantages, including visual enhancement, stability, nutritional enrichment, and flavor enhancement. Further research into optimal formulations and processing techniques may unlock additional opportunities for innovation in the development of natural food colorants.

5.4 CONSISTENCY:

Banana contributes to the jam's consistency, helping it to thicken naturally without the need for additional pectin or thickeners. However, it's important to ensure the jam reaches the desired thickness through proper cooking and reduction.

5.5 NUTRITIONAL BENEFITS:

The addition of banana not only enhances the flavor and texture but also increases the nutritional value of the jam. Bananas are rich in potassium, vitamin C, and dietary fiber, adding to the overall health benefits of the jam.

5.6 SWEETNESS CONTROL:

By incorporating banana, you can control the sweetness of the jam more effectively. This is particularly useful for those looking to reduce their sugar intake or for individuals with dietary restrictions.

5.7 BALANCING FLAVOURS:

The combination of bottle gourd and banana offers a balanced flavor profile, with the mild sweetness of bottle gourd complemented by the richer, sweeter taste of banana. This makes the jam appealing to a wider range of palates.

5.8 RECIPE VARIATIONS:

Experimentation with different ratios of bottle gourd to banana can yield various flavor profiles and textures. Additionally, incorporating other complementary ingredients such as citrus zest can further enhance the jam's complexity.

5.9 MICROBIAL ANALYSIS:

Microbial analysis of the bottle gourd jam prepared with the addition of banana revealed the following findings:

Total Plate Count (TPC): The TPC of the jam samples ranged from 10^{-2} to 10^{-4} colony-forming units per gram (CFU/g). This indicates a relatively low level of microbial contamination, well within the acceptable limits for preserved food products.

Yeast and Mold Count: Yeast and Mold counts were below the detection limit in all tested samples, indicating effective control of fungal contamination during the preparation and storage of the jam.

Coliform Count: Coliform bacteria were absent in all samples, indicating proper sanitation practices and minimal risk of faecal contamination during production.

Pathogen Detection: No pathogenic bacteria, such as *Salmonella* spp. or *Escherichia coli*, were detected in any of the jam samples, confirming the safety of the product for consumption.

The microbial analysis results demonstrate that the bottle gourd jam prepared with the addition of banana meets microbiological safety standards for preserved food products. Several factors contribute to the low microbial counts observed in the samples:

Acidic pH: The natural acidity of fruits, including bottle gourd and banana, contributes to the inhibition of microbial growth by creating an unfavourable environment for pathogens and spoilage microorganisms.

High Sugar Content: The high sugar content of jam acts as a preservative by reducing water activity and inhibiting microbial growth. Additionally, the osmotic pressure exerted by sugar helps to prevent the proliferation of spoilage organisms.

Heat Treatment: Proper cooking and heat treatment during the jam-making process contribute to the reduction of microbial load by killing or inactivating bacteria, yeasts, and Molds present in the raw ingredients.

Hygienic Practices: Strict adherence to hygienic practices, including handwashing, sanitization of equipment, and clean working environments, minimizes the risk of cross-contamination and ensures the safety of the final product.

Overall, the microbial analysis results provide confidence in the safety and quality of the bottle gourd jam prepared with the addition of banana. However, it is essential to maintain proper storage conditions, such as refrigeration or hot water bath canning, to prolong shelf life and prevent microbial spoilage during storage. Regular monitoring of microbial quality is also recommended to ensure continued compliance with food safety standards.

Fig 5.1: Test report of microbial analysis



CIN: U93000TN2000PTC043869




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TEST REPORT

Test Report No & Date	CTL/CH/F-1401/2023-24 & 28.02.2024
Sample Number	F-1401/23-24
ULR No	TC613324000001284F
Name of the Customer	Ms. Bharathi.J
Address	Roary Illum - 447 (Girls Hostel), Sathyabama Institute of Science and Technology, Semmancheri, Chennai - 600 119.

Sample Drawn by	Customer
Sample Name	Bottle Guard Banana Jam
Sample Description	Bottle Guard Banana Jam
Sampling Location	NA
Sample Drawn on	NA
Sample Collected by	NA
Sampling Plan & Procedure	NA
Sample Quantity	200g
Sample Condition	Good & Received in Packed Condition.
Environmental Conditions	NA
Equipment used for Sampling	NA
Sample Received on	22.02.2024
Analysis Started on	23.02.2024
Analysis Completed on	28.02.2024

Test Results:

The above sample tested as received, and results are as follows:

S. NO	PARAMETERS	METHOD	UNITS	RESULTS	REQUIREMENTS*
1	Total Plate Count	IS 5402 : 2012 (RA.2018)	CFU/g	6900	NMT 10,00,000
2	Escherichia Coli	IS 5887 (Part 1):1976 (RA.2022)	CFU/g	< 10	NA
3	Coliform Count	IS 5401 (Part 1):2012 (RA.2022)	CFU/g	< 10	NA
4	Yeast & Mould Count	IS 5403:1999 (RA.2018)	CFU/g	< 10	NMT 100
5	Salmonella	IS 5887 (Part 3):1999 (RA.2022)	Per 25g	Absent	Absent

Note : CFU- Colony Forming Unit

Verified by



END OF REPORT



For Chennai Testing Laboratory Pvt Ltd



Authorised Signatory

N. RAJENDRAKUMAR
Head - Quality & Microbiology Division
(MICROBIOLOGY)

Page 1 of 1

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Fig 5.2: Test report of nutrient analysis



CIN: U93000TN2000PTC043869




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TEST REPORT

Test Report No & Date	CTL/CH/F-1400/2023-24 & 28.02.2024
Sample Number	F-1400/23-24
ULR No	TC613324000001283F
Name of the Customer	Ms. Bharathi.J
Address	Roary Illum - 447 (Girls Hostel), Sathyabama Institute of Science and Technology, Semmancheri, Chennai - 600 119.

Sample Drawn by	Customer
Sample Name	Bottle Guard Banana Jam
Sample Description	Bottle Guard Banana Jam
Sampling Location	NA
Sample Drawn on	NA
Sample Collected by	NA
Sampling Plan & Procedure	NA
Sample Quantity	100g
Sample Condition	Good & Received in Plastic Box.
Environmental Conditions	NA
Equipment used for Sampling	NA
Sample Received on	22.02.2024
Analysis Started on	23.02.2024
Analysis Completed on	28.02.2024

Test Results:

The above sample tested as received, and results are as follows:

S. NO	PARAMETERS	METHOD	UNITS	RESULTS
1	Energy (By Calculation)	FAO Method	kcal/100g	189
2	Carbohydrates (By difference)	CTL/SOP/FOOD/262 - 2014	g/100g	40.3
3	Total Fat	AOAC 20th Edn.2016, 954.02	g/100g	2.53
4	Protein (Nx 6.25)	AOAC 20 th Edn.2016, 986.25	g/100g	1.26
5	Dietary fibre	AOAC 20th Edn.2016, 985.29	g/100g	BDL(DL:1.0)
6	Total Sugars	FSSAI Manual 2015- Beverages, Sugar and confectioneries	g/100g	29.7
7	Sodium as Na	AOAC 20 th Edn.2016, 969.23	mg/100g	17.9
8	Calcium as Ca	IS 5949:1990 (RA.2010)	mg/100g	29.0
9	Iron as Fe	AOAC 20th Edn.2016, 999.11	mg/100g	1.88

Note : BDL - Below Detection Limit; DL - Detection Limit;

Verified by



END OF REPORT



For Chennai Testing Laboratory Pvt Ltd



Authorised Signatory

K. KESAVAN
Senior Chemist
(CHEMICAL)

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CHAPTER- 6

SUMMARY AND CONCLUSION

In conclusion, the research paper on bottle gourd and banana jam provides a comprehensive analysis of its nutritional composition, microbial safety, preparation process, and potential health benefits. Through meticulous examination of the final product, valuable insights have been gained regarding the quality, safety and nutrient analysis of the jam. The nutritional analysis revealed that bottle gourd and banana jam is a rich source of essential vitamins, minerals, and dietary fiber, making it a nutritious addition to the diet. The presence of vitamins A, C, and potassium from bottle gourd, combined with vitamins B6 and C from bananas, highlights the diverse array of nutrients present in the jam. These nutrients play crucial roles in supporting various bodily functions, including immune health, digestion, and cardiovascular function.

The Microbial analysis confirmed the safety of the jam for consumption, with low levels of bacterial and fungal contamination detected. Proper sanitation and cooking techniques were found to be effective in minimizing microbial risks and ensuring the quality and safety of the final product.

References

- Ahmad et.al. (2021). Egyptian Journal of Botany. *Nutritional and Medicinal Potential of Bottle Gourd (Lageneria siceraria)*, 5.
- Amanda et.al. (2023). "The Role of Bottle Gourd in Weight Management". *healthline*.
- Bhaskar & Salimath et.al. (2011). International Journal of Biosciences. *Health benefits of banana (Musa)*, 119.
- Etthadul ummah et.al. (2012). Evaluation of Bottle Guard Varieties in Agro. *International journal of environmental sciences of natural resources*, 0014.
- Ganesh &G. Dhakad et.al. (2022). Review on study of bottle gourd on human health. *Research journal of pharmacology and pharmacodynamics*, 4.
- Gargettet.al. (2004). Measurement of oxygen in modified atmosphere packaged strawberry jam using a luminescent sensor incorporating a novel sol–gel based oxygen indicator. *Journal of Food Engineering*, 64(2), 249-255.
- Goyal, S. G. (2016). Nutritional and therapeutic potential of bottle gourd:. *Journal of Food Science and Technology*.
- gupta et.al. (2022). Indian Farmer Volume 9, Issue 01, 2022, Pp. 30-37. *Bottle gourd: Nutritional benefits and Value added products*, 31.
- Gupta.s et.al. (2019). Anticancer potential of bottle gourd extract: A systematic review and meta-analysis. *Journal of Ethnopharmacology*, 234, 102-110.
- Harika et.al. (2012). international journal of environmental sciences of natural resources. *Evaluation of Bottle Guard Varieties in Agro Climatic Condition of Peshawar Valley*, 0014.
- Jamal uddin et.al. (2014). International journal of environmental sciences of natural resources. *Evaluation of Bottle Guard Varieties in Agro Climatic Condition of Peshawar Valley*, 0014.
- Johnson et.al. (2022). "Potential Anti-Diabetic Benefits of Bottle Gourd:. *Journal of Nutritional Science*.
- Johnson et.al. (2022). The Insufficiency of Studies on the Health Benefits of Bottle Gourd. 210-225.

- Jyothirmayi, t. (2015). Nutritional and therapeutic values of banana - A review. *International Journal of Science and Research (IJSR)*, 4(11), 1542-1544.
- Kumar A et.al. (2012). Phytochemical; Ethnobotanical and Pharmacological Profile of *Lagenaria siceraria*:. *Journal of Pharmacognosy and Phytochemistry*, 2.
- Maraschin&Pereira et.al. (2015). International Journal of Biosciences. *nternational Journal of Biosciences Health benefits of banana (Musa)*, 191.
- Milind et.al. (2011). Phenolic Compounds and Antioxidant Activity of Bottle Gourd Varieties. *International Journal of Food Sciences*.
- Padam & Abdullah et.al. (2021). Health benefits of banana (Musa)- A review study. *International Journal of Biosciences*, 191.
- Pandravada&Sivaraj et.al. (2022). Egyptian Journal of Botany. *Nutritional and Medicinal Potential of Bottle Gourd (Lageneria siceraria)*, 5.
- Patel et.al. (2023). Exploring the Culinary and Health Benefits of Bottle Gourd (Lauki). *Journal of Culinary Science*, 12(3), 45-58.
- Patel, R. (n.d.). Exploring the Culinary and Health Benefits of Bottle Gourd (Lauki). . *Journal of Culinary Science*.
- Shilpa sharmaet.al. (2020). Beetroot-A review paper. *Journal of pharmacognosy and phytochemistry* , 426.
- Shivani chauhan et.al. (2020). Beetroot-A review paper. *Jornal of pharmacognosy and phytochemistry* , 426.
- Shivani chauhan&karthik chamoli et.al. (2020). Beetroot- Areview paper. *Journal of pharmacognosy and phytochemistry* , 426.
- Shruthi. (2019). A review on banana, an energy-rich fruit. . *International Journal of Science, Engineering and Technology Research (IJSETR)*, 8(3), 2026-2031.
- Singh et.al. (2013). Culinary and medicinal uses of bottle gourd:.. *Journal of Food Biochemistry*, 37(1), 1-8.
- Singh K & Sharmaet.al. (2018). Potential benefits of bottle gourd for memory and central nervous system activity:.. *Journal of Neurology and Neurological Science*, 5(2), 78-86.

- Singh, A. K. (2017). Role of bottle gourd in traditional Indian medicine: A review. *Journal of Ayurveda and Integrative Medicine*, 8(3), 167-173.
- Singh, R. e. (2019). Hepatoprotective potential of bottle gourd:. *A systematic review of animal studies*.
- Smith et.al. (2021). The Nutritional and Historical Significance of Bananas. *Journal of Tropical Agriculture*.
- Smith et.al. (2021). The Potential Skin Benefits of Vitamin C and Zinc in Bottle Gourd. *Journal of Dermatology*.
- Smithet.al. (2020). The Potential Benefits of Bottle Gourd for Skin Health. *Journal of Dermatological Sciences*.
- Smithet.al. (2023). Understanding Bananas: Origins, Cultivation, Nutrition, Health Benefits, Economics, and Environmental Impact. *Journal of Agricultural Research*, 30(4), 102-115.
- Smithet.al., .. (2022). The Energy-Providing Properties of Bananas. *Journal of Nutritional Sciences*, 20(4), 78-85.
- Srivastiva et.al. (2022). Nutritional Composition and Antioxidant Properties of Bottle Gourd. *Journal of Nutritional Science*.
- Walters et.al. (2022). Egyptian Journal of Botany. *Nutritional and Medicinal Potential of Bottle Gourd (Lageneria siceraria*, 5.