

**A PROJECT REPORT**  
**ON**  
**PREPARATION OF FORTIFIED**  
**PINEAPPLE COOKIES**

**SUBMITTED TO**  
**Dr. Ulhas Patil College of Agricultural Engineering and Technology,**  
**Jalgaon**

**In the partial fulfilment for the requirement for the degree of**  
**BACHELOR OF TECHNOLOGY**  
**IN**  
**AGRICULTURAL ENGINEERING**

**SUBMITTED BY**  
**Mr. GAURAV SHIVDAS CHAUDHARI (EJ-018/2018)**  
**Mr. KALPESH MAHESH BAGADE (EJ-005/2018)**  
**Mr. PRANAV ARUN DEVRE (EJ-026/2018)**

**UNDER THE GUIDANCE OF**

**Prof. P. A. YADAV**



**DEPARTMENT OF PROCESS FOOD ENGINEERING.**  
**Dr. Ulhas Patil College of Agricultural Engineering Technology,**  
**Jalgaon.**  
**(Affiliated to Mahatma Phule Krishi Vidyapeeth, Rahuri)**

**2021-2022**

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## **DECLARATION OF STUDENTS**

We declare that the experimental work and its interpretation in the Project **“PREPARATION OF FORTIFIED PINEAPPLE COOKIES”** or part of it has not been submitted for any degree or diploma of any university, nor the data have been derived from any thesis or Publication of any university or scientist organization. The source of material used and all assistance received during the course of investigation have been duly acknowledged.

Place: Jalgaon

Date:

|                                     |                      |
|-------------------------------------|----------------------|
| <b>Mr. GAURAV SHIVDAS CHAUDHARI</b> | <b>(EJ-018/2018)</b> |
| <b>Mr. KALPESH MAHESH BAGADE</b>    | <b>(EJ-005/2018)</b> |
| <b>Mr. PRANAV ARUN DEVRE</b>        | <b>(EJ-026/2018)</b> |

## **CERTIFICATE**

This is to certify that the project report entitled “**PREPARATION OF FORTIFIED PINEAPPLE COOKIES**” submitted in the partial fulfilment for the degree Bachelors of Technology in Agricultural Engineering from Dr. Ulhas Patil College of Agricultural Engineering and Technology, Jalgaon, affiliated to "Mahatma Phule Krishi Vidyapeeth, Rahuri", is a record of bonafied research work carried out by **Gaurav Chaudhari, Kalpesh Bagade, Pranav Devre** under my guidance and supervision. I also certify that the dissertation has not been previously submitted by them for the award of Degree or Diploma of any University or Institute.

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Place :-Jalgaon

Date :-

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|                 |                    |
|-----------------|--------------------|
| %               | : per cent         |
| cm              | : centimeter       |
| cm <sup>3</sup> | : cubic centimeter |
| et al           | : and other        |
| etc.            | : etcetera         |
| g               | : gram             |
| h               | : hour(s)          |
| Q               | : heat supplied    |
| k               | : drying constant  |
| kg              | : kilogram         |
| m               | : meter            |
| min             | : minute           |
| mg              | : milligram        |
| °C              | : degree Celsius   |
| °               | : degree           |
| Rs.             | : rupees           |
| i.e             | : that is          |
| s               | : second           |
| No.             | : number           |

# **CHAPTER I**

## **INTRODUCTION**

Baking Industry is considered as one of the major segments of food processing in India. Baked products are gaining popularity because of their availability, ready to eat convenience and reasonably good shelf life. Cookies are ideal for nutrient availability, palatability, compactness and convenience. New developments are taking place, given the benefits of new knowledge in nutrition science, new process technologies and the modern consumers demand for foods with multiple health benefits.

### **1.1 COOKIES**

A cookie is a baked or cooked food that is typically small, flat and sweet. It usually contains flour, sugar and some type of oil or fat. It may include other ingredients such as raisins, oats, chocolate chips, nuts, etc.

Biscuit or cookie variants include sandwich biscuits, such as custard creams, Jammie dodgers, Bourbons and Oreos, with marshmallow or jam filling and sometimes dipped in chocolate or another sweet coating. Cookies are often served with beverages such as milk, coffee or tea. Factory-made cookies are sold in grocery stores, convenience stores and vending machines. Fresh-baked cookies are sold at bakeries and houses, with the latter ranging from small business-sized establishments to multinational corporations.

Cookies are most commonly baked until crisp or just long enough that they remain soft, but some kinds of cookies are not baked at all. Cookies are made in a wide variety of styles, using an array of ingredients including sugars, spices, chocolate, butter, peanut butter, nuts, or dried fruits. The softness of the cookie may depend on how long it is baked.

## **1.2 PINEAPPLE**

The Pineapple (*Ananas, comosus*) is a tropical plant with an edible multiple fruit consisting of coale seed berries, also called pineapple, and the most economically significant plant in the Bromeliaceae family.

Pineapple May be cultivated from a crown cutting of the fruit, possibly flowering in 5-10months and fruiting in the following six months. Pineapple does not ripen significantly after harvest. Pineapple can be consumed fresh, cooked, juiced, or preserved. They are found in a wide array of cuisines. In addition to consumption, the pineapple leaves are used to produce the textile fiber pina in the Philippines, commonly used as the material for the men's barong Tagalog and women's bartsaya formal wear in the country. The fiber is also used as a component for wallpaper and other furnishing.

**Table 1.1 : Nutritional value of pineapple**

(All the values are per 100 gm. of edible portion)

| <b>Nutritional Value</b> | <b>Value ( g or mg Per 100 gm)</b> |
|--------------------------|------------------------------------|
| Moisture                 | 87.8                               |
| Protein                  | 0.4                                |
| Fat                      | 0.1                                |
| Fiber                    | 0.5                                |
| Carbohydrate             | 10.8                               |
| Energy(Kcal)             | 46 kcal                            |
| Calcium                  | 20                                 |
| Phosphorus               | 9                                  |
| Iron                     | 2.42                               |

**Table 1.2 : Vitamin content of pineapple**

(All the values are per 100 gm. of edible portion)

| <b>Vitamins</b> | <b>Values (mg/100 gm)</b> |
|-----------------|---------------------------|
| Carotene        | 18                        |
| Thiamine        | 0.20                      |
| Riboflavin      | 0.12                      |
| Niacin          | 0.1                       |
| Vitamin C       | 39                        |

### 1.3 HEALTH BENEFITS OF PINEAPPLE:

It regulates glands and found to be helpful in case of

- I. Goiter
- II. Dyspepsia (chronic digestive disturbance)
- III. Prevents nausea (includes morning sickness and motion sickness).
- IV. Arthritis (Diseases of the joints).
- V. High blood pressure.

Very few people know that pineapple is the second most favourite tropical fruit in the world. Fresh pineapple has adequate quantity of vitamins, enzymes and minerals which are good for overall development of health it has many health benefits and can fight against immuned regulating blood pressure, reducing risk of cancer, combating diabetes, as its benefits are concerned, the fully ripened fruit is the most beneficial one.

1. **Pineapple juice improves digestion:** The enzyme bromelain in presenting Pineapple is useful in digestion and ensure neutralization of acids. Bromelain breaks down protein into simpler form and promotes digestion. It regulates pancreas secretion to aid in digestion process besides natural digestions aids, bromelain encourage healing of wounds, reduce pain in arthritis. Bromelain also helps in treatment of indigestion and acts as anti- inflammatory agent.
2. **Bromelains effect:** Pineapple juice contains bromelain enzyme which is beneficial in preventing of cough and colds as well as has other therapeutic values. Fibrin which is known as clotting of blood gets broken down into simpler form by bromelain. Bromelain helps in improvement of breathing by thinning mucous in the respiratory region. Taking bromelain properly helps to lessen pain in arthritis. It is also beneficial in inflammatory conditions like acne, eczema, psoriasis, dermatitis and rosacea. It is also used as immunity booster.
3. **Pineapple Strengthen bones:** It is good in maintaining strong and healthy bones due to presence of manganese. A cup of pineapple juice contains about 73 percent of manganese for daily requirement of the body. Pineapple helps to grow bones at the younger stage while strengthening at the older stage. The juice contains vitamin C and solves the problems related with gums. Instead of strengthening of bones, manganese is also useful in healing wounds, blood sugar regulation, increases immunity and

keeps the skin healthy.

4. **Pineapple is good for eyes:** Pineapple contains beta-carotene and vitamin A that good for eyesight. Drinking of pineapple juice prevent macular generation and reduces the risk of vision loss at the old age, as suggested by many studies. The presence of anti-oxidants helps to solve the eye related problems and maintains good eye health.
5. **Pineapple combats arthritis and joint pain:** Drinking a glass of pineapple juice can greatly help to alleviate the sign symptoms of arthritis is due to its anti-inflammatory in nature. Pineapple juice reduces pain to old age people who are initially suffering from arthritis. Juice of pineapple also gives relief from muscle pain. Eating of this fruit strength bones. The presence of bromelain enzyme is considered to reduce inflammation and swelling
6. **Nutritional value of pineapple juice:** Pineapple juice is packed with vitamins and minerals. Pineapple contains vitamin C, B-Complex (thiamine, pyridoxine, riboflavin). On minerals front. it is having potassium, calcium, phosphorous and Manganese. It is l so rich in natural soluble and insoluble fiber and low in calories. Fresh pineapple juice is having 75% vitamin C of daily requirements. Vitamin C is good for healthy immune system, effective in cold and cell growth. Vitamin B boosts metabolic activities of the body. Vitamin B regulate blood sugar, Vitamin A maintains healthy mucus membrane, eyesight and skin. Potassium prevents muscle cramps and soreness.
7. **Pineapple reduces risk of hypertension:** Pineapple juice reduces hypertension due to adequate presence of potassium and lesser amount of sodium. This proportion of potassium and sodium is the best way to combat high blood pressure. A cup of pineapple juice contains about 1 milligram of sodium and 195 milligram of potassium. So, it is suggested that persons suffering from hypertension may take pineapple juice regularly. Pineapple is considered as the fruit which has among the lowest amount of sodium in fruits.
8. **Pineapple is good for heart health:** Pineapple juice improves blood circulation, also good for heart health and ensures smooth blood flow in the circulatory system. Pineapple juice also contains bromelain that makes blood thinner which reduces the chances of heart attack, stroke and to her heart diseases. Antioxidants in vitamin C also lower the risks of heart diseases by combating free radicals. Vitamin C also prevents atherosclerosis. It acts like as anticoagulant.



## **OBJECTIVES**

1. To prepare formulation of Pineapple cookies.
2. To study physiochemical properties of pineapple cookies.
3. To study storage/shelf life observation of pineapple cookies.
4. To analyze marketing strategies for pineapple cookies.

## **CHAPERT II**

### **REVIEW OF LITRATURE**

#### **2.1 Pineapple composition**

Pineapple is a common name for one member of the Bromeliaceae, a family of chiefly epiphytic herbs and small shrubs native to the American tropics and subtropics. Pineapple is the species of *Ananas*, *Tillandsia*, and other genera sometimes cultivated as ornamentals. This fruit is grown throughout warmer regions such as Thailand, the Philippines, and Brazil which were known as the largest producers of canned pineapple. In Malaysia, pineapples are mostly planted in the states of Johor, Sarawak, Sabah, Kedah, Selangor, Penang, and Kelantan. Among the varieties of pineapples planted in Malaysia are MORIS, MORIS Gajah, Josapine, Yankee, Gandul, N36, and MD2. However, only two local varieties namely Josapine and N36 have been successfully exported, mainly to Singapore and the United Arab Emirates (UAE) due to its long shelf-life (Kasim, 2010).

This fruit is formed from the flowers and bracts and grows on top of a short, stout stem bearing stiff, fleshy leaves. Normally, pineapples are eaten fresh, tinned, or even made into juice. Pineapples are a composite of many flowers whose individual fruitlets fuse together around a central core. Each fruitlet can be notorious by an "eye," the rough spiny marking on the pineapple's surface. It has a wide cylindrical shape, a scaly green, brown or yellow skin and a regal crown of spiny, blue-green leaves and fibrous yellow flesh. The area closer to the base of the fruit has more sugar content and therefore creates a sweeter taste and more tender texture.

Matured pineapples can be eaten fresh as dessert or salads, cooked as mostly founding local delicacies or processed into juice and jams, among others. The juices from young pineapples are suitable for the treatment of various diseases because they are rich in nutrients such as bromelain and vitamin A and B1. Additionally, pineapple also contains citric acid that can effectively eliminate fat and help in reducing weight. Masniza, Jeng Yih, and Roji (2000) stated that two-third of pineapple is in the form of sucrose and the rest were glucose and fructose (12-15%) sugar. Bartolome, Ruperez, and Fuster (1995) also contented approximately two-third of the total sugar present is in the form of sucrose content. The amount of sugar varies in fruits and may depend on its stage of maturity during harvesting time, soil condition and its variety. The sugar concentration has not always been associated with the point of color, as agricultural and production factors will also impact the growth of sugar (Wijesinghe and Sarananda, 2002).

## **2.2 Benefits of pineapple**

### **2.2.1 Potential anti-inflammatory and digestive**

Pineapple is the source of bromelain, used as a meat-tenderizing enzyme, and high quality fiber (d'Eeckenbrugge, Sanewski, Smith, Duval, and Leal, 2011) and it contains a considerable amount of calcium, potassium, fiber and vitamin C but low in fat and cholesterol. Other than that, pineapple is also a good source of vitamin B1, vitamin B6, copper and dietary fiber. Pineapple is a digestive aid and a natural anti-inflammatory fruit (Joy & Anjana, 2010). Bromelain is a complex mixture of substances that can be extracted from the stem and core fruit of the pineapple. Among dozens of components known to exist in this crude extract, the best-studied components are a group of protein digesting enzymes (called cysteine proteinases). Originally, researchers believed that these enzymes provided the key health benefits found in bromelain, a popular dietary supplement containing these pineapple extracts. In addition, researchers also believed that these benefits were primarily limited to help with digestion in the intestinal tract.

### **2.2.2 Antioxidant protection and immune support of pineapple**

Studies have shown that the residues of certain fruits can present a higher antioxidant activity than the pulp (Gorinstein, Zachwieja, Foltá, Barton, Piotrowicz, Zemser, et al, 2001) Vitamin C is known as the body's primary water-soluble antioxidant that defends all aqueous areas of the body against free radicals that attack and damage the normal cells. Free radicals have been shown to promote the artery plaque build-up of atherosclerosis and diabetic heart disease which causes airway spasm that leads to asthma attacks, damage the cells of the colon so they become colon cancer cells, and contribute to the joint pain and disability seen in osteoarthritis and rheumatoid arthritis. This situation would explain why diets rich in vitamin C have been shown to be useful for preventing or reducing the severity of all of these conditions. In addition, vitamin C is vital for the proper function of the immune system, making it a nutrient to turn to for the prevention of recurrent ear infections, colds, and flu.

## **CHAPERT III**

### **MATERIALS AND METHODS**

#### **3.1 INGREDIENTS REQUIRED**

1. Wheat flour
2. Sugar
3. Butter
4. Pineapple Essence
5. Baking Powder

#### **ROLE OF INGREDIENTS**

**Plate No.3.1 Wheat Flour:**



Flour creates the basic structure for the entire cookies.

**Plate No.3.2 Sugar:**



Sugar's main role is to sweeten the cookies. It also assists in the aeration and stabilization of the batter. Sugar helps to keep the cookies moist and soft, but it can also create a crisp, browned crust due to caramelizing.

### **Plate No.3.3 Baking powder:**



Baking powder is a bakery additive comprising a mixture of sodium bicarbonate, starch, and one or more acidic substance for (example cream of tartar) when moist turned and heated, they act as agents by generating carbon dioxide, bubbles of which have leavening effect.

### **Plate No.3.4 Butter:**



Butter is high in beta-carotene, a compound that your body converts into vitamin A

### **Plate No.3.5 Pineapple Essence:**



Pineapple essence is used to increase the flavor and aroma of biscuits.

**Plate No.3.6 Pineapple Pulp:**



**3.2 PROCUREMENT OF RAW MATERIALS**

Pineapple was procured from the fruits and vegetable market in Jalgaon, and other ingredients were procured from a retail shop, in Jalgaon.

## **DETAILS OF PROCESSING AND ANALYZING EQUIPMENT**

Proper selection of equipment is essential for effective production of Beetroot Jelly Blended with Orange Juice. The right selection of them saves efforts and time required for production.

### **3.3 PROCESSING EQUIPMENT:**

**Plate No. 3.7 Digital weighing balance**



It was used to weigh quantities of materials.

**Plate No.3.8 Gas (Stove)**



Gas stove was used for cooking of mixture of beetroot and orange juice, sugar, pectin.

**Plate No.3.9 Cooking Pan**



**Plate No.3.10 Cooking Spoon**



**Plate No.3.11 Oven**





**Plate No.3.12 Baking Pan**

H



**Plate No.3.13 Mixture**



**Plate No.3.14 Molder**



## PROCESSING TECHNOLOGY

### 3.4 FLOW CHART

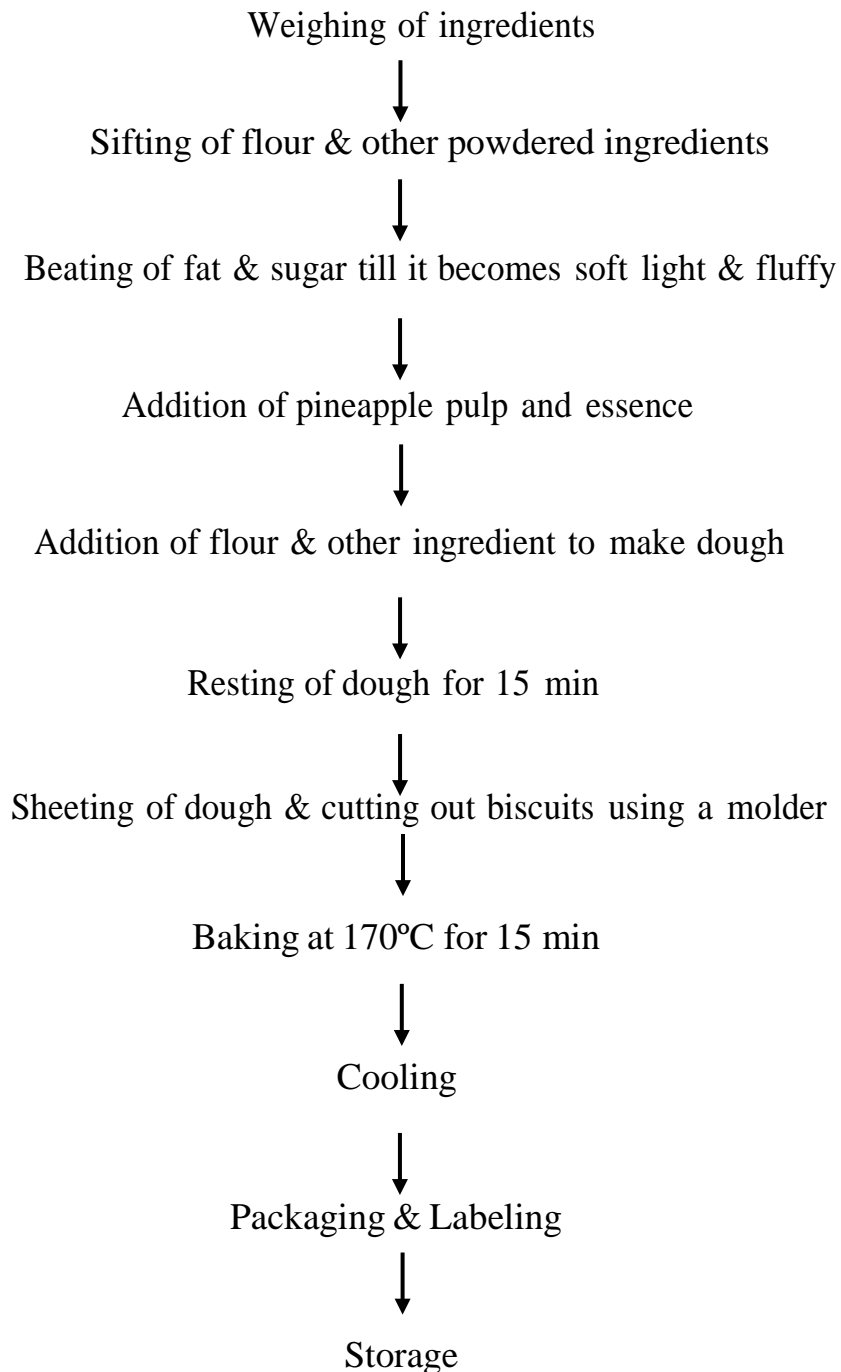


Fig no 3.1 Flow chart of Processing Method Of Pineapple Cookies

### 3.5 NATURE OF MARKETING

Direct marketing: Direct marketing of pineapple cookies was done on village premises amongst neighbors and relatives. Packets of 200 grams were sold.

#### 3.5.1 REVENUE GENERATED

**Table 3.1 : Quantity Of Ingredients**

| <b>Sr. No.</b> | <b>Ingredients</b> | <b>Amount ( gm)</b> |
|----------------|--------------------|---------------------|
| 1              | Flour              | 500 gm              |
| 2              | Sugar              | 250 gm              |
| 3              | Hydrogenated Fat   | 325 gm              |
| 4              | Pineapple Pulp     | 200gm               |
| 5              | Pineapple Essence  | 5-10 ml             |
| 6              | Milk               | If required         |
| 7              | Baking Powder      | 1.25 gm             |

Total amount of product prepared = 400 grams

Final cost =40 Rs.

Price per packet (200 grams) = 30 Rs.

Selling Calculation for Profit follows;

- Market price for 1 kg = 150 Rs.

Profit obtained= (total sale income) – (cost of product)

= 60 Rs – 44 Rs

= 16 Rs

Creative suggestion for the next batch of students:

- Maintain hygiene and sanitary condition while processing.
- Select good quality grade packaging material.
- Focus on providing good quality food product to the customer.
- Avoid loss of raw material during processing.

Potential for commercial production-

- There is great demand for bakery products because of the increase in health consciousness, easy availability & less price.
- Due to the high demand for this Product it will be beneficial for large-scale manufacturing.
- Thus, there is great potential for large-scale production.

### **3.6 PACKAGING MATERIAL**

Packaging materials have a Multi-Purpose function for a food product. The primary function of packaging material is to protect the food from various hazards.

#### **3.6.1 Requirement of Packaging Material-**

- 3.3.8 Easily Available
- 3.3.9 Low Cost
- 3.3.10 Good Quality
- 3.3.11 Easy to Handle
- 3.3.12 Protect The Food From Various Changes
- 3.3.13 Causing Less damage to the Environment

Polypropylene Boxes were used to package pineapple pulp Cookies.

### 3.7 MARKETING STRATEGY

It contains two various key components as follows:

- A. Products and Services - It may include concentrating on a narrow product line, and developing highly specialized products or services.
- B. Promotion - Promotion may be defined as the coordination of all seller-initiated efforts to set channels of information and persuasion to facilitate the sale of goods and services. It includes-

Advertising

Personal Selling

Sales Promotion

Publicity

### 3.8 ADVERTISING:

It is maybe paid form of non-personal presentation and promotion of ideas, goods, or services by an identified sponsor. Advertising is only one element of the promotion mix but is often considered prominent in overall marketing. It includes-

- I. **Informative Advertising:** It aims to create brand awareness and knowledge for new products or new features of existing products.
- II. **Persuasive Advertising:** It aims to create liking of performances, conviction, and purchase of products or new features of existing products.

Effects of Advertising:

To get or win new customers

To increase the sale of the product.

It makes customers aware of products.

It makes selling profitable.

Personal selling: It is dissemination by non-personal methods like face-to-face, contact between the audience and employees of sponsoring organization.

Sales promotion: It is the dissemination through a wide variety of activities other than selling,

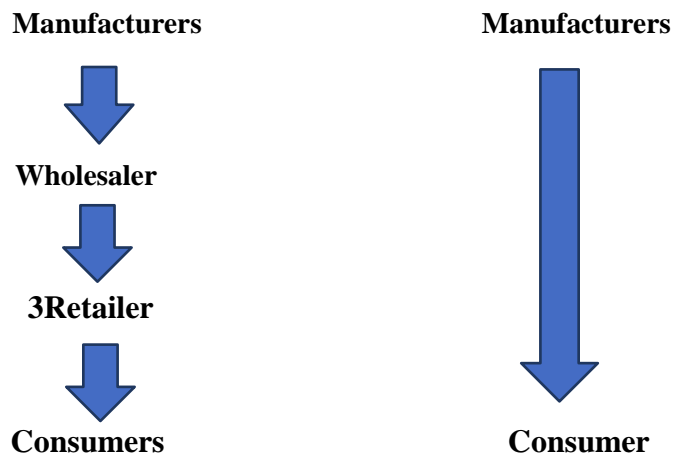
advertising, and publicity that stimulate customers. It is a key ingredient in the marketing campaign.

Publicity: It is the dissemination of information by personal or non-personal means and it is not directly paid for by the organization.

**3.9 DISTRIBUTION AND PRICING:** The right place is crucial for maximizing total revenue. Pricing is important for making a profit.

**3.10 MARKETING CHANNELS:** Direct Marketing: It consists of manufacturers selling directly to the final customer. E.g. Door-to-door, mail order, telemarketing, TV selling, Internet selling.

**3.10.1 Direct Marketing:** It consists of manufacturers selling directly to the final customer. E.g. Door-to-door, mail order, telemarketing, TV selling, Internet selling.



**Fig 3.2 : Flow Chart Of Direct Marketing**

**3.10.2 Retailing:** It includes all the activities is selling the product direct to consumers for personal or non-business use.

**3.10.3 Whole Selling:** It includes all the activities in selling the products who buy for resale , e.g. . Shopkeeper , merchant , wholesaler , etc.

### **3.11 LABELLING**

A label may be simple attached to a product or an elaborate design that is part of the package. Label contains the brand name and other essential information like manufacturing date, expiry date, ingredients, nutritional value etc. The label design should be attractive and informative which first appeals the consumer towards product. Following picture shows label for Pineapple Cookies

## CHAPTER IV

### RESULTS AND DISCUSSION

#### 4.1 PHYSICAL ANALYTICAL TESTS

##### A. Moisture Content

Procedure-

1. Take 1 gm sample in a pre-weighed empty Petri plate
2. Keep the Petri plate in a hot air oven at 105° C till constant weight is obtained.
3. Cool the plate in a desiccator.
4. Moisture content is calculated by using a formula.

Formula-

$$\% \text{ Moisture Content} = \frac{\text{Initial weight} - \text{Final weight}}{\text{Initial weight of sample}} \times 100$$

##### B. Estimation of ash content

Procedure-

1. Note the tare weight of the 3 silica dishes.
2. Weigh the 10 gm of the sample into each.
3. Ignite the dish and the contents on the Bunsen burner.
4. Ash the material at not more than 525 C for 4 to 6 hours; If need ash overnight in the muffle furnace.
5. Cool the dishes and weigh them.



6. The difference in weights gives the total ash contents and is expressed as a percentage.

Formula:

$$\text{Ash content} = \frac{\text{Weight of ash}}{\text{Weight of sample}} \times 100$$

**C. Dimensions-** The dimension of Pineapple cookies is measured by using a Vernier caliper.

Formula-

$$\text{M.S.R.} + (\text{V.S.R.} \times \text{L.C.})$$

Where;

M.S.R. = Main Scale Reading

V.S.R. = Vernier Scale Reading

L.C. = Least Count (0.1mm)

## 4.2 CHEMICAL ANALYTICAL METHOD

### A. Fat estimation by soxhlet method

Procedure-

1. Transfer the dried sample remaining after moisture determination to a thimble and plug the top of the thimble with fat free cotton.
2. Drop the thimble into the fat extraction tube of Soxhlet apparatus.
3. Attach the bottom of the extraction tube to a Soxhlet flask.
4. Pour approximately 75 ml or more anhydrous ether through the sample in the tube.
5. Attach the top of the extraction to the condenser.
6. Extract the sample for 16 hours or longer on a water bath.
7. At the end of the extraction period, remove the thimble from the apparatus and distilled off most of the ether.
8. When the ether has reached a small volume, pour it into a small, dry beaker through a small funnel.

9. Evaporate the ether in a steam bath at low heat. Dry at 100°C for 1 hr, cool and weight

Formula

$$\% \text{ Crude fat} = \frac{\text{Weight of ether-soluble material}}{\text{Weight of sample}} \times 100$$

### **B. Protein estimation by Kjeldhal's Method**

Procedure-

1. Set up the Kjeldhal's apparatus.
2. Digest the sample containing 0.04 to 0.05 gm of nitrogen within 6-8 gm catalyst mixture and 25 ml concentrated H<sub>2</sub>SO<sub>4</sub>.
3. Cool the digest transfer into distilling flask with about 400 ml of ammonia free water and add a large piece of granulated zinc.
4. Take 50 ml of boric acid in the receiving flask, add a few drops of mixed indicator, place below condenser and ensure that the delivery tube dips into the boric acid solution.
5. Into the funnel of the distillation flask, take sufficient [80ml] 50% NaOH solution.
6. Open the tap and wash down the condenser and the delivery tube into receiving flask.
7. Titrate the distillate using 0.05 NHCl.
8. Carryout blank determination in the same way without the sample and calculate using the expression.

### C. Carbohydrates test by Anthrone Method

#### Procedure-

1. Weight 100 mg of the sample into a boiling tube.
2. Hydrolyze by keeping it in a boiling water bath for 3 hrs. with 5 ml of 2.5 N HCl and cool to room temperature.
3. Neutralize with solid sodium carbonate until the effervescence ceases.
4. Make up the volume to 100 ml and centrifuge.
5. Collect the supernatant and take 0.5 ml and 1 ml aliquots for analysis.
6. Prepare the standards by taking 0, 0.2, 0.4, 0.6, 0.8, 1 ml of working standard -0. Serve as blank.
7. Make up the volume to 1 ml in all the tubes including the sample tubes by adding distilled water.
8. Then add 4 ml of another one reagent.
9. Heat for 8 minutes in a boiling water bath.
10. Cool rapidly and read the green to dark green color at 630 nm.
11. Draw a standard graph by plotting concentration of the standard on the X-axis versus absorbance on the Y axis.
12. From the graph, calculate the number of carbohydrates present in the tube.

**Note:** cool the content of all tubes on ice before adding ice cold Anthrone reagent.

#### Formula

$$\% \text{ Nitrogen} = \frac{(\text{sample titer} - \text{blank titer}) \times \text{N of HC} \times 14}{100 \text{ Wt. of sample}} \times 100$$

## **CHAPTER V**

### **SUMMARY AND CONCLUSIONS**

#### **5.1 Summary**

Research work entitled “Preparation of fortified pineapple cookies” by using wheat flour, sugar, baking powder, butter as well as pineapple pulp the important objective of project was to made pineapple Cookies. The cookies would be beneficial for health and good in taste. The main ingredient which is most important in cookies is pineapple pulp.

##### **5.1.1 Chemical Composition Of Pineapple :**

Pineapple fruits and peels contain diverse phytochemicals, among which are polyphenols, including gallic acid, syringic acid, vanillin , ferulic acid, sinapic acid, coumaric acid, chlorogenic acid, epicatechin, and arbutin.

##### **5.1.2 Properties Of Pineapple Pulp :**

Pineapple Pulp is high in vitamin C, which can help protect our body against the common cold. It also contains enzymes that have been shown to active a healthy immune system response. Pineapple Pulp Contain an enzyme called bromelain , which triggers our body ability to fight pain and reduce swelling.

## 5.2 Conclusion

**Conclusion** The use of fruit by-products positively influenced nutritional aspects of the cookies, especially regarding their fiber content, with the most expressive results (4.67–6.46%) obtained for the treatments using the flour composed of melon peels. It was verified that the high by-product concentration resulted in darker cookies, besides promoting variations in their diameter and expansion factor. Cookies prepared with flour made of pineapple central axis were more interesting in the sensory point of view, with FC-PI 15% presenting the highest acceptance and buying intention. Therefore, we conclude that the partial substitution of wheat flour by fruit by-product powder is a viable alternative, attributing nutritional, technological or sensory advantages to the cookies, depending on the byproduct employed.

## CHAPTER VI

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