﻿Murukku is a popular South Indian snack made from rice flour and urad dal (black gram) flour. It is crispy, crunchy, and flavorful. Below is a detailed recipe to make traditional murukku:

**Recipe**

### Ingredients

- Rice flour: 2 cups

- Urad dal flour: 1/4 cup

- Butter: 2 tablespoons (softened)

- Cumin seeds or carom seeds (ajwain): 1 teaspoon

- White sesame seeds: 1 tablespoon

- Asafoetida (hing): a pinch

- Salt: to taste

- Water: as needed (for the dough)

- Oil: for deep frying

**What’s needed:**

1. Automatic Muruku Machine with different shapes and sizes
2. Deep Fryer -
3. Drain excess oil   - Remove with a slotted spoon and place on paper towels to absorb excess oil.

**Labeling food products**

Labeling food products with nutritional information, including calories, involves following specific steps to ensure accuracy and compliance with food labeling standards. Here's a guide on how to create labels for your food products:

**### 1. Gather Nutritional Information**

You’ll need the details of all the ingredients in your product to calculate the nutritional content. These include:

- Calories

- Macronutrients: Carbohydrates, Proteins, Fats

- Micronutrients: Vitamins, Minerals

- Other Values: Fiber, Sugar, Sodium, etc.

**#### Options for Obtaining Data:**

- Use a nutrition analysis software or online tools (e.g., USDA FoodData Central).

- Hire a professional laboratory for precise nutritional testing (mandatory for some markets).

**### 2. Calculate Nutritional Content per Serving**

1. Determine serving size:

   Decide a standard serving size for your product (e.g., 30g for snacks).

2. Calculate nutrient values:

   Sum up the nutritional content of each ingredient based on the serving size.

3. Round the values:

   Round the calculated values according to the regulations in your region (e.g., FDA standards in the U.S.).

**### 3. Design the Label**

**#### Mandatory Information**

Include the following on the label:

1. Serving Size: Clearly state the serving size (e.g., 1 piece, 30g).

2. Calories: Mention total calories per serving.

3. Macronutrients: Include the amount of fat, carbohydrate, and protein per serving, broken down as follows:

   - Total Fat (with saturated fat and trans fat specified)

   - Cholesterol

   - Sodium

   - Total Carbohydrates (include dietary fiber and total sugars)

   - Protein

4. Vitamins and Minerals: If applicable, list amounts of essential nutrients like Vitamin D, Calcium, Iron, and Potassium.

**#### Optional Information**

- Percentage daily values (%DV), based on a standard diet (e.g., 2,000 calories/day).

- Allergen warnings (e.g., contains peanuts).

**### 4. Ensure Compliance with Local Regulations**

Each country has specific requirements for food labeling. Refer to the guidelines for your region:

- U.S.: FDA guidelines for Nutrition Facts labels.

- EU: Food Information to Consumers (FIC) Regulation.

- India: FSSAI labeling guidelines.

**### 5. Print and Apply the Label**

- Use professional graphic design tools to create a clean, easy-to-read label.

- Ensure the label size fits the packaging appropriately.

### Example Label

Nutrition Facts

| Serving Size: 30g (1 piece) | Servings per container: 10 |

|-----------------------------|----------------------------|

| Calories: 150           | % Daily Value\*         |

| Total Fat: 5g               | 6%                         |

| Saturated Fat: 1g           | 5%                         |

| Trans Fat: 0g               | -                          |

| Cholesterol: 0mg            | 0%                         |

| Sodium: 200mg               | 9%                         |

| Total Carbohydrates: 22g    | 8%                         |

| Dietary Fiber: 2g           | 8%                         |

| Total Sugars: 5g            | -                          |

| Protein: 3g             | 6%                         |

| Vitamin D: 0mcg         | 0%                         |

| Calcium: 30mg           | 2%                         |

| Iron: 1mg               | 6%                         |

| Potassium: 100mg        | 2%                         |

(\*Percent Daily Values are based on a 2,000-calorie diet.)

**### Tips for Success**

- Keep it accurate: Mistakes in labeling can lead to legal issues.

- Update as needed: Revise labels if the recipe changes.

- Highlight unique selling points: Add details like “Low Fat,” “Gluten-Free,” or “No Added Sugar” if applicable.

**Estimating the shelf life**

Estimating the shelf life of a food product involves testing and analyzing various factors that influence the product's quality, safety, and stability over time. Here's a detailed guide:

**### 1. Understand Shelf Life**

Shelf life is the time during which a product remains safe to consume and retains its intended quality under specific storage conditions.

**### 2. Identify Factors Affecting Shelf Life**

1. Ingredients: Perishable items like dairy and fresh produce have shorter shelf lives.

2. Water Activity (aw): Foods with higher water content spoil faster.

3. pH Levels: Acidic foods (low pH) generally have longer shelf lives.

4. Packaging: Proper sealing, vacuum packaging, or modified atmosphere packaging (MAP) can extend shelf life.

5. Storage Conditions: Temperature, humidity, and exposure to light or air significantly impact shelf life.

**### 3. Conduct Shelf Life Testing**

**#### Accelerated Shelf Life Testing (ASLT)**

This method estimates shelf life faster by storing the product at elevated temperatures or humidity levels to simulate aging.

1. Store samples at different conditions (e.g., 25°C, 35°C, and 45°C).

2. Analyze quality and safety parameters (taste, texture, color, microbial growth, etc.) periodically.

**#### Real-Time Testing**

Store the product under normal storage conditions and monitor changes over time. This method is more accurate but time-consuming.

**### 4. Perform Quality Assessments**

1. Microbial Analysis: Check for bacterial, yeast, or mold growth.

2. Sensory Evaluation: Assess taste, smell, texture, and appearance over time.

3. Chemical Stability: Test for oxidation (e.g., fats becoming rancid) or nutrient degradation (e.g., vitamin loss).

4. Physical Stability: Check for moisture loss, crystallization, or separation in the product.

**### 5. Use Predictive Models**

Tools like the Arrhenius equation can help estimate shelf life by relating reaction rates to temperature. Some software solutions also model shelf life based on data input.

**### 6. Determine Storage Conditions**

Clearly define optimal storage conditions for your product. For example:

- Room temperature (25°C) for dry snacks.

- Refrigeration (4°C) for dairy or fresh foods.

- Freezing (-18°C) for frozen products.

**### 7. Assign a Best-Before or Expiry Date**

- Best-Before Date: Indicates the period for peak quality.

- Expiry Date: Indicates the last safe consumption date.

**### 8. Validate with Consumer Trials**

Conduct small-scale tests with real consumers to confirm the product meets expectations throughout its intended shelf life.

**### 9. Regularly Reassess Shelf Life**

Review shelf life periodically, especially if there are changes in the recipe, packaging, or production process.

**### Tips for Accurate Shelf Life Estimation**

- Document Everything: Record all test conditions and results.

- Consult Experts: Partner with a food scientist or testing laboratory for complex products.

- Focus on Packaging: Improve packaging to minimize exposure to oxygen, moisture, and light.

**Packaging**

To pack Indian snacks like murukku and maintain freshness without using artificial preservatives, you need to focus on effective natural preservation techniques, packaging materials, and methods that minimize exposure to air, moisture, and light. Here's a step-by-step guide:

**### 1. Choose Appropriate Packaging Materials**

The packaging should provide a barrier against air, moisture, and light, which are the primary causes of spoilage.

**#### Options for Packaging:**

- Food-grade plastic pouches: Multi-layered, high-barrier pouches (BOPP, PET) are ideal.

- Metalized or Aluminum Foil Pouches: These provide excellent protection from light and oxygen.

- Kraft Paper Bags with Inner Liners: Eco-friendly and biodegradable with proper sealing.

- Glass Jars or Tin Containers: Reusable, airtight, and eco-friendly for premium packaging.

**### 2. Prepare Snacks for Packaging**

Proper preparation is key to extending freshness:

1. Cool the Murukku: Let the murukku cool completely after frying to avoid condensation inside the packaging.

2. Drain Excess Oil: Use paper towels to remove surface oil, which can cause rancidity.

3. Dry Roasting (Optional): Lightly roast fried murukku to ensure extra crispiness and reduce moisture content.

**### 3. Use Airtight Packaging**

Seal the packaging to minimize air exposure, which can cause oxidation and loss of crispiness.

- Vacuum Sealing: Removes all air from the package, preserving freshness and extending shelf life naturally.

- Heat Sealing: For plastic or foil pouches, use a heat-sealing machine to create a strong, airtight seal.

**### 4. Include Natural Freshness Preservers**

Incorporate natural methods to keep snacks fresh:

- Desiccant Sachets: Use silica gel or food-safe moisture absorbers to reduce humidity.

- Oxygen Absorbers: Prevent oxidation and keep snacks crispy without artificial chemicals.

- Natural Anti-Oxidants: Add small amounts of turmeric or asafetida (hing) in the recipe, which naturally slow down spoilage.

**### 5. Label Storage Instructions**

Provide clear instructions on the packaging:

- “Store in a cool, dry place.”

- “Once opened, transfer to an airtight container.”

**### 6. Use Eco-Friendly Outer Packaging**

Consider sustainable materials for outer packaging:

- Corrugated Boxes: For bulk packaging with cushioning to prevent breakage.

- Cloth or Jute Bags: Eco-friendly and attractive for gifting.

**### 7. Test the Packaging**

Before finalizing, test the packaging for:

- Air tightness

- Moisture resistance

- Durability during transport

**### 8. Batch and Store Properly**

- Batch Processing: Pack small batches at a time to avoid prolonged exposure during packaging.

- Storage Environment: Store packed snacks in a cool, dry, and well-ventilated area.

### Example Workflow for Murukku Packaging

1. Fry and drain excess oil → Cool completely.

2. Pack in a vacuum-sealed aluminum foil pouch or an airtight jar.

3. Insert a silica gel sachet to absorb residual moisture.

4. Seal and label the package with storage instructions.

**Natural oxygen absorbers**

Natural oxygen absorbers are an excellent way to maintain food freshness, prevent spoilage, and extend shelf life without artificial additives. For a 5 kg package of snacks like murukku, the following natural oxygen-absorbing options can be considered:

**### Best Food-Safe Natural Oxygen Absorbers**

**#### 1. Iron Powder Sachets (Commercial Oxygen Absorbers)**

- How it works: These sachets contain iron powder that reacts with oxygen in the package, forming iron oxide and reducing oxygen levels to nearly zero.

- Advantages:

  - Safe for food packaging.

  - Widely available and effective.

  - Leaves no residue or odor.

- Usage for 5 kg package:

  - Use 100cc–300cc oxygen absorber packets, depending on the residual air in the packaging.

**#### 2. Activated Charcoal**

- How it works: Activated charcoal can absorb moisture and odors while reducing oxygen levels in an airtight environment.

- Advantages:

  - Completely natural and eco-friendly.

  - Can be used in combination with silica gel for dual action (oxygen and moisture absorption).

- Usage: Place small sachets of food-grade activated charcoal in the packaging.

**#### 3. Natural Antioxidant Ingredients (Indirect Oxygen Control)**

These ingredients are mixed into the food or added in small quantities within the package to reduce oxidation:

- Turmeric Powder: Acts as an antioxidant and imparts a mild yellow tint.

- Clove or Bay Leaves: Helps absorb moisture and acts as a natural preservative.

- Asafoetida (Hing): A natural antioxidant that enhances flavor.

- Cost: Minimal, as these are kitchen staples.

**#### 4. Silica Gel Sachets (Moisture + Indirect Oxygen Control)**

- While primarily used for moisture absorption, silica gel reduces oxygen indirectly by maintaining a low-humidity environment. Combine it with other oxygen absorbers for maximum effectiveness.

- Usage: Place 2–3 silica gel sachets in each 5 kg package. Ensure they are food-grade and non-toxic.

**### Costs of Oxygen Absorbers for a 5 kg Package**

The cost of oxygen absorbers depends on the quantity and type:

- Iron Powder Sachets: $10–$15 for a pack of 100 sachets (100cc each). For a 5 kg package, you may need 2–4 sachets, costing $0.20–$0.50 per package.

- Activated Charcoal: $10–$20 for a 1 kg bulk pack. Small sachets cost around $0.10–$0.30 per package.

- Silica Gel: $5–$10 for a pack of 50 sachets. For a 5 kg package, it costs around $0.10–$0.20.

**### Where to Buy**

- Online stores like Amazon, Uline, or specialized packaging suppliers.

- Food-safe oxygen absorbers are often available through packaging wholesalers.

**Natural and food-safe oxygen absorbers**

Natural and food-safe oxygen absorbers, such as iron-based options, are an excellent choice for preserving snacks like muruku without synthetic additives. These absorbers reduce oxygen levels in sealed packages to near 0%, helping to prevent spoilage, mold growth, and rancidity, while retaining the freshness, taste, and aroma of food products.

### Recommended Oxygen Absorbers:

1. O Sorb (Streampeak Group):

   - Food-safe and available in various sizes (e.g., 100cc, 200cc, etc.).

   - Suitable for dry snacks and ensures effective oxygen absorption【17】.

2. FreshPax (Multisorb):

   - Absorbs oxygen down to 0.01% and preserves freshness without altering taste.

   - Ideal for snacks, spices, and dry foods【18】.

3. Integra Boost & Similar Options (Humidity Packs):

   - Effective for dry foods with size variations from 50cc to 400cc.

   - Packets are cost-effective for small- to medium-sized packaging【19】.

**Cost Estimation of Oxygen Absorbers**

### Cost Estimation:

- For a 5 kg package, the required oxygen absorber size typically depends on the packaging volume.

  - Example: 200cc packets for each kg of product (approx.) at $25–$35 for a pack of 100 packets【19】.

  - Custom calculations may vary based on package dimensions and food density.

### Usage Tips:

- Use multi-layer or vacuum-sealed packaging to optimize oxygen absorber performance.

- Select an absorber size based on your food type and packaging volume.

- Test the packaging setup to ensure the effectiveness of oxygen reduction.

These solutions are affordable and efficient, with bulk purchasing options further reducing costs. If you'd like, I can help guide you through calculating specific needs for muruku packaging.

To calculate the number and size of oxygen absorbers needed for 2 kg of murukku packaging, follow these steps:

### Step 1: Estimate Package Volume

The oxygen absorber requirement is based on the volume of air inside the package, not the weight of the food. To estimate:

1. Calculate Bulk Density of Murukku:

   - Murukku is lightweight and airy, with an estimated density of 0.25–0.3 g/cm³ (varies by shape and frying process).

   - For 2 kg:

     \[

     \text{Volume of Murukku (cm³)} = \frac{\text{Weight (g)}}{\text{Density (g/cm³)}} \approx \frac{2000}{0.3} \approx 6667 \, \text{cm³}.

     \]

2. Account for Packaging Airspace:

   - Add 10–15% extra volume for air gaps inside the package.

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     \text{Total Package Volume} = 6667 + (0.15 \times 6667) \approx 7667 \, \text{cm³}.

     \]

**### Step 2: Select Oxygen Absorber Size**

Oxygen absorbers are rated in cc (cubic centimeters of oxygen they absorb). The general rule is:

- 100–150 cc per liter of air volume.

For 2 kg murukku:

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\text{Oxygen Absorber Requirement} = 7667 \, \text{cm³ (or ~7.7 L)} \times 150 \, \text{cc/L} = 1150 \, \text{cc}.

\]

- You could use two 500 cc absorbers or one 1000 cc absorber and a smaller 200 cc one for safety.

**Packaging Options**

### Step 3: Packaging Options

Choose suitable packaging to minimize air exposure:

1. Vacuum-Sealed Pouches:

   - Reduces the volume of air significantly.

   - Requires fewer or smaller oxygen absorbers.

2. Heat-Sealed Plastic or Aluminum Foil Bags:

   - Provides an airtight barrier to maximize the effectiveness of oxygen absorbers.

### Step 4: Validate and Adjust

1. Use trial packaging with the selected oxygen absorbers.

2. Check the freshness and crispness of murukku after 7–15 days to ensure proper air removal.

### Cost Estimation

- 500cc Absorbers: ~$15 for a pack of 50 packets.

- 1000cc Absorbers: ~$20 for 20 packets.

For 2 kg, you'll spend around $0.50–$1 per package depending on the supplier.

**Affordable packaging suppliers in China:**

1. Lanker Pack: They offer a wide range of food-grade packaging solutions such as kraft paper bags, zip-lock pouches, and custom designs to keep snacks fresh and visually appealing. Their focus on eco-friendly materials is a bonus. You can learn more on their website  [oai\_citation:3,Snack Packaging Manufacturers and Suppliers - China Snack Packaging Factory - Lanker Pack](https://www.lankerpackaging.com/snack-packaging/).

2. STLPak: This supplier specializes in sustainable food packaging and offers customized options. They use food-grade materials and have facilities to ensure aseptic, high-quality production. Their services also include free mold making for custom designs, which is great for branding. Visit them  [oai\_citation:2,STLPak Food Packaging supplier in China, OEM&ODM](https://stlpak.com/).

3. Wuhan Ipack Packaging Co., Ltd.: They provide customizable food-grade packaging bags, including aluminum foil and stand-up pouches, ideal for snack preservation. Their prices start as low as $0.02 per unit for bulk orders, with a minimum order quantity of 500 pieces. Explore their offerings on their Alibaba page  [oai\_citation:1,Company Overview - Wuhan Ipack Packaging Co., Ltd.](https://ipackpartner.en.alibaba.com/).

These companies provide various styles, including resealable, moisture-proof, and flat-bottom pouches, which are ideal for preserving freshness without artificial additives. Costs vary based on order quantity, material, and customization, so reaching out for quotes is recommended.

**Product Pricing**

To calculate the actual price of 100g of murukku, you need to consider several cost components:

**### Step 1: Break Down Costs**

1. Ingredient Costs:

   Add the cost of all raw materials used in making murukku (per batch).

   - Example ingredients: rice flour, urad dal flour, sesame seeds, spices, oil, etc.

   - Calculate for the full recipe and divide by the total output in grams.

**2. Labor Costs:**

   - Include wages for preparation, frying, and packaging.

   - Divide the total labor cost by the number of grams produced.

**3. Utility Costs:**

   - Add costs for gas, electricity, and water used during production.

   - Spread this cost over the total output.

**4. Packaging Costs:**

   - Include the cost of packaging materials (bags, labels, oxygen absorbers).

   - Divide by the total number of units produced.

**5. Overhead Costs:**

   - Include any rent, equipment maintenance, transportation, or storage expenses.

   - Allocate these costs proportionally to the total production.

**6. Profit Margin:**

   - Add a profit margin (e.g., 10–30%) to the total cost for business sustainability.

**### Step 2: Example Calculation**

Assume you are making 5 kg (5000 g) of murukku in a batch.

**#### Costs for the Batch:**

- Ingredients: ₹500

- Labor: ₹200

- Utilities: ₹50

- Packaging: ₹100

- Overheads: ₹150

Total Batch Cost = ₹1000

**#### Cost per Gram:**

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\text{Cost per Gram} = \frac{\text{Total Batch Cost}}{\text{Total Output}} = \frac{₹1000}{5000} = ₹0.20/\text{g}

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**#### Cost for 100g:**

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100g \times ₹0.20/\text{g} = ₹20

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**#### Add Profit Margin:**

- For a 20% margin:

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\text{Selling Price for 100g} = ₹20 + (20\% \times ₹20) = ₹24

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**### Step 3: Factors Influencing Price**

1. Ingredient Sourcing: Bulk purchases reduce per-unit costs.

2. Batch Size: Larger batches lower overhead costs per unit.

3. Packaging Quality: Premium packaging increases the unit price.

4. Market Pricing: Adjust the price based on competitor analysis.

**Product pricing in US Dollars**

**### Step 1: Break Down Costs (Convert to USD)**

Assume you are making a batch of 5 kg (5000g) of murukku.

**1. Ingredient Costs:**

   Ingredients include rice flour, spices, oil, etc. For example, if ingredients cost ₹500 in India, convert it to USD:

   \[

   ₹500 \approx \$6 (based on an exchange rate of ₹83 = \$1)

   \]

**2. Labor Costs:**

   Labor cost for the batch may be, say, ₹200.

   \[

   ₹200 \approx \$2.41

   \]

**3. Utility Costs:**

   Gas, electricity, and water might cost ₹50.

   \[

   ₹50 \approx \$0.60

   \]

**4. Packaging Costs:**

   Packaging like bags, labels, etc., may cost ₹100.

   \[

   ₹100 \approx \$1.20

   \]

**5. Overhead Costs:**

   Rent, equipment, and storage could cost ₹150.

   \[

   ₹150 \approx \$1.80

   \]

**6. Total Batch Cost:**

   \[

   \text{Total Batch Cost} = 6 + 2.41 + 0.60 + 1.20 + 1.80 = \$12.01

   \]

**### Step 2: Calculate Cost per Gram and 100g Price**

For a batch of 5 kg (5000 g):

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\text{Cost per Gram} = \frac{\text{Total Batch Cost}}{\text{Total Output}} = \frac{12.01}{5000} \approx 0.0024 \, \text{USD/gram}

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For 100g of murukku:

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100 \times 0.0024 = 0.24 \, \text{USD for 100g}

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**### Step 3: Add Profit Margin**

To cover business costs and make a profit, you might add a profit margin. For example, adding 20%:

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\text{Selling Price for 100g} = 0.24 + (0.20 \times 0.24) = 0.24 + 0.048 = 0.29 \, \text{USD for 100g}

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**Thus, the price for 100g of murukku would be approximately \$0.29 or 29 cents.**

**### Key Influencing Factors**

- Ingredient Sourcing: Bulk purchases can lower ingredient costs.

- Batch Size: Larger batches spread fixed overhead costs over more units, reducing per-unit costs.

- Packaging: Premium packaging or eco-friendly materials can increase costs.

- Market Pricing: Prices may also depend on competition and the market segment you're targeting.