

Food products from cassava

1. Cassava dried chips

Cassava chips are most commonly available product of cassava. The shelf life of cassava can be increased by processing it into chip. There are two types of chip making sun dried chips and parboiled chips.

Under the conventional practice, cassava tubers are sliced with the help of hand-knives with or without peeling the outer skin and rind. Chips are then dried in the sun for 3 to 5 days depending upon the weather conditions. Moreover, cassava chips are produced in various forms, sizes and shapes at different places. It is estimated that more than one lakh tonnes of chips are produced in India every year.



Farmers as well as small scale industries are engaged in chip production. Parboiled chips are produced in Kerala to improve the storage life of chips as well as to protect from insect damage. Tubers are cut into pieces with or without peeling and then put in boiling water for ten to fifteen minutes and then they are sun dried and is mostly used as cattle feed.

2. Cassava flour

Cassava chips are used for the preparation of cassava flour which is consumed in the same manner as rice flour. It is used in the preparation of gums, corrugated box making industries, animal feed preparations etc.

Dried cassava chips are grounded in the decicator/pulveriser into powder form and the sieved different size flours. Very fine flour, coarse flour and rough/fibrous waste flour are the different grades in cassava flour. While the very fine flour finds application in food industries, adhesives and textile industries, the coarse flour and rough/fibrous waste flour are used in the cattle and poultry feed mix industries. Thippi and peel flour too are mostly used in animal feed.



3. Pre-gelatinized cassava starch (yuca rava and yuca porridge)

Cassava-based *rava* / *starch* can be used as a substitute for our commonly used wheat *rava*.

The process for producing cassava *rava* consists of the following steps:

1. Partial gelatinization of cassava
2. Drying, and
3. Powdering.

By partial gelatinization, the granules swell to a small extent and give a granular form to the product. Care must be taken to avoid too much steaming or treatment in hot water as this can lead to too much swelling, resulting in a cohesive texture on powdering. It has been found that a steam treatment of less than 5 min at 5 psi of steam, or immersion in boiling water for less than 10 min

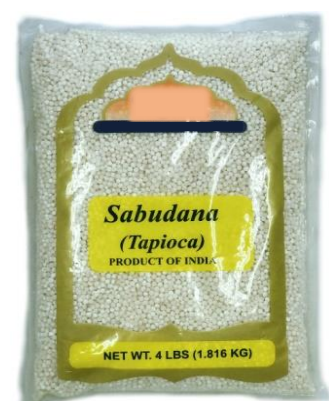
is ideal for gelatinization. The moisture content at this stage increases by 10-15% over the original moisture content in the cassava roots.

After draining the water, the chips are spread out on mats in the sun or placed in a mechanical dryer (drying temperature of 70°C). The moisture content is brought down to around 15%. At this stage, the chips are hard. The dried chips are then powdered in a hammer mill, taking care that the powder is not too fine nor too coarse. The maximum fraction should have a granule size between 0.5 and 3 mm, and should pass through sieves of 20-80 mesh. Sieving is carried out on the powdered product. The fraction passing through 80 mesh is too fine, but possesses a cohesive texture useful in the preparation of sweets, puddings, etc., i.e. products which require fast miscibility of starch in milk/water, etc. The fraction which is retained by a 20 mesh sieve may be re-powdered and sieved. The fraction which does not pass through 80 mesh but passes through 20 mesh has a granule size range of 0.5 to 3 mm, and is most suitable as a wheat semolina substitute. It can be used for the preparation of products such as *uppuma* and *kesari*.

The fine grade pre-gelatinized cassava starch (*yuca* porridge) can be utilized to make an instant energy drink using hot milk or hot water. Two teaspoonfuls of porridge can be added to hot milk or water after adding sugar to taste, and served to infants and invalids as an energy drink. Addition of cardamom powder to *yuca* porridge will add flavor to the product.

4. Sago

It is used as a snack food in preparation of porridge and also popular as an infant food. It is estimated that 1.5 lakh tonnes of sago is produced in our country. Moti dana, medium dana, bada dana and nylon sago are the four different types of sago produced commercially in our country. It is mostly used as a food item in the preparation of snacks, sweets etc.



Preparation

- Collection of tapioca roots
- Thorough Washing and Peeling of Skin,
- Washing of Peeled Root and Crushing,
- Extracting, Filtering Fiber and getting pure extract in low-moisture powder-form,
- Making round Globules of Desired Shape by sizing and sieving,
- Roasting (for Common-Sago) or boiling (for Nylon-Sago) the sized globules,
- Hot-Air Drying or Sun-Drying to remove the extra moisture,
- Filtering Broken and packing the finished product for Market.



5. Cassava papad

Cassava *papad* is an important snack food item prepared from cassava flour. The preparation involves gelatinization of the flour with a minimum quantity of water, spreading out the paste on a mat or some similar surface to dry in the sun. After drying it is stored in polythene bags. The *papad* is consumed by deep-frying in oil, especially coconut oil. The final product undergoes 2-3 times expansion on frying. It is crisp and can be consumed as a side dish.

Preparation

- Heat flour in water (3-5 min) to obtain a gelatinized flour Add salt and pepper to taste
- Cool partially
- Spread out as round discs on mats/polythene sheets/cotton cloth
- Drying in sun for 6-8 hours
- Peeling out and packing to avoid exposure to moisture



6. Sago Wafers

Sago wafer is an important product made at a cottage level in many parts of Tamil Nadu. The wafers are deep-fried in oil and consumed as a side-dish. Preparation involves spreading sago pearls in round aluminium trays. The trays are then introduced into steam boilers and steamed for 20 min. Gelatinization takes place, making the pearls adhere together and giving them a round shape. The trays are then sun-dried and resulting wafers are peeled off. Natural food colors and salt are added.

7. Wafers

Wafers made from cassava starch are similar to sago wafers. In this case a starch cake containing approximately 40% moisture is used instead of sago. Wafers can be made into different shapes and sizes, such as round, square, floral patterns, etc. The product on frying expands three to fourfold.

8. Fried chips

Fried chips are made by deep frying thin french fries made from cassava. The roots are washed thoroughly and the peel and rind removed. The roots are then sliced as thinly as possible. The quality of the chips depends very much on the thickness of the slices and the age of the crop. Chips made from the roots of varieties having high sugar content turn brown on frying. Similarly, roots from varieties harvested early or late do not give chips of good quality. Chips from varieties having high dry matter content also become very hard. Hence, for the production of good quality chips, roots of correct maturity with relatively lower dry matter should be used. In addition, the roots may be subjected to some blanching. The slices may be dipped in sodium chloride or sodium bisulfite solution for 5- 10 min, and then removed. They are then washed with water and surface-dried on filter paper or cloth. The chips are fried in oil (preferably coconut oil which has been heated to nearly boiling temperature and to which a salt solution has been added). Usually, the frying takes 5-10 min. The fried chips are

removed from the oil and drained before packing them in polythene bags. The bags are sealed tightly to prevent the entry of moisture and air.

Compared to potato chips, cassava chips have a harder texture, but a major advantage is that the chips do not become leathery like potato chips within a few minutes of exposure but maintain their crispness. There is vast potential for cassava chips, in view of the increased preference by consumers for convenience foods and ready-to-eat items. The shelf life of chips may be further increased by vacuum-sealing or using an inert gas during packing.

fried chips



9. Cassava buttercake

Another produce that can be produced from cassava and market. Cakes also have high consumer preference compared to other products. Cassava flour is the main ingredient for used for preparation of cake.

Materials:

1. 1 3/4 cups cassava flour
2. 1/4 cup powdered munggo
3. 1 cup sugar
4. 1 cup diluted milk
5. 1/2 cup margarine
6. 2 eggs
7. 2 tea spoon baking powder
8. 1/2 teaspoon vanilla

Procedure

- Sieve the cassava flour and baking powder together.
- Cream margarine in a big bowl until fine.
- Gradually add sugar with constant stirring.
- Add alternately and little by little,
 - * beaten egg yolk
 - * cassava flour
 - * munggo flour
 - * baking powder and milk
- Mix well, stirring in one direction only.
- Beat the egg whites until fluffy and stiff, and;
- Add little by little to the mixture
- Put mixture in pan and cook in oven at 307°C for 25-30 minutes.
- Remove from oven and cool.

10. Cassava Coconut Cookies

It is an another value added product from cassava that have a high market value.

Materials:

1. 2½ cups wheat flour
2. 2½ cups cassava flour
3. ½ cup butter or margarine
4. 2 cups dessicated coconut
5. 2 eggs
6. 5 table spoons baking powder

Procedure:

1. Sieve together flour and baking powder
2. Add dessicated coconut
3. Cream butter in a separate bowl
4. Add sugar and egg gradually to the creamed butter

5. Add flour and baking powder and knead well until a soft dough is formed
6. Shape the dough into balls
7. Grease the tray with oil or margarine (about 5 gms)
8. Flatten the balls with the aid of a fork and arrange on the tray
9. Bake in pre-heated oven until golden brown
10. Remove tray from oven Detach cookies while hot to keep them from sticking to the pan
11. Cool, serve or seal in a plastic bag

11. Functional pasta from cassava

Pastas are other products which can be produced from cassava. Functional pasta is a normal pasta product which provides additional benefits. Pasta products with enhanced nutritive value like high protein content or functional value like high dietary fiber content were developed from cassava and sweet potato. These products are characterized by good textural quality and low starch digestibility which make them ideal as food for diabetic and obese people. It is standardized by CTCRI.



There are different types of functional pasta

1. Protein- enriched sweet potato pasta *Whey protein enriched pasta* which is rich in immunoglobulin and lactoferrin, which promote the growth of beneficial bacteria (microbiota).

2. Defatted soy flour enriched pasta – Rich in isoflavones which protects against hormone-related disorders such as breast cancer and prostate cancers

3. Fish powder enriched pasta – Rich in omega-3- fatty acids.

12. Cassava Pakkavada

This is a hot snack food having good texture and taste made out of cassava flour. The other ingredients include maida, bengal gram flour, salt, chilli powder, asafoetida, baking soda and oil. The ingredients are thoroughly mixed and made into dough with hot water (50°C), proofed for 1h and then extruded through hand extruder having flat rectangular holes, into hot oil.

13. Cassava Sweet Fries

This is a sweet snack food made out of cassava flour, maida, baking soda and oil. The ingredients are mixed well and made into dough with hot water (50°C). The dough after proofing for 1h is hand extruded through die having round holes, into hot oil. The fried product is then coated with sugar by dipping for a few minutes in sugar syrup having thick consistency.

14. Cassava Nutrichips

This is a high protein snack food made out of cassava flour by mixing with other ingredients like maida, groundnut paste, egg, salt, sugar, sesame, coconut milk, baking soda and oil. After mixing the ingredients, hot water is added and mixed to form smooth dough. The dough after proofing is made into small balls which are then spread into sheets of 0.2cm thickness. This is then cut into diamond shape using a sharp knife and deep fried in oil.

15. Cassava crisps

This is a soft and good textured crispy snack food made from cassava flour, maida, rice flour, bengal gram flour, salt, baking soda, turmeric powder and oil. The dough made with hot water is proofed for 1h and then extruded through the small pore size die having round holes.

The deep fried material is mixed with fried nuts, curry leaves etc. before packing.

Other products include: Cassava nutrichips (without egg), , Cassava hot sticks, Cassava salty fries, etc.

16. Sweeteners

▪ **Liquid glucose and dextrose**

Cassava starch is a raw material for the production of liquid glucose and dextrose. Hydrolysis of starch to glucose is achieved mostly using hydrochloric acid. After neutralization with soda ash, the hydrolyzate is filtered, decolorized and concentrated in a triple effect evaporator. Finally, the decolorized syrup is vacuum-concentrated to obtain a product containing 43% dextrose, which is used by many confectionery industries in India. Crystalline dextrose is obtained by further vacuum-concentration to 70-88% and crystallization in cylindrical crystallizers using the seeding technique.

▪ **Fructose syrup**

Fructose syrup has gained importance in view of the fluctuating prices of sugars and the potential harmful effects of synthetic sweeteners. Glucose is isomerized to fructose using commercial glucose isomerase enzyme at 62°C in glass-lined tanks for 6 h at pH 8.0. The fructose solution is decolorized and vacuum-concentrated to obtain a syrup containing 45% fructose, 50% glucose and 5% oligosaccharides. Though the technology is readily available, the Indian industry has yet to come forward to exploit it fully.

- ***Maltose***

Maltose is obtained commercially from starch by enzyme treatment. There are three types of commercial maltose syrups, i.e., high maltose syrup, extremely high maltose. syrup and high conversion syrups. The process for maltose manufacture involves two steps, i.e., liquefaction of starch by heat and a thermolabile α -amylase, and saccharification using microbial α -amylase. The maltose syrup is used in brewing, baking, soft drink manufacture, canning and confectionery industries.