RAMAKRISHNA MISSION VIVEKANANDA EDUCATIONAL AND RESEARCH INSTITUTE

FACULTY OF AGRICULTURE, RURAL AND TRIBAL DEVELOPMENT

MULTIDISCIPLINARY CERTIFICATE COURSE (0+3)

COURSE MATERIAL

FOOD PROCESSING AND POST HARVEST TECHNOLOGY

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CHAPTER - 1

PREPARATION OF JAM

Jam is a product made by boiling fruit pulp with sufficient quantity of sugar to a reasonably thick consistency, firm enough to hold the fruit tissues in position. Apple, sapota, papaya, plums, mango, grapes, jack, pineapple, banana, guava and pears are used for preparation of jam. It can be prepared form one kind of fruit or from two or more kinds. In its preparation about 45% of fruit pulp should be used for every 55% of sugar.

The FPO specification of jam is 68.5% TSS, 45% of fruit pulp and 0.5 – 0.6% of acid (Citric acid) per 100 gm of the prepared product.

Preparation of jam: a) Selection and preparation of fruit Select good quality ripe fruits. Wash the fruits well in cold water. Peel the fruits and remove the stones and cores present. Cut the peeled fruit into small pieces with a stainless steel knife. If the fruit is hard, it should be cut into very small pieces. Pulp the fruits by using pulper. b) Addition of sugar and pectin Required amount of sugar and pectin is added to the fruit pulp/juice. Water can be added, if needed. Sugar, binds to the water molecules and frees up the pectin chains to form their network. Adding more pectin results in harder jam and using more sugar can make it sticky. c) Boiling and addition of acid Boil the mixture slowly with occasional stirring. The fruit pulp should be crushed with a ladle during boiling. Continue boiling till the temperature of the mass reaches 105.5 C. Specified amount of citric acid is added while boiling itself. Sheet or flake test A small portion of jam is taken out during boiling in a spoon or wooden ladle and cooled slightly. It is then allowed to drop. If the product falls off in the form of a sheet or flakes instead of flowing in a continuous stream (or) syrup, it means that the end point has been reached and the product is ready. Otherwise boiling is continued till the sheet test is positive.

d) Packaging

Fill the hot jam into clean dry sterilized jars. Allow the jam to cool and fix the sterilized lid to the jar and then store in a cool place.

Problems in jam production

i) Crystallization: The final product should contain 30 to 50% invert sugar. If the percentage is less than 30, cane sugar may crystallize out on storage and if it is more than 50 the jam will become a honey like mass due to the formation of small crystals of glucose. Corn syrup or

glucose may be added along with cane sugar to avoid crystallization. ii) Sticky or gummy jam: Because of high percentage of TSS, jams tend to become gummy or sticky. This problem can be solved by addition of pectin or citric acid or both. iii) Premature setting: This is due to low TSS and high pectin content in the jam and can be prevented by adding more sugar. iv) Surface graining and shrinkage: This is caused by evaporation of moisture during storage of jam. Storing in a cool place can reduce it. v) Microbial spoilage: Moulds may spoil the jam during storage but they are destroyed if exposed to less than 90% humidity. Hence, jams should be stored at 80% humidity. It is also advisable to add 40 ppm SO2 in the form of KMS or 200 ppm of benzoic acid.

INFERENCE

CHAPTER - 2

PREPARATION OF JELLY

Jelly

A jelly is a semi solid product prepared by boiling a clear, strained solution of pectin containing fruit extract, free from pulp, after the addition of sugar and acid. A perfect jelly should be transparent, well set but not too stiff and should have the original flavour of the fruit. It should be of attractive colour and keep its shape when removed from the mould. It should be firm enough to retain a sharp edge but tender enough when it is pressed. It should not be gummy, sticky or syrupy or have crystallized sugar. The product should be free from dullness with little or no syneresis (weeping) and neither tough nor rubbery. The FPO specification for jelly is the final product should have 65% solids, 45% fruit extract and 0.5 – 0.75% acid.

Guava, sour apple, plum, karonda, wood apple, papaya and jack fruit are rich in pectin and generally used for preparation of jelly. Pineapple, strawberry, grapes etc., can be used but only after addition of pectin powder, because these fruit have low pectin content. Preparation of jelly is similar to that of jam. Boiling with water (1½ times the weight of fruits for about 20-30 min). Addition of citric acid during boiling (2 g per kg of fruit). Removal of scum (or) foam (one teaspoonful of edible oil added for 45 kg sugar). Addition of colour and remaining citric acid. Filling hot into clean sterlized bottles and Waxing (parafffin wax). Then Capping and Storage at ambient temperature.

Important considerations in jelly making

Pectin, acid, sugar (65%) and water are the four essential ingredients. Pectin test and determination of end point of jelly formation are very important for the quality of jelly.

A. Pectin

Pectin substances present in the form of calcium pectate are responsible for the firmness of fruits. Pectin is the most important constituent of jelly. In the unripe fruit, the pectic substance is present in the form of water insoluble protopectin. In the ripened fruits, with the help of protopectinase enzyme it is converted into pectin. In the over ripe fruits due to the presence of pectin methyl esterase (PME) enzyme, the pectin gets largely converted to pectic acid which is water insoluble. This is one of the reasons that both immature and over ripe fruits are not suitable for making jelly and only ripe fruits are used.

The setting of pectin is also dependent upon the pH and sugar concentrations. Stiffness of the gel increases with increasing concentration of pectin up to a certain point beyond which the addition of more pectin has little effect. Too little pectin gives soft syrup instead of gel. The jellying power of fruit pectin depends upon the amount of pectin used as well as its degree of polymerization and acetyl content.

The amount of pectin extracted varied with the method of extraction, the ripeness of the fruit, the quantity of water added for extracting the juice and the kind of fruit. Usually about 0.5 – 1.0 percent of pectin of good quality in the extract is sufficient to produce good jelly. If the pectin content is higher a firm and tough jelly is formed and if it is less the jelly may fail to set.

Determination of pectin content

The pectin content of the strained extract is usually determined by one the following two methods:

i) Alcohol test: This method involves precipitation of pectin with alcohol. One teaspoonful of strained extract is taken in a beaker and cooled and 3 teaspoonfuls of methylated spirit are poured gently down the sides of the beaker which is retarded for mixing and allowed to stand for a few minutes. a. If extract is rich in pectin, a single transparent lump or clot will form. An equal amount of sugar is to be added to the extract for preparation of jelly. b. If extract contains a moderate amount of pectin, the clot will be less firm and fragmented. Three fourths the amount of sugar is to be added. c. If extract is poor in pectin, numerous small granular clots will be seen. One half the amount of sugar is added.

ii) Jelmeter test: The jelmeter is held in the left hand with the thumb and forefinger. The bottom of the jelmeter tube is closed with the little finger. The strained extract is poured into the jelmeter with a spoon, held in the right hand, filled to the brim. While still holding the jelmeter, the little finger is removed from the bottom end and is exactly allowed to flow or drip for one minute, at the end of which the finger is replaced. The reading of the level of extract in the jelmeter is noted. This figure indicates how many parts of sugar are to be added to one part of juice.

B. Acid

The jellying of extract depends on the amount of acid and pectin present in the fruit. Of the three acids citric, malic and tartaric found in fruits, tartaric acid gives the best results. The final

jelly should contain at least 0.5% but not more than 1% total acid because a larger quantity of acid may cause syneresis.

pH of extract

Jelly strength increases with the increase in pH until an optimum is reached. Further the addition of acid decreases the jelly strength. The optimum pH for a jelly containing 1% pectin is approximately 3.0, 3.2 and 3.4 for 60, 65 and 70% TSS, respectively. The pH of the jelly can be controlled by adjusting pH of extract with acid/alkali and adding a suitable buffer. In general, the optimum pH value for jelly is 3.2.

c) Sugar

This essential constituent of jelly imparts to it sweetness as well as body. If the concentration of sugar is high, the jelly retains less water resulting in a stiff jelly, probably because of dehydration.

Judging of end point

Boiling of jelly should not be prolonged, because excessive boiling results in a greater inversion of sugar and destruction of pectin. The important point to remember is that it is the fruit extract which requires boiling and not the added sugar4. if a jelly is cooked for a prolonged period, it may become gummy, sticky, syrup and deteriorate in colour and flavour. The end point of boiling can be judged in the following ways:

1. Sheet or flake test: As described under jam.

2. Drop test: A drop of the concentrated mass is poured into a glass containing water. Settling down of the drop without disintegration denotes the end point. 3. Temperature test: A solution containing 65% TSS boils at 1050C. Heating of the jelly to this temperature would automatically bring the concentration of solids to 65%. This is the easiest way to ascertain the end point.

Problems in Jelly making

1. Failure to set: This may be due to a. Addition of too much sugar b. Lack of acid (or) pectin c. Cooking below the end point d. Cooking beyond the end point e. Prolonged cooking

2. Cloudy or foggy jellies : It is due to the following reasons a. Use of non – clarified juice (or) extract b. Use of immature fruits c. Over – cooking d. Over – cooling e. Non – removal of scum f. Faulty pouring g. Premature gelation – due to excess of pectin in the extract

3. Formation of crystals: It is due to excess of sugar.

4. Syneresis or weeping of jelly: The phenomenon of spontaneous exudation of fluid from a gel is called syneresis (or) weeping. This may be due to a. Excess of acid b. Too low concentration of sugar c. Insufficient pectin d. Premature gelation e. Fermentation

INFERENCE

CHAPTER - 3

PREPARATION OF RTS

Tropical countries, like India, have a vast scope of providing delicious cold drinks during hot summer particularly the fruit beverages. Due to increased consumer awareness with respect of quality, safety and health, these fruit beverages are becoming more and more popular and are gradually acquiring a chunk of the market share of cold drinks. Fruit beverages are easily digestible, highly refreshing, thirst quenching, appetizing and nutritionally far more superior to the synthetic aerated drinks. Fruit beverages can be classified as fermented and unfermented. In this practical, however, we will only deal with unfermented beverages which do not undergo any alcoholic fermentation.

1. Ready - to - serve (RTS)

This is a type of fruit beverage which contains at least 10% fruit juice and 10% total soluble solids besides 0.3% acid. It is not diluted before serving hence it is known as ready to serve. Commercially RTS beverages (with 13% TSS and 0.3% acid) can be prepared by using SO2 @ 70 ppm or benzoic acid @ 120 ppm.

Procedure

Ripe fruits - Washing - Peeling - Cutting into halves - Seed removal - Passing through pulper - Pulp - Mixing with strained syrup solution (Sugar + water + acid, heated just to dissolve) - Homogenisation - Bottling - Crown corking - Pasteurization (About 900C for 25 min) - Cooling - Storage

2. Nectar

This type of fruit beverage contains atleast 20% fruit juice/ pulp and 25% TSS and also about 0.3% acid. It is not diluted before serving. For preparing the above beverages, the total soluble solids and total acids present the pulp / juice are first determined and then the requisite amounts of sugar and citric acid dissolved in water are added for adjustment of TSS and acidity. Process: The process is similar to that of preparation of RTS.

3. Squash

This is a type of fruit beverage containing at least 25 percent fruit juice or pulp, 45% TSS, 1.0% acidity and 350 ppm of SO_2 or 600 ppm of sodium benzoate. It is diluted before serving. Lime, mango, orange and pineapple are used for making squash commercially using potassium meta

bisulphite as preservative and fruits viz., jamun, passion fruit raspberry, strawberry, grape fruit etc., with sodium benzoate as preservative. Technique for removal of astringency from orange juice Oranges – Peeling – Dipping segments in hot lye solution i.e., 2% NaOH for 2 to 3 min. – Dipping in 0.5% citric acid solution (to neutralize alkali) – Use for juice extraction. Process for the preparation of squash Fruits – Washing – Trimming – Cutting (or) grating – Juice extraction – Straining – Juice measuring – Preparation of syrup (Sugar + water + acid, heating just to dissolve) – Straining – Mixing with juice – Addition of preservative – Bottling – Capping – Storage.

INFERENCE

CHAPTER - 4

PROCESSING OF DRIED AND DEHYDRATED FRUITS AND VEGETABLES

Drying generally refers to the method of removal of moisture from the food under natural condition such as sunlight and wind for example open sun drying, shade drying etc. and whereas, dehydration refers to a process of removal of moisture by application of artificial heat under controlled conditions of temperature, humidity and air flow. For drying, single thin layer of fruit and vegetables, either whole or sliced after primary pre-treatments is spread on the trays which are then placed inside the dehydrator or in the open sun for drying. In the dehydrator initial temperature is generally kept at 43^{o}C which is then gradually increased to 66-71^{o}C for fruits. Fruits like mango, grapes, papaya, apple, apricot, date, aonla and fig etc. and vegetables like carrot, onion, bitter gourd, cauliflower etc. are used for preparing dried and dehydrated products.

Procedure for drying:

Drying generally involves three stages: pre-drying treatments or pre-treatments, drying and post drying handling, packaging and storage. Pre- drying treatments 1. Select mature and firm fruits for drying. 2. Sort, wash and peel (where required), 3. Slice apple and Papaya into thin slices. Cut small bunches of grapes along with rachis. 4. Blanching: Fruits like grapes, plum and apricot are dipped in boiling 0.5% NaOH solution for 7-10 seconds followed by cooling to remove the bloom (waxy layer from grapes and plum) or to remove pubescence (hairy growth from apricots) which otherwise interfere in moisture removal. Blanching of vegetables is carried out to inactivate enzymes. The vegetables are kept in boiling water or under steam for a pre-determined period followed by immediate cooling.

5. Lye peeling: Dipping the fruits (grapes and dates) in 0.5% to 2.5% boiling caustic soda solution for 0.5 to 2.0 minutes depending on their nature and maturity. Hot lye loosens the skin from the flesh by dissolving the pectin. The peel is then removed easily by hand. Any trace of alkali is removed by washing the fruit thoroughly in running cold water or dipping it for a few seconds in 0.5% citric acid solution.

6. Sulphuring: The sulphuring is done in sulphur fumigation box which is airtight wooden box of 90×60×90 cm size in which the trays are arranged to place the fruit for sulphuring. Generally 3g sulphur for each kg of prepared fruits and is burnt inside the chamber. Sulphur fumigation

is carried out for 45-60 minutes to allow the fumes of sulphur dioxide to be absorbed by the commodity.

7. Sulphiting: Place the prepared fruits/ in a solution of potassium meta-bisulphite (1-2% KMS) and keep for 30-45 minutes. After the treatment, the fruits are drained and are placed on the trays for drying.

8. Drying: Place the prepared fruits/after sulphuring or sulphiting in thin layers on the trays and keep either in sun light, solar drier or mechanical dehydrator. Allow the drying process to continue till a constant weight loss. Frequently turn the fruits upside down for uniform drying. Mechanical dehydrator takes few hours to dry while sun or solar drier takes longer time for drying. The drying time depends upon temperature used for drying and quantity of material loaded in the drier.

9. Sweating: Keep the dried product in boxes/cloth bag or bins to equalize the moisture contents within the product. 10. Sorting, grading and packing: After moisture equalization for 10-15 days, sort the dried product (remove rachis from grape bunches) and grade on the basis of colour, size and pack in polythene bags or aluminium laminated bags.

11. Yield of dried products: The yield of dried product generally depends upon the total solid content including TSS of the fresh product. Drying yield of different products vary between 2025% grapes, 18-20% apricot, 10-12% apple, 14-20% banana and 3-5% onion etc. 12. Storage: Store the dried products in a cool and dry place.

INFERENCE

CHAPTER - 5

PREPARATION OF OSMOTIC DEHYDRATION

1. Place the prepared fruits (apple slices, apricot and plum) in 70^{o}Brix syrup at room temperature for overnight.

2. Drain the fruits and rinse in water to remove the excess syrup from the fruit surface

3. Place on the drying trays and dry in mechanical drier to a constant weight.

4. After drying, keep in the cloth bags for moisture equalization.

5. Pack in airtight bags and store in cool and dry place.

6. The yield of osmotically dried fruits is more than that of fruits dried without osmosis.

INFERENCE

CHAPTER - 6

PREPARATION OF FRUIT BAR

Fruit bars are high calorie foods and rich source of vitamin and minerals. Fruit bars are principally made out of fruit pulp and with other ingredients form as a good nutrient supplement. Fruit bars or so far made from pulpy fruits or being mixing the pulps of fruits that are commercially in demand.

Processing of sapota and papaya fruit bar

Ingredients

Pulp - 1 kg Sugar - 500 g Pectin - 25 g Citric acid - 10 g Maltodextrin - 10 g Skim milk powder (SMP) - 6g

Method

1. Uniform sized fully ripened fruits of sapota and papaya free from any injury and disease. 2. These fruits are then washed thoroughly with clean water and peeled to remove the outer skin. 3. Pulp was extracted from the peeled fruits with the help of pulper. 4. To the boiled pulp Sugar, Pectin, Citric acid, Maltodextrin and Skim milk powder (SMP) were added and it was heated enough to form a homogenous mixture. 5. The mixture was poured into Aluminium trays (smeared with butter) in thin layer (0.5-1 cm) and dried at 60 ± 2°C for 10-12 h in tray drier. 6. The cooled fruit bar were cut in to rectangular pieces and wrapped in food grade polythene (fresh wrap).

INFERENCE

CHAPTER - 7

PREPARATION OF FRUIT CANDIES

Candies are prepared by cooking the entire fruit or its slices/pieces in sugar syrup of higher concentration (70-75^{0}Brix). Usually for 1 kg fruit around 1.75 kg sugar is used and the cooking is continued till the TSS reaches 75%. For candy preparation, the fruit pieces are dipped initially in 55-60% sugar solution and the TSS of the syrup is increased by 5% everyday up to 45 days till a TSS of 75^{o}Brix is reached. The fruit pieces are then separated from syrup, rolled in powdered sugar, dried and packed. Karonda, apple, peels of orange, lemon, grapefruit etc are used for candy preparation. Mango, orange, papaya, aonla candies are commercially available in the market.

Procedure for candy making

1. Select healthy, mature fruits and wash in running water to remove dirt and residues.

2. Peel, core and cut the fruits into pieces.

3. Pricking should be done with stainless steel forks. In case of petha, after pricking place them in lime water. (If slices are substantially thin, pricking may not be necessary).

4. Prepare fruits for candy making by following steps, Aonla Wash and prick the fruits with stainless steel fork (avoid using iron needle), Steep in 2% salt solution for 24 hours to remove astringency, Wash and dip in 2% alum solution for 24 hours and wash Blanch until soft but segments should remain attached

5. Blanch the fruits and place in alternate layers of fruit and sugar.

6. Fruits can be dipped directly into syrup without blanching.

7. The sugars to be spread in the layers on fruits starts to dissolve in juice which comes out of the fruits.

8. In case of syrup, the strength of the syrup is increased by 5% on each alternate day up to the TSS of 75^{0}B respectively.

9. The syrup is then drained off and the pieces of fruits are dried in the drier.

10. The prepared candy after draining from the syrup can be rolled in powdered sugar and then dried.

11. Pack the pieces in pouches or airtight containers/glass jars.

FPO specifications for candies

Fruit contents - Not less than 45%

Total soluble solids- Not less than 68% (w/w) for preserve and not less than 75% in candies

INFERENCE

CHAPTER - 8

PREPARATION OF TOMATO JUICE/PULP

Commercial products from tomatoes include juice, puree and paste. Processing of tomato is now practiced from home scale level to a large scale enterprise. As a semi-finished product, tomato puree is prepared on a small scale while at large scale tomato paste has gained commercial significance. Both puree and paste are used for preparation of different finished products like ketchup, juice, soup etc. The method for preparation of these products are well standardized, however, some modification with respect to recipes are made in the processing plants owing to variation in the quality of the raw material.

The method for preparation and recipe of Tomato juice/pulp

Tomato juice is the unconcentrated product consisting of the liquid with a substantial portion of the pulp, expressed from ripe tomatoes with or without the application of heat and addition of salt. The juice should be deep red in colour with a characteristic taste and flavor. The juice shall have about 0.4% acidity expressed as citric acid. Cane sugar (1%) is added to further improve the taste and flavor of the finished product.

Method for preparation of tomato juice

1. Tomatoes should be washed in plenty of running water. Rotary washers or trough washers fitted with moving conveyer belt are generally employed commercially.

2. Tomatoes, after trimming are cut into pieces for extraction of pulp through the fruit grater. Tomato pulp can be extracted either by passing through the pulper after crushing without heating (cold pulping) or after boiling the crushed or whole tomatoes till softening followed by extraction of pulp in a pulper (Hot pulping).

3. Tomato juice/pulp is extracted either by passing the crushed tomatoes through a continuous spiral press.

4. After extraction, edible common salt (0.4-0.6 %) and sugar (1%) are added to the extracted pulp /juice to improve the taste and flavour of the finished product.

5. The finished juice is then heated to 82-88^{0}C and filled hot in pre-sterilized glass bottles. The bottles are then sealed using crown corks and then sterilized in boiling water (100^0 C) for about 25-30 minutes.

6. After sterilization, the bottles are cooled and stored in a cool dry place. Glass bottles are allowed to air cool.

INFERENCE

CHAPTER - 9

PREPARATION OF TOMATO PUREE

Tomato puree is prepared from tomato pulp without skin and seeds, with or without salt addition after evaporation/concentration of the juice or pulp to desired total soluble solids.

Method for preparation of tomato puree

The preparation of tomato puree involves grating/crushing, heating to soften the tissue and straining of heated mass through a pulper finisher.

1. Tomato pulp prepared from ripened tomatoes is concentrated either by using open cooking method or cooking by using vacuum pan or by using steam jacketed kettle.

2. Boiling should be done at much lower temperature (71^0C) to retain the original red colour, flavour with natural vitamin C.

3. The puree is sterilized and packaged in pre-sterilized glass bottles.

4. The bottles are crown corked and processed in boiling water for 25-30 minutes.

5. Tomato puree can also be preserved by adding sodium benzoate (250 ppm benzoic acid).

INFERENCE

CHAPTER - 10

PREPARATION OF TOMATO KETCHUP

Tomato paste

Method for preparation of tomato paste

Tomato pulp or juice is concentrated to 14-15% soluble solids in open pans followed by concentration in vacuum pans and packing in pre-sterilized bottles while still hot.

In large scale processing units, the tomato paste is manufactured by using vacuum evaporators and finally packed either in glass bottles or in bulk aseptic packages.

The tomato paste is utilized for manufacture of different tomato products like ketchup, soup etc.

Tomato ketchup:

Tomato ketchup is the commercial product made either from fresh tomato by converting them into juice/pulp or by using tomato puree or tomato paste. It is made by concentrating tomato juice or pulp without seeds and skin. Spices, salt, sugar, vinegar, onion, garlic etc are added to the extent that the ketchup contains not less than 12% tomato solids and minimum of 25 % total soluble solids (w/w). The juice or puree prepared earlier can be used for preparation of tomato ketchup.

Method for preparation of tomato ketchup

The tomato juice is concentrated with spices, salt, sugar etc. About 1/3 of the sugar is added initially at the time of commencing the boiling and the balance is added a little before the ketchup is ready. The sugar added initially helps to intensify and fix the red tomato color. The total sugar, if added initially adversely affects the colour of the ketchup. Salt is added towards the end of boiling, as otherwise, it bleaches the tomato colour. Vinegar should be added when the ketchup has thickened sufficiently, so that the acid does not volatize away. Tomato ketchup generally contains 1.35- 1.5% acid. 0.1-0.2% can be added as a thickening agent. The tomato ketchup is generally concentrated to 25-30% solids. The ketchup is filled hot (880C) into presterilized glass bottles, crown corked and processed for 30 minutes and cooled at room temperature.

INFERENCE

CHAPTER - 11

PREPARATION OF TOMATO SOUP

Tomato soup:

Tomato soup is a fairly popular product now a day. It can be prepared either from pulp or tomato juice. Butter or cream, spices, starch etc. are used for preparation of soup. These are added in different proportions on the basis of desired taste.

Method for preparation of soup:

The juice is boiled in pans for concentration.

Add spices in a cloth bag as in case of tomato ketchup, while it is being concentrated. In the mean time arrowroot and butter with small amount of juice are mixed to form smooth paste and added to the whole lot.

Boiling is continued to the desired consistency by stirring it continuously. At the end, sugar and salt are added and mixture is boiled for about 2 minutes to dissolve them.

The soup is then filled into the cans and closed.

The soup is filled hot (88^0C) into cans and is processed at 100-110^0C for 20-45 minutes depending on the size of cans and cooled quickly after processing.

INFERENCE

CHAPTER - 12

PREPARATION OF PICKLE

Lemon Pickle is a traditional Indian condiment made with lemons (or limes), ground spices, salt and an optional ingredient – oil. Many Indian homes make pickles during summer that usually last for an year. Pickles are eaten as a side in an Indian meal and is believed to aid digestion when eaten in small quantities. A typical Indian meal always consists of a pickle and Lemon Pickle is the most common one loved by many.

Firstly lemons are rinsed well and wiped dry. Then chopped and deseeded. They are sun dried for few hours or can be kept in the oven.

These are brined with salt, lemon juice and turmeric for 1 to 3 days. This reduces the bitter taste of the skin.

Then chilli powder and roasted fenugreek powder are stirred in and then the pickle is bottled.

For an extended shelf life it needs to be tempered with oil and mustard seeds

Preparation

1. Rinse 8 large lemons (400 grams) well under running water and pat dry with a clean cloth. Air dry them until completely moist free, preferably overnight.
2. Ensure your chopping board, knife, bowls, spoons and everything else you use to make the pickle are moisture free and dry.
3. Sun dry or air dry them well for a few hours. oven for a while at 60 to 70 C (140 to 160 F).
4. Cut 4 lemons to halves and remove the seeds with a small knife and chop them to quarters or smaller cubes as desired.
5. To a small bowl, extract the juice from the rest of the lemons and remove the seeds
6. .Then spread them on a large tray spacing apart and sun dry for at least 5 hours.
7. If there is no sunlight, simply keep the tray in your oven and turn on the oven at 40 C (104 F), at the lowest possible settings for 1 hour.
8. Shake the tray after 30 mins.
9. Keep the oven door a jar (slightly open) through out to avoid moisture building up inside.

10. Heat 4 tablespoons oil in a pan. I used mustard oil here so heated it until smoky. However you can use any oil you prefer. When the oil turns hot, add ¼ teaspoon mustard seeds, 2 to 3 crushed garlic cloves and 2 red chilies. Once the garlic turns golden, turn off the heat. Add ⅛ teaspoon hing now. Cool this completely.
11. Transfer this to the jar. Pour the rest of the oil on top. Press down the lemon pickle with a spoon so the pieces all go under the oil.

INFERENCE

CHAPTER - 13

PREPARATION OF COOKIES

Cookies are baked or cooked items that are small, flat and sweet. It is prepared using flour, sugar and some type of oil or fat.

Ingredients	**Quantity**
Maida	: 2½ cups
Butter	: 1 cup
Sugar	: 1 cup
Egg	: 1
Milk	: 2 table spoons
Vanilla essence	: 1 teaspoon
Salt	: a pinch

Method

- Preheat oven to 190°C.
- Lightly coat 2 cookie sheets with vegetable oil.
- Sift flour, baking powder and salt together.
- Beat egg yolks in a mixer bowl until pale and thick.
- In a clean mixer bowl, with clean beat-ers, beat egg whites to soft peaks.
- Beat in sugar 1 table spoon at a time, until stiff and glossy.
- Gently fold egg yolks into egg whites.
- Fold in dry ingredients and milk until just blended.
- Drop by level tablespoonfuls 2 inches apart onto prepared cookie sheets.
- Bake for 10 minutes or until golden.
- Carefully transfer to wire racks to cool

INFERENCE

CHAPTER - 14

PREPARATION OF BUN

Ingredients

4 cups all-purpose flour, divided, or more as needed

2 (.25 ounce) packages dry yeast

1 cup milk

¾ cup water

½ cup vegetable oil

¼ cup white sugar

1 teaspoon salt

Procedure

1. In the bowl of a stand mixer (or a very large bowl if you are kneading by hand), whisk together the 2 cups warm water, butter, ⅓ cup sugar and salt.
2. Add the bubbly yeast mixture and stir to combine.
3. Place the bowl in the stand mixer and put the dough hook on the machine. You can also knead by hand.
4. Add the flour, one cup at a time, and mix until nearly combined before adding more. You can use all purpose or whole wheat or a combination. Start with 4-5 cups flour, mixing until each is incorporated.
5. The closer you get to your dough being ready, the less flour you will add at once. We want a smooth, soft dough, never stiff, so we need to watch and stop adding flour at just the right moment.
6. Add up to 6-7 cups flour total, very gradually at the end, until the dough comes together in a smooth, soft ball and does not stick to the sides of the stand mixer. When you touch it, it should be smooth and slightly tacky but not sticky.
7. Place dough in a large lightly greased bowl (you can use the same bowl and grease it), and cover with plastic wrap or a clean kitchen towel.
8. Set in a warm spot (I use the oven with the light on — turn the oven on to preheat for 2-4 minutes before turning off and adding the dough) and let rise until doubled, about 1.5 hours.

9. Uncover dough, punch down, and roll out 20-24 rounds — smoothing the top and pinching the seam in the back to smooth (see video for additional details).
10. Place on a parchment lined baking sheet and let rise (you don't have to cover them) in a warm spot for 30 to 90 minutes (instant yeast will be quicker) until doubled.
11. Bake at 350 degrees for 15-20 minutes, until light golden brown.

INFERENCE

CHAPTER - 15

PREPARATION OF PUFFED RICE

Step 1

- Preheat oven to 250°F. Cook rice according to package directions. Transfer to parchment paper-lined baking sheet; bake for 2 to 2 1/2 hours or until dry to the touch and all the moisture has evaporated. Let cool completely (rice should be dry and hard before frying).

Step 2

- Pour enough oil into large saucepan to come 2 inches up side; heat over medium-high heat until instant-read thermometer reaches 425°F. Add a few grains of cooked rice; if oil is hot enough it will start to puff up instantly.

Step 3

- Working in batches, carefully add 1/2 cup rice to hot oil; fry for 3 to 6 seconds or until puffed. Using small metal wire sieve, carefully transfer rice to paper towel-lined baking sheet. Let cool completely.

Flavor Tip

Toss popped rice with your favorite sweet or savory seasoning. Use as a crunchy puffed topping for stir-fries, breakfast bowls or salads.

INFERENCE

CHAPTER - 16

FOOD ADULTERATION

The substances that lower the quality of food, when added to it, are called adulterants. It is a substance found within other food substances that hamper the natural quality of the food. The adulterant may be present in any form and in any quantity. Adulterants are mostly harmful and pose the ability to lower the potency of the product. Even if the adulterant is not harmful, it reduces the nutritional value of the food to a greater extent. Some adulterants are also identified as carcinogenic or lethal when exposed to them for a longer period. Different types of adulterants are used to adulterate different types of food.

Some of the examples of food adulteration are listed below.

- Mixing of pulses with sand particles, pebbles.
- Mixing of milk with water.
- Mixing oil with chemical derivatives or cheaper oils.
- Packing low-quality food products with fresh and high-quality ones.
- These are a few examples of food adulteration.

Types of Food Adulteration

There are four different types of food adulteration.

- **Intentional Adulteration:-** When substances that look similar to the constituents of the food are added to it, to increase its weight and gain more profit. Example- mixing of pebbles, stones, marbles, sand, mud, filth, chalk powder, contaminated water, etc.
- **Incidental Adulteration:-** Incidental adulteration occurs due to negligence while handling food. Like residues of pesticides in grains, larvae growth, presence of droppings of rodents, etc.
- **Metallic Adulteration:-** The addition of metallic materials into food like lead or mercury is metallic adulteration. It may happen accidentally or even intentionally.

- **Packaging Hazard:-** The packing materials in which the food is packed may also interfere and mix with the constituents of the food, leading to packaging hazards.

Methods of Food Adulteration

Various food adulteration methods are as follows:-

- **Mixing:-** Mixing of sand, dust, clay, mud, and pebbles with food particles.
- **Substituting:-** Some healthy constituents are replaced by cheaper and low-quality ones, which alter the nutritional values of the food and may even impose a health hazard.
- **Using Decomposed Food:-** This method indicates mixing decomposed food with healthy ones. Food that even conceals damage or inferiority of any manner is also considered to be adulterated. Also, the deliberate mixing of healthy food with questionable quality food leads to the final product being adulterated.
- **Additions of Toxic Substances:-** Food adulteration also involves the mixing of food with toxic substances to gain higher profit and increase sales. For example, addition of colour, dyes, or harmful unpermitted preservatives.
- **Misbranding:-** Altering the manufacturing dates, expiry dates, list of ingredients or misleading ingredient derivatives, and so on.
- **Artificial Ripening:-** Adding chemicals to the fruits and vegetables which speed up the process of ripening in them, is also considered food adulteration. For example, mango is ripened with carbide for meeting the commercial demand against supply.

Effects of Food Adulteration

Food adulteration has a great impact on our health. Be it any kind of adulteration, prolonged consumption of this type of food is very harmful to the body. Consuming such food increases the toxicity in the body. As the nutritional value of the adulterated food goes down, such food is no longer nutritive for the body. The addition of chemical adulterants and colours many times proves to be fatal. as they pose an onset of health risks and also carcinogens. Some adulterated

food may also affect our internal organs directly leading to heart, kidney, liver, and many more organ disorders and failure.

Food adulteration has many ill effects on our health. Prolonged consumption of adulterated food may even prove to be lethal. The use of organic food is more trending these days, as organic foods give us the complete nutrition that a particular food is supposed to give. It is not laden with harmful chemicals or polished with toxins like wax. But, due to low productivity, organic food is not always available and is more expensive than the common produce. Therefore, it is important to detect if your food is adulterated. Various home methods can be used to do this.

For example, to determine if milk is adulterated with detergents, take some milk in a bottle along with some water and shake it well. If it settles into a frothy layer, it is pure. If the milk is adulterated, it forms a thick layer.

Similarly, if you want to know if milk, sugar, or jaggery is adulterated with chalk powder, take your sample and mix it in a glass of water. Any precipitate at the bottom of the glass indicates the presence of chalk.

To determine if the vegetables are polished with colour, soak them in water for some time and you will be able to see the colour getting dissolved in water.

In Indian markets, FSSAI is the government license number that stands for food safety. Thus, always make sure to look for FSSAI, a list of ingredients, manufacturing, and expiry dates on the food packs.

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