

**Practical Manual**  
**FN 505 FOOD PRESERVATION AND**  
**PROCESSING TECHNOLOGY (2+1)**

**Prepared by**  
**Norma Xavier Chelat**



**Kerala Agricultural University**  
**COLLEGE OF HORTICULTURE**  
**DEPARTMENT OF COMMUNITY SCIENCE**  
**VELLANIKKARA, KAU P.O., THRISSUR , 680656**  
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## **Exercise 1**

### **SPECIFICATION SUGGESTED BY FSSAI - SPECIFICATION OF FRUIT BEVERAGE**

**Aim: To Learn about the importance of quality attributes and standards in Food Industry.**

#### **Introduction :**

**FSSAI – Food Safety and Standard Authority of India – is an autonomous body established under the Ministry of Health and Family Welfare, Govt.of India.**

#### **History**

- **FSSAI was established by Former Union Health Minister Dr Anbumani Ramadoss, Government of India on 5 September 2008 under Food Safety and Standards Act, 2006.**
- **The FSSAI consists of a chairperson & 22 members.**
- **The FSSAI is responsible for setting standards for food so that there is one body to deal with and no confusion in the minds of consumers, traders, manufacturers, and investors. Ministry of Health & Family Welfare, Government of India is the Administrative Ministry of Food Safety and Standards Authority of India. The following are the statutory powers that the FSS Act, 2006 gives to the Food Safety and Standards Authority of India (FSSAI)**
  1. Framing of regulations to lay down food safety standards
  2. Laying down guidelines for accreditation of laboratories for food testing
  3. Providing scientific advice and technical support to the Central Government
  4. Contributing to the development of international technical standards in food
  5. Collecting and collating data regarding food consumption, contamination, emerging risks etc.
  6. Disseminating information and promoting awareness about food safety and nutrition in India

#### **FSSAI is located in 5 regions**

**Northern Region – With head office at New Delhi**

1. Eastern Region
2. North Eastern Region
3. Western region
4. Southern Region

#### **Regulatory Frame Work**

**The Food Safety and Standards Authority of India is a statutory body under Food Safety and Standards Act, 2006. The Food Safety and Standards Act (FSS), 2006 is the primary law for regulation of food products. This act also sets up the formulation and enforcement of food safety standards in India. The FSSAI appoints food safety authorities on the state level.**

- ❖ **The FSSAI functions under the administrative control of the Ministry of Health and Family Welfare. The main aim of FSSAI is to : Lay down science-based standards for articles of food**
  - ❖ **To regulate manufacture, storage, distribution, sale and import of food**
  
- ❖ **To facilitate food safety**

The FSS Act is a bucket for all the older laws, rules and regulations for food safety. The FSS Act took 7 older acts into one umbrella.

1. **Prevention of Food Adulteration Act, 1954**
2. **Fruit Products Order, 1955**
3. **Meat Food Products Order, 1973**
4. **Vegetable Oil Products (Control) Order, 1947**
5. **Edible Oils Packaging (Regulation) Order 1988**
6. **Solvent Extracted Oil, De- Oiled Meal and Edible Flour (Control) Order, 1967**
7. **Milk and Milk Products Order, 1992.**

#### **Departments**

1. **Import Division**
2. **International Co-operation**
3. **Regulatory Compliance Division (RCD)**
4. **Food Safety Management System (FSMS) Division**
5. **Risk Assessment and R&D division (RARD)**
6. **Information Education Communication (IEC) Division**
7. **Regulation and Codex Division**
8. **Quality Assurance/ lab Division**
9. **HR Division**
10. **Standards Division**

#### **Research and Quality Assurance**

##### **Research**

FSSAI has set certain guidelines for food safety research. The Research and Development division is responsible for research with the following objectives:

1. **Generate new knowledge that would help in continuously updating and upgrading food safety standards which are compatible with international organizations**
2. **Carry out evidence based studies for improving or building policies.**

##### **Quality Assurance**

FSSAI has been mandated to perform various functions related to quality and standards of food. These functions in addition to others include “Laying down procedure and guidelines for notification of the accredited laboratories as per ISO17025.” The FSSAI notified laboratories that are classified as:

1. **FSSAI notified NABL accredited labs- 112**
2. **State Labs-72**
3. **Referral Labs -14**

## Standards

Standards framed by FSSAI are prescribed under Food Safety and Standards (Food Product Standards and Food Additives) Regulation, 2011, Food Safety and Standards (Packaging and Labelling) Regulation, 2011 and Food Safety and Standards (Contaminants, Toxins, and Residues) Regulations, 2011.

The FSSAI has prescribed standards for following food products:

- Dairy products and analogues
- Fats, oils and fat emulsions
- Fruits and vegetable products
- Cereal and cereal products
- Meat and meat products
- Fish and fish products
- Sweets & confectionery
- Sweetening agents including honey
- Salt, spices, condiments and related products
- Beverages, (other than dairy and fruits & vegetables based)
- Other food product and ingredients
- Proprietary food
- Irradiation of food

## Consumer Out Reach Programme

Consumers can connect to FSSAI through various channels or call Toll free Number 1800112100. Recently an online platform called 'Food Safety Voice' has been launched which helps consumers to register their complaints and feedbacks about food safety issues related to adulterated food, unsafe food, substandard food, labeling defects in food and misleading claims & advertisements related to various food products. A GAMA portal for concerns regarding misleading claims and advertisements too is operated.

FSSAI issues three types of license based on nature of food business and turnover:

1. **Registration:** For Turnover < 12 Lakhs
2. **State License:** For Turnover between 12 Lakhs to 20 Corers
3. **Central License:** For Turnover above > 20 Corers

Other criteria like the location of the business, number of retail stores etc. is needed while evaluating the nature of license applicable.

BEVERAGES	JUICE % MINIMUM	TSS% MINIMUM	ACIDITY% MINIMUM	PRESERVATIVES (PPM)	
				SO2 (PPM)	BENZOIC ACID (PPM)
SQUASH	25	40	3.5% Not < 1.5%	350	600
SYRUP	25	65	3.5% Not < 1.5%	350	600

CRUSH	25	55	Minimum 1.5%	350	600
CORDIAL	25	30	<4% Lemon <5% Lime juice, not less than 4%	350	600
RTS	10	10	0.3%	70	120

**Exercise: Calculate the ingredients to prepare 1000 Kg of mango squash or 750 Kg of orange squash or 500 Kg of grape squash with a juice containing 0.5% acidity of 15° Brix. Example:**

- Calculate the ingredients to prepare 1000 kg of pineapple squash with a juice containing of 0.5% of acidity of 10% Brix.

a) The quantity of fruit juice need to be present in 1000 kg of squash as per FSSAI  
 $= \frac{1000 \times 25}{100} = 250 \text{ kg.}$

b) Acid already present in 250 kg of juice  $= \frac{0.5}{100} \times 250 = 1.25 \text{ kg.}$

Acid to be present 100 kg of squash as per FSSAI  $= 3/100 \times 1000 = 30 \text{ kg.}$

(Acidity is not < 15% & maximum of 3.5%)

So acid to be added in squash  $= 30 - 1.25 = 28.75 \text{ kg.}$

**c) Quantity of preservatives added;**

Molecular weight of KMS-  $\text{K}_2 \text{S}_2 \text{O}_5$

(K=39, S=32, O=16)

$= 39 \times 2 + 32 \times 2 + 16 \times 5 = 222 \text{ g}$

1  $\text{K}_2 \text{S}_2 \text{O}_5$  gives -2 molecules of  $\text{SO}_2$

i.e., 222  $\rightarrow$  128

To get 128 g of  $\text{SO}_2$ , we have to add 222g of  $\text{K}_2 \text{S}_2 \text{O}_5$

To get 350 ppm of  $\text{SO}_2$  is:

1 g of  $\text{SO}_2 = 222/128$

To get 350 mg of  $\text{SO}_2$

1 gm of  $\text{SO}_2 = 222/128 \times 350 = 607 \text{ mg.}$

$= 0.607 \times 1000 = 607 \text{ gram} - 0.607 \text{ Kg/l}$

To prepare 1000 kg  $= 0.607 \times 1000 = 607 \text{ g.}$

Exact amount of KMS

(Since KMS is only 80% purity, use to calculate the exact amount of KMS.

$= 0.607 \times \frac{100}{80} = 0.76 \text{ kg.}$

**d) TSS in 250 kg of juice  $= 10/100 \times 250 = 25 \text{ kg}$**

TSS that has to be present in squash  $= 40/100 \times 1000 = 400 \text{ kg.}$

Actually TSS includes acid, preservatives, sugar.

So the quantity of sugar has to be worked out.

TSS already present =  $25 + 28.75 + 0.76$   
= 54.51 kg is already present

Exact quantity of sugar to be added.  
=  $400 - 54.51 = 345.49$  kg.

**e). Quantity and water.**

**Total quantity of ingredients other than water =  $345.49 + 25 + 28.75 + 0.76 = 625$ kg**

Quantity of water =  $1000 - 625 = 375$  kg.

**2. Calculate ingredients required to produce 750 kg of orange.**

Squash with orange juice having 0.5% acid and 15<sup>o</sup>Brix as TSS

a). Quantity of fruit juice need to be present in 750 kg of squash as per FSSAI  
=  $750 \times 25/100 = 1875$  kg.

b). Acid already present in 187.7 kg of juice.  
=  $3/100 \times 750 = 22.5$  kg.

( not less than 1.5% & maximum 3.5%)

So acid to be added in squash  
=  $22.5 - 0.03375 = 21.56$  kg.

c). **Quantity of preservative added molecular weight of KMS K, S, O<sub>5</sub>**  
=  $39 \times 2 + 32 \times 2 + 16 \times 5 = 222$  (K=39, S= 32, O=16)

1 K<sub>2</sub> S<sub>2</sub> O<sub>5</sub> gives 3 molecules of SO<sub>2</sub>  
=  $222 \rightarrow 128$

To get 350 ppm of SO<sub>2</sub>, 1 g SO<sub>2</sub> =  $222/128$ .

To get 350 mg of SO<sub>2</sub> =  $222/128 \times 350 = 607$  g/l  
 $607/1000 = 0.607$  kg.

To prepare 750 g of squash =  $0.607 \times 750 = 455.25$ g = 0.455 kg.

Exact amount of KMS

Since KMS is only 80% purity are have to calculate the exact amount of KMS  
=  $0.455 \times 100/80 = 0.56$  kg.

d). **TSS in 187.5 kg of juice =  $15/100 \times 187.5 = 28.125$  kg.**

TSS that has to be present in squash =  $40/100 \times 750 = 300$  kg.

Actually TSS include acid, preservative and sugar. So that quantity of sugar has to be worked out.

TSS already present =  $28.125 + 21.56 + 0.56 = 50.245$  is already present.

Exact quantity of water

**Total quantity of ingredients, other than water**  
=  $244.75 + 0.56 + 21.56 + 187.5 = 459.37$  kg

**Quantity of water =  $750 - 459.37 = 290.63$  kg.**

**Results and Discussion:** Explain in detail about the merits of FSSAI license and difficulties and constraints confronted in acquiring and maintaining it.

**Inference:** Why FSSAI is important in Post Harvest Technology.

**Activity:** Students should learn to do calculation with other processed products as per FSSAI specifications.

**References:**

## Exercise 2 PREPARATION OF PINEAPPLE SQUASH



### Introduction:

- **Pineapple Squash** is a luscious cooling and refreshing thirst quencher from pure fresh **pineapple juice** and sweetened with sugar to make an exceptionally delectable chilled beverage.
- **Pineapple squash** is prepared by using freshly ripened **pineapples juice**.
- **Pineapple juice** taste best when chilled and it is an ideal fruit drink to consume during the hot **summer days**.
- The various **vitamins and minerals** that we acquire from the fresh pineapple is a great relief from heat and energizers our body system.
- Pineapple is an extraordinary multiple fruit which can be consumed fresh, canned or in juice combinations (**fruit punch/ mocktails (non-alcoholic Fresh drinks)/ cocktails**).
- **Pineapple** and its extracts are usually used for marinating, **salads**, desserts, fruit cocktail and complements to various meat dishes.
- Fresh pineapple slices are used in baking **pineapple pastries, cakes and soufflé**.
- It contains vitamins that benefit some intestinal disorders.



- December arrives and the **pineapple fruits** are in abundance in most of the markets filling the air with its attractive and appetizing aromatic flavours.
- Pineapples are a favourite fruit to many and during season people preserve them by making **jams and squashes**.
- **Pineapple halva** is a very popular dish prepared during marriages, reception or spiritual occasions at home.

**Special Features:**

- **Squash** is a concentrated form of **fruit drink**.
- Squashes are one of the few drinks that are ready to use and also nutritive at the same time.
- They can be served as a beverage by just adding water.
- Squashes are manufactured by crushing the fruits, concentrating and adding permitted preservatives to increase their shelf life.
- The entire manufacturing process is carried out in **hygienic conditions**.
- There are various commercial products of squashes that are available in different quantities to suit the needs of the customer.
- **Pineapple squash** should be prepared from fully matured and ripe pineapple fruits free from insect infestation, diseases etc.
- **Preparing of Pineapple squash** requires only few ingredients that includes required quantity of juice, sugar, citric acid, preservative (Potassium metabisulphite or sodium benzoate), water, essence and colour.
- The **pineapplesquash** is generally diluted 2-3 times with water at the time of consumptions and chilled with ice cubes and served.
- Preparing the Pineapple squash is very simple and easy to prepare.
- There are few who do not use preservative or artificial colour to **squash** and keeps it natural.
- Instead they substitute it with **citric acid** (lemon juice).
- The quantity of adding sugar purely depends on the sourness/ sweetness of the ripe pineapple.

- For preparing this juicy and delicious pineapple squash, firstly clean the pineapple and peel the skin thickly.
- Grate the pineapple/cut into cubes/ cut it into cubes and pour ½ cup of water and pressure cook it for 10 minutes so that all itchinness goes off and it becomes more tender and juicy and grind it thoroughly.
- If you need it with more pulp,add a little crushed pineapples.
- Do not take the hard portion inside the pineapple.
- Filter the grated pineapple through a clean cloth and collect the juice out of it and keep it aside.
- In a heavy bottomed deep vessel bring sugar and water to boil.
- Simmer to make a sticky syrup which is not one thread.
- Add the dissolved citric acid.
- Citric acid removes dirt in the sugar and sugar syrup becomes clear.
- In order to make it more clear when you make large quantities with 10 to 20 kg sugar syrup, to clear the sugar syrup fast, add 1 egg white and stir and remove the scum fast .
- Boil it for 10 minutes in high flame.
- Lower the flame and take it off from the fire.
- Cool and then add the sieved pineapple juice.
- Dissolve KMS (potassium metabisulphite) in little water and mix it with the squash.
- Stir till well blended.
- Pour in sterilized bottles and seal air tight.
- Refrigerate opened bottles.
- Making the pineapple squash at home is hygienic and healthier.

**Characteristics:**

- Pineapple benefits make this wonderfully delicious fruit and excellent addition to your palate.
- When you want to give yourself a boost in health and healing, there is nothing better than a glass full of pineapple squash/ juice.

- Both fresh pineapple and **pineapple juice** are excellent for your body. A rich source of the enzyme **bromelain**, **pineapple** is a tropical fruit that is a favourite of many. The **juice** and the extract of the fruit are used in many dishes.
- **Bromelain** and **vitamin C** are what make **pineapple** one of the best health foods.
- **Bromelain** is an enzyme found in pineapple juice and in the pineapple stem. People use it for medicine.
- **Bromelain** is used for **reducing swelling (inflammation)**, especially of the nose and sinuses, after surgery or injury.
- Not only are the nutrients of **pineapple** great for healing the body, but they are also excellent for maintaining overall health.
- **Pineapple** is a citrus fruit and has a lot of **vitamin C** as well.
- **Vitamin C** is an excellent nutrient when you are looking to increase immunity.
- **Vitamin C** is an excellent antioxidant and is therefore good for the body.
- There are many different varieties of **pineapple** available in the market.
- Right from golden to green, you can choose from among a range of **pineapple** varieties.
- **Ripe pineapples** are the best for health benefits.
- If you can smell off a sweet tropical and juicy smell from a pineapple, it means that the fruit is ripe and good for consumption.
- Dark discolorations, soft spots, and a bad smell are all indicative that the fruit has gone bad. Avoid eating such a fruit.
- It is very important to select only healthy well ripened pineapple for processing and preservation purposes.
- Look always for the quality ingredients, so that you can produce excellent quality products and your business will succeed for sure.

**Characteristics:**

- Squash is a type of fruit beverage containing at least 25 % fruit juice or pulp and 40% total soluble solids.
- It also contains about 1% acid and 350 ppm sulphur dioxide or 600 ppm sodium benzoate. It is diluted before serving.

**Exercise:**

- **Prepare Pineapple squash.Do the Organoleptic Evaluation.Comparison of cost.**
- **Explain the changes occurs during the process.**

**Ingredients:**

Pineapple juice	-520ml
Sugar	-844g
Water	-520ml
Citric acid	-10.4 g
Pineapple essence	-1ml
Lemon yellow colour	-1 pinch
KMS	-0.3172g

**Procedure:**Remove the inedible portion of pineapple and cut into small pieces, crush pineapple and press finely and extract the juice content using Muslim cloth and keep aside.

- Mix sugar, citric acid and water and heat it till sugar melts.
- Filter it through a Muslim cloth to the pineapple syrup kept aside and mix well.
- Add KMS at 610 mg/kg of finished product.Add permitted colour and essence if required. Bottle and store the product which has been thoroughly washed with hot water and leaving 5 cm ahead space close air tight and store in cool dry place.

**Observation:**

**QUANTITY OF INGREDIENTS USED FOR PREPARATION OF SQUASH.**

INGREDIENTS	AMOUNT
Pineapple	520 ml
Sugar	844 g
Water	520 ml
Citric acid	10.4 g
Essence	1ml
Colour	1pinch
KMS	0.3172 g

**Observation:**

Volume of finished product	1540 ml
Total cost	Rs.130
Cost of 1 litre	Rs.75/ 700ml
Market price	Rs.135/700 ml

**SENSORY EVALUATION OF PINEAPPLE SQUASH**

Characteristics	No. of judges (n=7) stores							Mean
	1	2	3	4	5	6	7	
Colour	9	9	9	9	9	9	9	9
Appearance	9	8	8	9	8	9	9	9
Texture	9	8	8	8	9	8	9	8
Flavour	9	8	9	9	9	9	9	9
Taste	8	8	9	9	9	9	9	9
Overall acceptability	9	8	8	9	9	9	9	9

**Scores:**

1. Dislike extremely
2. Dislike very much
3. Dislike moderately
4. Dislike slightly
5. Neither like or dislike
6. Like moderately
7. Like slightly
8. Like very much
9. Like extremely.

**Results and discussions:**

Organoleptic evaluation was conducted since 9 points hedonic scale. Mean score obtained in the texture of pineapple squash was 8 (like very much). The other characteristics like colour, appearance, flavour, taste and overall acceptability was obtained like mean score 9 (Like extremely).

The total quantity of squash obtained was about 1540 ml from 520 ml of pineapple juice. The total cost of pineapple squash prepared is around Rs.75/.KAU sales it through sales counter for Rs.100/700ml.As compared to the market price it is less. Market price is Rs.135/ 700 ml.

**Inference:**

**Explain scientifically how each ingredients acts upon, in maintaining the quality of the product with supportive studies.**

**Activity: Prepare Pineapple Squash / other squashes with seasonal and indigenous fruits.Do the organoleptic tests. Calculate the cost and compare it with market price. Nutritive benefits/ health benefits/Quote scientific studies.**

### Exercise: 3

## PREPARATION OF PINEAPPLE JAM



#### Aim:

To prepare quality pineapple jam and to learn about its scientific attributes.

#### INTRODUCTION:

- **Pineapples (*Ananas comosus*) grow in some tropical countries such as Hawaii, India, Malaysia, the Philippines and Thailand.**
- **Pineapple varieties are plentiful, but only a few types are sold commercially, (Bartholomew *et al.*, 2003)**
- **Pineapple are vibrantly coloured with fabulous flavours and make fragrant jams and luxurious sweet preserves.**
- **These are made from fruit boiled with sugar until setting point is reached.**
- **They rely on pectin, sugar and acid for a good set, (Mayhew, 2008).**
- **In most countries there is a legal requirement to use a certain minimum amount of fruit material in the product if it is described as jam, but jellies may not have to contain any fruit base material (Manley, 2001).**

- The main constituent of fruit is water, which contributes about 78 to 88% of total weight; other volatile constituents, such as essential oils, esters, etc., are usually relatively negligible in quantity.
- The non-volatile constituents include sugars, fruit acids, pectin and gums, woody fiber and cellulose, nitrogenous substances, mineral salts and starch.
- Colouring matters, tannins, ascorbic acid and alkaloids may also be present in small quantities.
- In most fruits the natural sugars, sucrose, glucose and fructose constitute the greater part of the total soluble solids (Morris, 2004).
- Fruit pulp, pectin, sugar and acid are contained in jam as it is an intermediate moisture food (Santanu *et al.*, 2007).
- Jam is a preparation consisting of whole fruit boiled with sugar, having a consistency firm enough to meet the demands of confectioners.
- All jams shall contain not less than 68.5% total soluble solids (Morris, 2004).
- Street (1991) stated that boiling fruit with sugar until the total soluble solids reaches 69.5% to produce jam, but for bakery purposes a stiffer jam of about 72% solids is often used.
- The solids content can be monitored using a refractometer (Street, 1991).
- Sugar is necessary to give the strength of the pectin-sugar-acid gel.
- It is assumed that about 3 to 5% of total weight of jam is represented by sugar derived from the fruit; meanwhile about 65% is added sugar (Morris, 2004).
- Sugar may be added to fruit or pulp either in solid form or dissolved in water as sugar syrup.
- Addition of solid sugar frequently causes a slight burning of the sugar, particularly on the surface of the boiling pans, resulting in the caramel flavour which is the characteristic of home-made jam (Rauch, 1965).
- Sucrose acts as sweetener or a humectant which is a common ingredient of many food products (Troller and Christian, 1978).
- The main sources of sucrose are sugar cane and sugar beet, (Jones *et al.*, 1997).
- The main effect of particle size of sugar is to influence the rate at which the sucrose crystals will dissolve in water (Cauvain and Young, 2006).
- Sugar are generally very soluble in water and frequently form supersaturated syrups when their solutions are concentrated by boiling or evaporation (Coultate, 1992).
- Sucrose is a disaccharide which can be separated into a 1:1 mixture of glucose and fructose, known as invert sugar (Jackson, 1995).
- In all jam and jelly boiling, the immediate indicators of the end point are thermometer and long handled, flat spoon or skimmer, made of silver or copper.
- When thermometer has risen to about 218 to 220° F, the jam is tested for jelling properties by dipping the skimmer into the boiling mass and observing the manner in which the jam or jelly falls from the edge.

- **Firstly, it merely runs off in a stream, showing that the end point has not been reached.**
- **Later, it begins to thicken and finally it shows a tendency to gel by flaking off or breaking off clean.**
- **The practical tests are supplemented by tests in laboratory in order to determine the total solids and the degree of inversion of sugar in the jam.**
- **The thermometer and skimmer should be used continually throughout the day's run and the jam should be tested in the laboratory at frequent intervals (Morris, 2004).**
- **During the boiling process, sucrose undergoes a chemical change.**
- **Sucrose is converted into two reducing sugars, which are dextrose and laevulose.**
- **They are known as invert sugar.**
- **There is no general standard of jam boiling.**
- **Almost every factory has its own process of production and develops its peculiar quality, yet there are certain factors applicable to all good quality jams, and it is these factors which should be stabilized.**
- **They are—**
- **Soluble solid content of jam**
- **The sucrose-invert sugar balance of jam**
- **pH of jam.**
- **The amount of invert sugar in jams should always be less than the amount of sucrose present.**
- **Based on total soluble solids of 70%, the percentage of invert sugar should be less than 35%.**
- **The inversion of sugar is affected by both the boiling time and boiling temperature (Rauch, 1965).**
- **A short boiling time is of the utmost importance for the preservation of the colour and natural flavour of the jam.**
- **Excessive boiling greatly increases the inversion sugar.**
- **Important factors affecting boiling time are-**
- **The ratio between the volume of the boiling pan and its effective heating surface**
- **The heat conducting properties of the boiling mixture,**
- **The temperature of the heating surface a**
- **The steam pressure.**
- **During the process of boiling, part of the moisture content of the boiling mixture is evaporated.**
- **The larger the batch in the boiling pans in relation to the heating surface, the longer is the boiling time.**
- **The jam boiler's safest control to determine the end point is the weight of the finished product and its soluble solid content (Rauch, 1965).**



Pua Ming Yee, Rosnah Shamsudin, Azman Hamzah and JohariEndan,2011. **Kinetic Studies on Cooking of Pineapple Bakery Jam**. American Journal of Food Technology, 6: 594-603.

**In their study, they revealed the following effects:**

- **The reaction order of pineapple bakery jam cooking and activation of cooking process were examined.**
- **The effects of cooking temperature, stirring speed and batch volume on the cooking rate of pineapple bakery jam were investigated.**
- **The most suitable temperature for cooking pineapple bakery jam was determined in order to produce the pineapple bakery jam with high cooking rate and the colour and flavour will be accepted by public.**
- **Earlier researchers have determined the degree of cooking by using different techniques (Chakkaravarthi *et al.*, 2008). Morris (2004) and Rauch (1965) stated that the total soluble solids of jam were measured from time to time to determine the end point of cooking.**
- **The total soluble solids will be increased from time to time as the moisture content of pineapple juice is evaporated during jam cooking process.**
- **The total soluble solids must be 72 or above for bakery jam in order to form a stiffer jam (Street, 1991).**
- **In their study, cooking rate was assumed to follow the first-order chemical reaction.**

**Total Soluble Solid (TSS):**

- **Total soluble solid (TSS) or °Brix of pineapple bakery jam were examined with a Digital ABBA refractometer (Model AR-2008, Kruss, Germany).**
- **The jam was placed on the equipment and the reading was recorded.**
- **The Brix° of jam was started to measure after the pulp inside the Ezy Cooker achieved the required cooking temperature.**
- **The cooked jam was measured in every 2 min until Brix° achieve the desired value.**
- **Each measurement was repeated thrice and the average value of these replications were calculated.**
- **Cooking rate of pineapple bakery jam followed the equation of a first-order chemical reaction.**
- **The rate constant increased with cooking temperature and stirring speed, but decreased with increasing batch volume.**
- **The cooking temperature of 100°C caused highest cooking rate, but the jam was burnt at heating surface, thus, the darker colour and caramel flavour were resulted in the jam.**
- **The recommended temperature for cooking pineapple bakery jam was 90°C in order to produce jam in high rate and the colour and flavour will be acceptable by public.**

- The effects of temperature, stirring speed and batch volume on cooking rate constant were investigated to provide a guideline and reference for designing a better jam cooker in aspect of **heat transportation and higher cooking rate**.
- Cooking rate of pineapple bakery jam was investigated and the effect of cooking temperature, stirring speed and batch volume on rate constant was examined.
- The linear relationship between the logarithmic total soluble solids gain ratios of cooked jam and the cooking time showed that the cooking rate followed the equation of first-order chemical reaction.
- In the study, the cooking rates were increased with cooking temperature and stirring speed, but it decreased with increasing batch volume.
- The activation energy of cooking process was  $42.49 \text{ kJ mol}^{-1}$ .
- The recommended cooking temperature for cooking of pineapple bakery jam was  $90^\circ\text{C}$  as the jam was burnt on the surface of the cooker and undesirable caramel flavour was resulted at **cooking temperature of  $100^\circ\text{C}$** .
- Present investigation of cooking rate constant will be useful in designing more efficient jam cookers with higher ratio of effective heating surface to batch volume of fruit pulp.

#### **Characteristics:**

- Jam is a product made by boiling fruit pulp with sufficient sugar is a reasonable thick, consistency, firm, enough to hold the fruit tissue in position.
- Jam contains about 68.5% of TSS, 45 % of fruit pulp and 0.5-0.6 % of acid.

#### **INGREDIENTS**

Pineapple pulp	- 1 kg
Sugar	- 1 kg
Citric acid	- 5 g

#### **PROCEDURE**

- After removing crown, peel and eyes, cut sound portions of fruits into small pieces.
- Crush thoroughly and obtain a uniform mass.
- Add equal quantity of sugar by weight to the prepared fruit pulp.
- Allow it to stand for  $\frac{1}{2}$ - 1 hour. Cook the mixture slowly and then jam reaches the medium thickness.
- Add citric acid of 5g / kg of fruit pulp.
- Cook till mass approaches jam consistency, it is checked by sheet or flake test.
- Which is carried out by taking a small portion of jam during boiling and allow it to drop.
- If the jam falls off in the firm oil sheet.

- The doneness of the jam can be determined, then flame is turn off and colour essence are added.
- Fill the hot jam in a clean dry jar and allow to cool, close the containers and store in a cool dry place.

**Observation:**

**QUANTITY OF INGREDIENTS USED FOR PREPARATION OF JAM**

INGREDIENTS	STANDARD AMOUNT
Pineapple pulp	640 ml
Sugar	640 g
Citric acid	3.2 g
Colour	1 pinch
Essence	1 ml

**COST ANALYSIS**

Volume of finished products	720 g
Cost Rs.	Rs.105/
Market Price	Latest price

**SENSORY EVALUATION OF PINEAPPLE JAM**

	No. of judges (n-7) stores							Mean
	1	2	3	4	5	6	7	
Colour	9	9	9	9	9	9	9	9
Appearance	9	8	9	8	9	9	9	9
Flavour	9	8	8	9	8	8	9	8
Texture	7	7	7	7	7	8	8	7
Taste	9	9	8	8	9	8	9	8
Overall acceptability	8	7	8	8	8	9	9	8

**Result& Discussion:**

- The quantity of jam obtained was about 720 g from 640 g of pineapple pulp.
- The cost production of prepared jam was about Rs.105 and it was lower than market price Rs.120/ 500 g.
- The standard international sale price Rs.110/500 g.
- Hedonic scale organoleptic evaluation was carried out.
- The colour and appearance obtained a score of 9 and for flavour, taste and overall acceptability of score was 8.
- The score obtained for consistency was 7 as the product was little bit thicker than normal product.

**Inference:**

**Scientifically comment on the quality attributes of the prepared product with supportive studies.**

**Activity:** Prepare Pineapple Jam/Apple Jam/Jackfruit Jam/Mixed fruit Jams/Jams with other indigenous fruits/different types of Jams with seasonal fruits

Do the organoleptic studies .Do quote more nutritional &health benefits studies for different types of Jams, Calculate their cost. Compare it with market prices. Do substantiate your inference with more scientific studies.



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## EXERCISE 4

### PRESERVATION BY DRYING



#### **Introduction:**

- Drying is the oldest method of preserving food.
- Dried foods such as dates, apricot, corn, apple slices, currants, grapes, peaches, spices, herbs, fish and meat are quite common in international markets.
- Compared with other methods, drying is quite simple.
- Most of the equipments may be on hand.

- Dried foods keep well because the moisture content is very low that spoiling organisms cannot grow.
- Drying will never replace canning and freezing since these methods do a better job of retaining the taste, appearance, and nutritive value of fresh food.
- Drying is an excellent way to preserve foods that can add variety to meals and provide delicious, nutritious snacks.
- One of the biggest advantages of dried foods is that they take **much less storage space** than canned or frozen foods.
- Recommended methods for canning and freezing have been determined by research and widespread experience.
- Home drying does not have firmly established procedures.
- **Food can be dried several ways, for example, by the sun if the air is hot and dry enough, or in an oven or dryer if the climate is humid.**
- Drying foods at home is becoming popular again, since the cost of the commercially dried products are high.
- Drying is not difficult, but it does take time and a lot of attention.
- There are different drying methods, the guidelines remain the same.
- Solar drying is a popular and very inexpensive method.
- Dependable solar dehydration of foods requires 3 to 5 consecutive days when the temperature is 95<sup>0</sup> F and the humidity is very low.
- Drying food in the oven of a kitchen range, can be very expensive.
- In an electric oven, drying food has been found to be nine to twelve times as costly as canning it. Food dehydrators are less expensive to operate but are only useful for a few months of the year.
- A convection oven can be the most economical investment if the proper model is chosen.

- A convection oven that has a controllable temperature starting at 120<sup>0</sup> F and a continuous operation feature rather than a timer-controlled one.

## **GUIDELINES**

### **Speed**

- For a good-quality product, vegetables and fruits must be prepared for drying as soon as possible after harvesting.
- They should be blanched, cooled, and laid out to dry without delay.
- Foods should be dried rapidly, but not so fast that the outside becomes hard before the moisture inside has a chance to evaporate.
- Drying must not be interrupted.
- Once you start drying the food, don't let it cool down in order to start drying again later.
- Mould and other spoilage organisms can grow on partly dried food.

### **Temperature**

- During the first part of the drying process, the air temperature can be relatively high, that is, 150<sup>0</sup> to 160<sup>0</sup> F (65<sup>0</sup> to 70<sup>0</sup>C), so that moisture can evaporate quickly from the food.
- Food loses heat during rapid evaporation, the air temperature can be high without increasing the temperature of the food.
- Surface moisture is lost (the outside begins to feel dry) and the rate of evaporation slows down, the food warms up.
- The air temperature must then be reduced to about 140<sup>0</sup> F (60<sup>0</sup> C).
- Toward the end of the drying process the food can scorch easily, so you must watch it carefully.
- Each fruit and vegetable has a critical temperature above which a scorched taste develops.



- The temperature should be high enough to evaporate moisture from the food, but not high enough to cook the food.
- Carefully follow directions for regulating temperatures.

### **Humidity and Ventilation**

- Rapid dehydration is desirable.
- The higher the temperature and the lower the humidity, the more rapid the rate of dehydration will be.
- Humid air slows down evaporation.
- Keep this in mind if you plan to dry food on hot, muggy summer days.
- If drying takes place too fast, however, "case hardening" will occur.
- This means that the cells on the outside of the pieces of food give up moisture faster than the cells on the inside.
- The surface becomes hard, preventing the escape of moisture from the inside.
- Moisture in the food escapes by evaporating into the air.
- Trapped air soon takes on as much moisture as it can hold, and then drying can no longer take place.
- For this reason, be sure the ventilation around your oven or in your food dryer is adequate.

### **Uniform Drying**

- Drying the food evenly takes a little extra effort and attention.
- Stirring the pieces of food frequently and shifting the racks in the oven or dryer are essential because heat is not the same in all parts of the dryer.
- For the best results, spread thin layers of uniformly-sized pieces of food on the drying racks.

## NUTRITIVE VALUE

- Dried fruits are a good source of energy because they contain concentrated fruit sugars.
- Fruits also contain a rather large amount of vitamins and minerals.
- The drying process, however, destroys some of the vitamins, especially A and C.
- Exposing fruit to sulphur before drying helps retain vitamins A and C. Sulphur destroys thiamine, one of the B vitamins, but fruit is not an important source of thiamine anyway.
- Many dried fruits are rich in riboflavin and iron.
- Vegetables are a good source of minerals and the B vitamins thiamine, riboflavin, and niacin.
- Both fruits and vegetables provide useful amounts of the fibre (bulk) we need.
- Save the water used for soaking or cooking dried foods because this nutrient-rich water can be used in recipes to make soups, sauces, and gravy.

## TYPES OF FOOD TO DRY

- Many kinds of fresh fruits, vegetables, herbs, meat, and fish can be dried.
- It's a good idea to experiment first by drying a small quantity in the oven.
- Fruits are easier to dry than vegetables because moisture evaporates more easily, and not as much moisture must be removed for the product to keep.
- Ripe apples, berries, cherries, peaches, apricots, and pears are practical to dry.
- Peas, corn, peppers, zucchini, okra, onions, and green beans are usually dried.
- It is a waste of time and energy to dry vegetables such as carrots that can be kept for several months in a cool, dry basement or cellar.

- Fresh herbs of all types are suitable for drying.
- The parts of the plant to dry vary, but leaves, seeds, or blossoms usually give the best results.
- Lean meats such as beef, lamb, and venison can be dried for jerky.
- Fish also is excellent when dried.
- Certain foods are not suitable for drying because of their high moisture content. Lettuce, melons, and cucumbers are a few foods that do not dry well.

### **SUCCESSFUL DRYING**

- Don't be surprised to find a variety of suggestions for drying methods, temperatures, and lengths of time.
- The drying process is simply not as precise as canning and freezing because it involves so many different factors.
- Need to use a trial and error approach to find what suits the best.
- Whichever method we adopt, be sure to remove enough moisture from the final product so that spoilage causing organisms cannot grow

#### **When you dry foods, remember the following:**

- Cleanliness and sanitation are essential.
- The flavour of dried fruits and vegetables will be somewhat different from that of their fresh, canned, or frozen counterparts.
- Different methods can be divided into 3.
- Sun-drying methods
- Solar sun-drying
- Oven dehydrating

Electric dehydrating, while using apricots and tomatoes as an example, as they are the most favoured dried fruits at international level.

#### **Method 1: Solar sun-drying**

Solar sun drying is viable for those living in 100 °F (38 °C) and relatively low humidity.

## **Preparation**

Select only good quality fruits. For eg. Tomatoes, preferably large tomatoes, should be washed and cut lengthwise into pieces about 1/6 inch thick.

Wash the fruits thoroughly to remove the dirt and lingering pesticides from the skin. Eg. Apricots. Pit the apricots and cut them into equal-sized pieces (in quarters or halves).

To dry the fruits at relatively equal rate, cut the fruit uniformly.

## **2. Treatment**

- Tomatoes can be dried as it is.
- Variations can be made by adding salt or red wine or red vinegar.
- Add Vitamin C ascorbic acid bath or a dip made with 2tbsp of ascorbic acid (5gm of crushed vitamin C tablet in 1000 ml water).
- Apples, pears, apricots requires blanching before dehydration.

## **3. Lay out**

- Cookie sheets and silpat mats (premium non-stick silicone baking Mat) can be used for drying apricots and tomatoes.
- Make the best use of direct sun light on the roof, back yard between 11 a.m. to 3 p.m when vitamin D production is at its highest which is proved to be beneficial especially for women with osteoporosis.

## **4. Wait**

- Time taken for each fruits differs. For eg. Tomatoes and apricots take different amounts of time to dry in the sun.
- Fruits get dried off between two to four days. Fruits should be turned once a day for equal drying.

- Keep the fruits in the sheets indoors to avoid the effect of dew or sudden down fall in temperature.

### **5. Check for Doneness and Store**

- Dehydrated products of tomatoes and apricots should be dry and wrinkled but not stiff like raisins.
- The final product should be of a pliable texture but not leathery.
- Torn open the dried fruit and if there is moisture still inside the fruit, keep it again in the sun for dehydration.
- Store the dehydrated fruits in airtight containers.

### **Method 2: Oven dehydrating**

- This method requires an oven.
- This method also requires the oven to be on for an extended period of time.
- Do it only when you are at home to avoid burning.

#### **1. Follow all the steps discussed above until step 3**

#### **2. Lay out**

- Lay the prepared apricots or tomato slices out on the wire racks and place them on top of a cookie sheet.
- No two fruits should touch one another. Set the oven temperature to the lowest setting or to 145-150° F (63 °C or 66 °C), and put the sheet into the oven.

#### **3. Wait**

- Allow the fruits to cook for 10 to 20 hours in a closed oven.
- Keep rotating them every once in a while and check them.

- In order to dry the product fast, increase the temperature to 200<sup>0</sup>F (93<sup>0</sup> C) and watch them closely.

#### **4. Check for Doneness and Store**

- Follow the aforementioned directions, once again checking for the right texture and storing in an airtight container.

#### **Method 3: Electric Dehydrating**

- In this method- the intimidating-to-amateurs commercial dehydrator is used.
- Constant watching is required in this method as compared to oven drying.

**Follow all the steps discussed for the solar sun-drying method until step 3.**

#### **2. Lay out**

- Uniform laying out of the fruits is highly recommended in electric drying.
- Caution about the possible dangers or problems has to be taken care of when you place the fruits on the dehydrator's racks.
- Follow strictly the instructions given in the manual.

#### **3. Wait**

- Dehydration is quick in an electric dehydrator than in oven and in solar dryers.
- Set the temperature 140<sup>0</sup>F (60<sup>0</sup> C) for tomatoes and apricots and wait for 3- 8 hours.

#### **4. Check for Doneness and Store**

- Store in air tight containers.
- Prepare your own food with any methods adopted by you among which sun drying is the simple, easy, customizable as compared to other methods.

- Commercial sun-dried foods can have added preservatives, chemicals, or oils.

## Food Dehydrating Equipment and Methods for Drying



## EQUIPMENT

- A kitchen oven, drying trays or racks, and storage containers are the only basic equipment needed.
- To dry large quantities of quality food, you may decide to buy or make a food dryer.
- For sun drying you need only racks and storage containers.
- For quality of uniform dried food products, the following equipment may be used..
- A food scale to weigh food before and after drying
- A thermometer to check the oven temperature
- A blancher for vegetables
- A sulphur box for fruit

**Wood slats or stainless steel screen mesh are the best materials to use for the racks.**

Cake racks or a wooden frame covered with cheesecloth or other loosely-woven cloth can also be used for drying racks.

- **Do not use solid metal trays or cookie sheets to dry food because air must circulate all around the food so that drying can take place from the bottom and the top at the same time.**

For preparing dried meat – cut the meat into large and long strip (Jerky).





Place it directly on the metal rack for dehydration.



- **Do not use racks made of galvanized screen, aluminium, copper, fibre glass, or vinyl. Galvanized screen contains zinc and cadmium.**
- **These metals cause an acid reaction that forms harmful compounds and darkens the food.**
- **Aluminium becomes discoloured and causes an off-flavour in sulphured fruit.**
- **Copper materials destroy vitamin C.**

- **Fibre glass may leave dangerous splinters in the food, and vinyl melts at temperatures used for drying.**



## **METHODS**

### **Oven Drying**

- Set the oven and preheat it to 140 °F (60 °C).
- It is faster. Once the food trays are kept for dehydration.
- Check the temperature.
- Arrange 1/2 to 1 Kg of prepared food in a single layer on each tray.

- Put one tray on each oven rack.
- Allow **1 ½ inches** of space on the sides, front, and back of the trays so that air can circulate all around them in the oven.





Oven temperature should be 140° F (60° C).

### **Food Dryer**

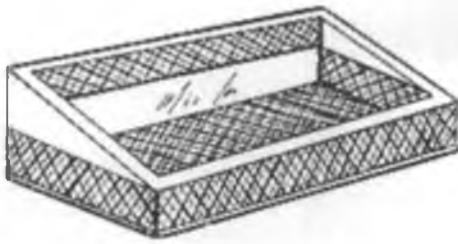
- It provides automatically controlled heat and ventilation.
- Temperature is usually **lower (about 120° F or 50 °C.)**, so **drying takes a little longer than in an oven.**
- Various types of food dryers are available in the market.
- The price varies with size, type of heating and other special features.
- An old refrigerator or icebox can be converted into a food dryer. Just be sure the temperature is controlled and the ventilation is adequate.
- **When using a dryer, preheat it to 125° F or 52° C.**
- **Place the food on trays and stack the trays in the dryer.**

- **Gradually increase the temperature to 140° F or 60° C.**
- **It takes 4 to 12 hours to dry fruits or vegetables in a dryer.**

### **Sun Drying**

- Uses heat from the Sun and natural movement of the air.
- Bright sun, low humidity, and temperatures around 100° F(38° C)are required
- Since this process is slow it requires attention.
- Protection is required for food from insects. So cover them in the night.
- Sun drying is not as sanitary as other methods of drying.
- **Don't sun dry food if you live near a busy road or in an area where the air is not clean.**





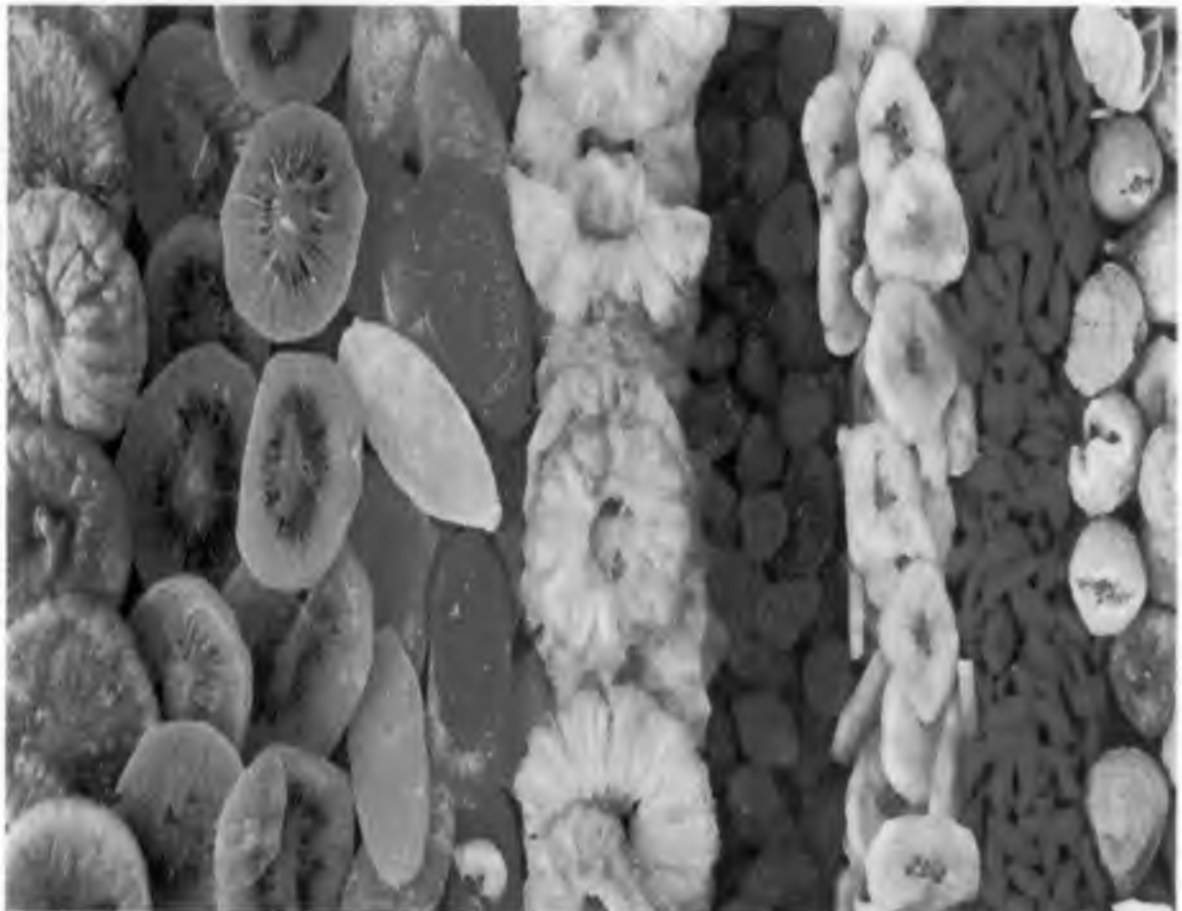
Use a natural-draft dryer. It traps heat from Sun.

It fasten the drying process.

It protects food from insects and birds.

- Place pieces of food on drying trays
- Cover them with a layer of cheesecloth or netting to keep off dust and insects.
- Place the dryer in direct sunlight on a roof or high surface away from animals, traffic exhaust, and dust.
- After the food is almost dry, put it in an airy, shady place to prevent scorching during the final stage of drying.
- Fruits and vegetables take 3 to 7 days to dry in the sun. The length of time depends on the type of food and the atmospheric conditions. Natural heat is slower and less dependable than controlled drying in an oven or food dryer.

#### DRYING OF FRUITS





## SELECTION AND CLEANING

- For dried fruit that is naturally sweet and flavourful, be sure to start with good-quality fruit.
- Select fruit that is fresh, fully ripe, and sound and the same quality you would choose for table use.
- Sort and wash the fruit thoroughly.
- Discard any bruised or overripe pieces.
- Decay on one piece may give a bad flavour to the whole batch.
- Sanitation during the handling and drying process is very important.

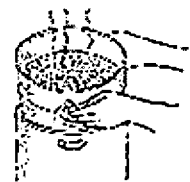
## PRETREATMENT

Almost all kinds of fruit need some treatment before drying.

- Apples are peeled, cored, and sliced.
- Fruits with pits, such as peaches and apricots, are usually halved and pitted.
- Most fruits do not need to be peeled before drying.
- The skins of some fruits such as cherries are tough and waxy, so you will have to "crack" the skins first.
- Fruit should be cut into uniform pieces or slices so that it will dry more evenly.
- Always remember that thin pieces dry faster than thick ones.

### Procedure for Cracking Skins

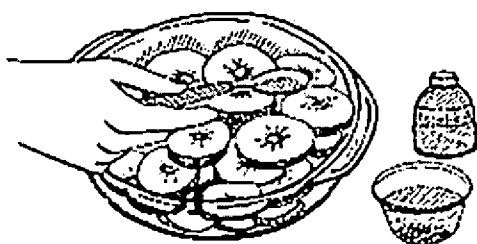
- Blueberries, cherries, grapes, plums, and a few other fruits have relatively tough skins with a wax like coating.
- The skin must be "cracked" or "checked" in many places to remove the waxy coating and to let the inside moisture come to the surface to evaporate.
- To crack the skin, put the fruit in-to boiling water for 30 to 60 seconds.
- Then dip in very cold water.
- Drain it thoroughly on absorbent towelling.





## Protecting Light-Colored Fruits

- Apples, peaches, pears, apricots, or other light-coloured fruits are cut and exposed to the air, the flesh turns brown rapidly.
- This darkening is caused by a chemical change called oxidation.
- If oxidation is not stopped, it will injure the texture, flavour, aroma, and appearance of the fruit.



While you are working with light-coloured fruits, treat them with an antioxidant to keep them from turning brown.

Mix a small amount of ascorbic acid (2 teaspoons for apples and 1 teaspoon for other light-coloured fruit) in 1 cup of water.

- Sprinkle the solution over the cut fruit as you are working. Stir lightly to coat all pieces. This amount is enough for about 5 quarts of fruit.
- Do not soak fruit in salt or vinegar water because this adds water to the fruit and lengthens the drying time.
- Soaking also dissolves out some of the water-soluble vitamins.
- The vinegar-salt solutions also tend to dull the colour of the fruit.
- The ascorbic acid coating is only a temporary treatment.
- For permanent, antidarkening action the fruit still needs to be specially treated before drying.

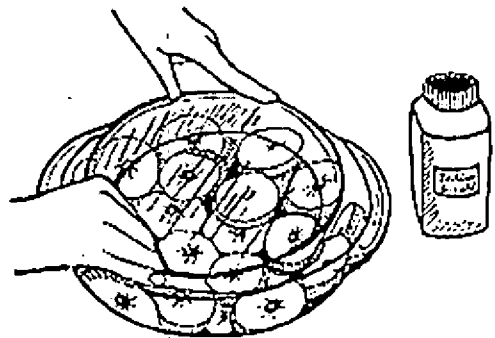
## Sulphuring

- Sulphuring is the best antioxidant treatment for preserving colour.
- To keep fruit from discolouring expose it to sulphur immediately after preparing it.
- There are two methods of sulphuring, each with its own advantages and disadvantages: using (1) sulphur fumes or (2) a sulphite solution.
- Sulphur fumes are more effective than sulphur solutions, but this method takes more time and equipment.
- You need a wooden or cardboard box and wooden trays or screens covered with cheesecloth.

- Several of the recommended references describe methods for making a sulphur box. They also explain how to load and operate the box.
- The sulphuring time for each type of fruit is different, so check your references.
- Fruits sulphured by this method should not be dried indoors because the odour of the fumes is unpleasant.
- Take care since sulphur is irritating to the eyes and nose.
- Soaking fruit in a sulphite solution is easy.
- The pieces of fruit are, however, less thoroughly sulphured than they are by fumes.
- Because of the soaking involved, the fruit absorbs some water, so the drying time is lengthened.
- Fruit that is sulphured by this method may be dried indoors or out.

#### Method to prepare Sulphite Solution

- Add 1 to 2 tablespoons of sodium bisulphite to 1 gallon (3785.41 ml) of water.
- Mix thoroughly.
- Soak the prepared fruit in the solution for 5 to 10 minutes.
- Soak lighter fruit longer.
- Use a weighted plate to keep the fruit submerged in the solution.
- Drain the pieces of fruit and then blot them dry on absorbent towelling.
- Do not rinse the fruit in water.
- Start the drying procedure immediately.



#### Precautions

- Sodium bisulphite is usually available at drug stores, winemakers' shops, and some health food stores.
- Use only pure reagent or food-grade bisulphite.
- Don't use practical-grade bisulphite because it is not pure enough for sulphuring fruit.
- Do not use garden-dusting sulphur.

### **Steam Blanching**

- Steam blanching fruit is an alternative to sulphuring, but it is not as effective.
- More vitamins are lost and drying takes longer.
- For these reasons **steam blanching is not recommended.**

### **DRYING**

- Arrange pre-treated fruit in a single layer on the drying trays.
- Then place the trays in the oven or dryer.
- Be sure to stack the trays at least 1 ½ inches apart.
- If you are drying juicy fruits such as apricots, cut them in half and remove the pits.
- Then set the pieces on the racks with the cut side up.
- This way the flavourful juices will not drain out and be lost.
- Very Thin pieces will take 6 hrs. Larger juicy fruits take 10 hrs.
- It becomes leathery.
- **Cut a piece of dried fruit and make sure that there should be no moisture inside the fruit.**

### **FRUIT LEATHERS**

- To prepare fruit "leathers," which are a tasty variation of dried fruits-they are made by **pureeing almost any type of fruit, then spreading the puree on a cookie sheet or similar tray to dry.**
- Cover the cookie sheet with plastic wrap and pour the thick puree onto the sheet.
- Spread it out to form a layer only ¼ inch deep.
- The fruit puree can be sweetened with honey or corn syrup, and spices, nuts, or coconut flakes can be sprinkled on top.
- Start with very little because the drying process will concentrate the flavours.
- Dry the puree until it is leatherlike and pliable but has no sticky spots.
- Fruit leathers make delicious snacks, treats, or gifts.
- They can be eaten as it is, or they can be reconstituted and used in many dishes.
- **They will keep longest in the refrigerator or freezer.**

### **Uses of dried fruit**

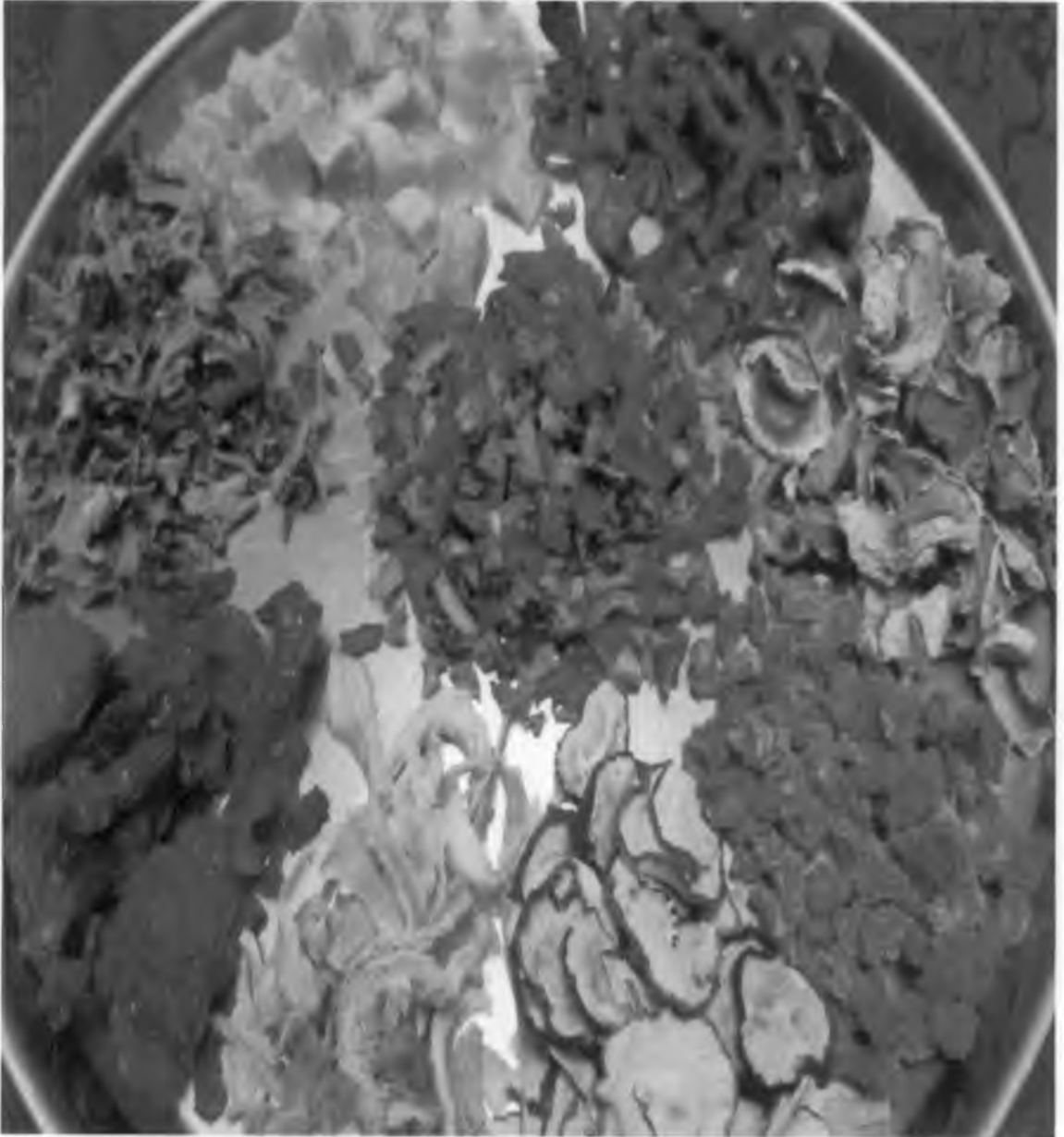
- Dried fruit may be eaten as it is.
- It is great for children's lunches, after-school snacks, or parties.
- Dried fruit can also be used in cookie or granola recipes or with breakfast cereal.

### **Reconstitution of dried fruit**

- To use dried fruit in prepared dishes, reconstitute it first by soaking it in cool water for about 2 hours, or until plump.
- Or pour boiling water over the fruit, just enough to cover, and simmer about 15 minutes, or until tender.
- Add more water if necessary. Do not overcook because the fruit will get mushy and lose flavour.
- After the fruit has been reconstituted, it can be used in any recipe that calls for fresh, canned or frozen fruit.

### **DRYING OF VEGETABLES**







### SELECTING, CLEANING, AND CUTTING

- Vegetables can be dried successfully at home.
- Be sure start with fresh, mature produce.
- Harvest or buy on the amount you can dry at one time - 2 to 3 kg you plan to use your oven.
- Wash all dirt off the vegetables and cut out any bad spots.
- Cut the vegetables into pieces of a suitable size.
- Keep in mind that thin pieces will dry faster than thick one.
- For example, French-cut green beans take less time dry than cross-cut beans.

**BLANCHING: Almost all vegetables need to be blanched (scalded in boiling water a short time before drying).**

- **Blanching** stops the **enzyme** action, which drying cannot stop.



- **If vegetables are not blanched, enzymes will destroy the colour and flavour during drying and storage.**
- A few vegetables such as mushrooms, okra, and onions do need to be blanched before drying.
- Blanching protects certain nutrients and reduce the drying time
- Some nutrient however, are lost during blanching in boiling water because they dissolve into the water.
- Steam blanching takes more time, but fewer water-soluble nutrients a lost.
- To minimize the loss of nutrients, blanch only for the required length of time.
- **But don't under blanch. The enzymes will not be inactivated, and the quality of the dried vegetables will be inferior.**



Blanch the cut pieces of vegetables in a large amount of water.

Follow the blanching times for freezing vegetable. Chill in ice water or in cold running water the same length of time recommended for blanching.

Drain well and blot the pieces dry on paper towelling to remove excess moisture.

- Save the water. It will add flavour and valuable nutrients to your soups, stews, and gravies.

## DRYING

- Spread the prepared vegetables in thin layers on the drying trays.
- Then stack the trays in the oven or dryer.
- Make sure to leave at least 1 inches between the trays so that the air can circulate freely around them.
- If the trays are too close together, drying will take longer.
- Keep the oven temperature at 140<sup>0</sup>F( 60<sup>0</sup> C)
- Stir it every ½ an hour interval.
- Shift the trays around on the racks.

- Vegetables take from 4 to 12 hours to dry.
- **The length of time depends on the kind and amount of food being dried, the method you use (oven or food dryer), and the drying temperature.**
- **When sufficiently dry, the vegetables will be hard and brittle.**
- **You can test them by hitting a piece with a hammer, the piece should shatter.**

### **SPECIAL HANDLING OF VEGETABLES**

- Mature beans, peas, and soybeans may be fully or partly dried on the vine.
- Carrots, turnips, parsnips, rutabagas, and potatoes are better stored fresh than dried.
- They can be kept for several months in a cellar or basement.
- Broccoli and asparagus are better frozen than dried because freezing helps preserve their fresh flavour and texture.
- Combinations of vegetables can be dried at the same time.
- Always remember that vegetables have different drying times, so some will be dry before others.
- Vegetables with a strong odour should not be dried at the same time as other vegetables because those with a mild flavour may absorb the strong odour.
- Salad seasoning ingredients should be dried separately, then mixed and stored together for delightful blends.
- A good mix for salads might include tiny bits of carrots, tomatoes, celery, onion, spinach, green peppers, and parsley.
- Soup vegetables should always be dried separately.
- Home prepared combinations will be much cheaper than those available commercially.

### **USING DRIED VEGETABLES**

- Reconstitute by soaking 1 cup of dried vegetables in 2 cups of water for about 2 hours.
- Add more water if necessary.
- Vegetables will return to almost their original size and shape.



Reconstituted vegetables are tasty additions to stews, casseroles, and soups.

- The water you use for soaking and cooking contains valuable nutrients, so use it in sauces and gravies.
- Vegetable mixes for seasoning salads should not be soaked.
- Simply combine the dried vegetables with the other salad ingredients and add your favourite dressing.

### **Drying of Herbs**



- The power of herbs –in the subtle flavours and aromas of herbs.
- Herbs and spices give zest to low Calorie foods.
- Herbs can enhance the taste of a salt free diet or tasteless foods.
- A pinch of rosemary or mint, oregano, thyme, sage, sweet basil, bay leaf, parsley, chives, dill, cardamom, clove, cinnamon etc. for example, dropped into the water that potatoes or rice are boiled in will give a delightful taste.

### **SELECTION**

- Grow and dry a wide variety of herbs. Some that are especially popular are thyme, tarragon, rosemary, mint, sage, sweet basil, bay leaf, parsley, marjoram, savoury, oregano, chervil, chives, and dill.
- The foliage of these plants is attractive, and they give off a soft, pleasant fragrance. If you plant your herb garden near the kitchen, you can enjoy the plants and harvest the leaves easily as they reach the peak of quality. Young, tender leaves are more flavourful and aromatic than older leaves.

## PREPARATION

- Cut the stalks when the leaves are mature or the plants have just started to bloom.
- Use only the tender, leafy tops and flower clusters.
- Discard the leaves below 6 inches from the top of the stalk.
- They are not as pungent as the top leaves.
- Remove any dead or discoloured leaves.
- Rinse with cold water to wash off dust and dirt.
- Blot off excess moisture with paper towelling.
- When drying dill, harvest the plant as soon as the seeds are ripe.

## DRYING METHODS

### Air



For air drying, tie six to eight stems together in a small bunch.

Then tie a large brown paper bag around the bunch to protect the herbs from the light.

Be sure the leaves do not touch the sides; otherwise, they may stick to the bag and not dry properly.

Make several holes in the bag for ventilation.

- Hang it in a warm, dry, airy room or attic.
- Herbs will dry in 1 to 2 weeks.
- You can remove the leaves from the stems before drying,
- Place the leaves on a tray in a warm, dry, airy place away from direct sunlight.
- For best results, use a cloth-covered rack or an open mesh screen.
- Turn or stir the leaves occasionally to assure even drying.
- Herbs should not be sun dried because light destroys the natural aroma.
- A poor-quality product will result if the herbs are exposed to direct sunlight.

## Oven

- For oven drying, place clean, fresh leaves in a single layer on racks.
- There should be at least 1 inches around the racks and between them so that the air can circulate freely.
- Use blocks of wood to separate the trays.
- Set the oven on the very lowest setting and dry the herbs slowly.
- Keep the oven door propped open slightly for ventilation and to control the heat.
- Drying will be complete in 2 to 4 hours.



## Microwave Oven

- Place the herbs between paper towels and set them on the rack.
- Close the door and turn the oven on a medium setting for 2 to 3 minutes.
- Then check for dryness; the leaves should feel brittle and should crumble easily.
- If they are not done, turn the oven on for 30 seconds longer.
- Although this process actually cooks the herbs, the end product is just about the same.

## STORING

- When the leaves are dry, shake them from the stems and discard the stems.
- Crush the leaves if desired.
- But keep in mind that whole herbs retain their flavour longer than crushed or ground herbs.
- Store dried herbs in small airtight containers away from the light.
- Containers such as metal cans or tinted glass that exclude light are best.
- Store it in a cool, dry, dark place.
- Whole dried herbs retain their flavour and aroma up to one year.
- A warm storage area may hasten the loss of flavour.
- A damp environment encourages caking, colour change, and infestation.
- Close the containers tightly after each use so that the volatile oils are not lost.
- Do not use old herbs.









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- If you aren't sure an herb is fresh, rub a bit of it between your palms and breathe in the aroma. If there is little or no aroma, replace the herb with a fresh supply.

## USAGE

- To release the full flavour, cut or chop the dried leaves into fine bits before adding to food.
- Or crush the leaves by rubbing them between your palms or by grinding them with a mortar and pestle.
- For the best results, add herbs to the liquid in the recipe.
- Keep seasoning blends subtle.
- When combining herbs, use one having a pronounced flavour with two to four others having a less pronounced flavour.
- All of the herbs in the following famous combinations can be grown and dried at home:
  - Bouquetgarni, bunches of herbs and sometimes spices tied together or put into a cheesecloth bag. The usual combination is celery leaves, onion, parsley, and thyme. The combination varies for different dishes.
  - Finest herbs, a mixture of three or more herbs. Combinations used are (1) chervil, chives, and parsley; or (2) basil, sage, and savoury.
  - The amount to use depends on your taste preferences, the piquancy of each herb, and the effect it has on different foods.
- If you do not have a recipe, start with 1/4 teaspoon of herb for ½ Kg of meat or pint of sauce, and increase as desired.
- If the recipe calls for fresh herbs, you can substitute dried herbs.
- Use a fourth of the recommended amount, for example, ¼ teaspoon of dried herb instead of 1 teaspoon of fresh.
- Avoid using the same herbs in several dishes to be served at the same meal.
- **The flavour of an herb will be at its best if you add it to the recipe at the proper time. Add herbs as follows:**
  - To soups and stews during the last ½ hour of cooking.
  - The delicate flavour and aroma of herbs can be lost by overcooking.
  - To uncooked foods such as tomato juice cocktail 3 to 4 hours before serving, or even overnight, to release the full flavour of the herb.
  - To quickly cooked dishes or sauces as soon as you begin cooking the food.

- To draw out more flavour, barely moisten herbs with a little lemon juice, water, cooking oil, or other liquid suitable for the food you are preparing, and let stand for 10 minutes or more before using.
- Herbs may be used to flavour vinegar, mustard, and butter.
- Choose your favourite herbs to add variety to these everyday ingredients, following the recommended steps.
- Use whole spices and herbs for beverages and pickles.
- Leaving whole spices in pickles can cause unsightly darkening.
- Tie herbs and whole spices in a small square of cheesecloth so that they can be removed easily before serving.
- This will also prevent seasoning specks in the finished product.
- The same method can be used when whole spices and herbs are added to other foods.

 <p><i>Sweet Basil</i></p>	 <p><i>Bay Leaves</i></p>	 <p><i>Sage</i></p>
<p>Use in tomato and egg dishes, stews, vegetables, meats, soups, and salads. Add a touch to hamburgers, noodles, and salad dressings.</p>	<p>Drop a few leaves into stewing chicken, fish chowder, tomato soup, and corn chowder. Remove the leaves before serving.</p>	<p>Essential in poultry seasoning. Use with onion for stuffing pork, duck, and goose. Rub powdered leaves on pork loin and ham.</p>
 <p><i>Marjoram</i></p>	 <p><i>Chives</i></p>	 <p><i>Parsley</i></p>

<p>Add a pinch to poultry, meats, egg dishes, poultry stuffing, soups, potato salad, creamed potatoes, and green beans.</p>	<p>Use as a substitute for onion. Sprinkle as a garnish over vegetables, baked potatoes, meats, and soups.</p>	<p>Attractive as a garnish with soups, vegetable salads, meats, and poultry. Good as a seasoning with almost any vegetable or meat dish.</p>
 <p><i>Oregano</i></p>	 <p><i>Rosemary</i></p>	 <p><i>Thyme</i></p>
<p>Delicious in pizzas or other Italian dishes, chili, meat loaf, veal dressings, and bean, tomato, or lentil soups. Gives a flair to sour cream served over sliced tomatoes.</p>	<p>Blend with parsley and butter, and spread on chicken breasts and thighs when roasting. Add sparingly to creamed soups, poultry, stews, and sauces.</p>	<p>Usually blended with other herbs. Leaves can be used with meat, poultry stuffing, gravies, soups, egg and cheese dishes, vegetables, and seafood.</p>

## DRYING OF MEATS



- Drying, smoking, and salting were the only methods of preserving meat for thousands of years.
- In cold countries people dried much of their meat because they could not carry a fresh supply when traveling across the country.
- Today, dried meat, more commonly known as jerky, is usually prepared in an oven instead of being dried in the sun as it was years ago.
- **Jerky** is a popular snack. It is sold almost anywhere that carries snack foods - from grocery stores to gas stations.
- It is a favourite with campers, hikers, and hunters because it is compact, lightweight, and keeps a long time.
- But jerky has value as a convenient backpacking food and as a nutritious snack food.

## PREPARING THE MEAT

- Any lean meat can be dried.
- Beef and venison are especially good; fish and poultry dry well, too.

- Be sure to use fresh, lean meat and cut off all fat and connective tissue.
- Fat becomes rancid easily and will spoil the dried meat.
- Partly freezing the meat before cutting makes it easy to slice.
- Slice with the grain into long, thin, even strips.
- Slice with the grain instead of crosswise makes the jerky chewy and less brittle.
- The strips should be about 1/8 to 1/4 inch thick, 1 to 1 ½ inches wide, and 4 to 12 inches long.
- Thin slices of meat will dry faster than thick ones.
- Any wild game meat should be frozen for at least 30 days to lower the chances of trichinosis infection by killing parasite larvae.



Meat may be dried as is, or it may be seasoned to suit your own taste. Salt and pepper are the basic ingredients.

In the drying method, however, salt is used only as a seasoning, not as a preservative.

- It is crucial, therefore, that the oven temperature be maintained above 140 °F(60°C).to prevent spoilage during the drying process. Keep in mind that too much seasoning will overpower the meat flavour.
- Place seasoned meat in a crockery, glass, or stainless steel bowl or pan, and cover. Marinate the meat overnight or for about 12 hours in the refrigerator at 40 °F (4 °C).

The marinade recipe on the following page makes **delicious jerky**.

### **Marinade Recipe**

#### Ingredients

Lean meat – 2 ½ Kg

Soy sauce- ½ cup

Worcestershire sauce -2tbsp

Pepper, garlic powder, ground ginger- ½ tsp each

Hickory smoke-flavoured salt (optional)-2tsp

#### **Method**

- Mix marinade ingredients in a bowl.

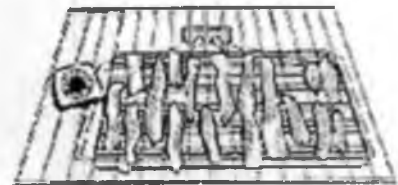


- Add strips of meat and stir to coat all surfaces.
- Cover and refrigerate overnight.
- Remove strips, blot off excess moisture.
- The flavour of jerky can be varied by marinating the strips in mixtures such as teriyaki sauce, sweet and sour sauce, hot chili sauce, or your own favourite marinade.
- Or you may simply coat the meat with the marinade.
- **The marinade should not contain oil because oil will become rancid and spoil the meat.**
- For full flavour allow enough time for the seasoning to be absorbed into the meat (about 12 hours).

## DRYING METHODS

### Oven Drying

- Arrange the seasoned strips of meat on cake racks or directly on oven racks.
- The edges of the strips may touch, but they should not overlap.
- Leave space at the edges of the racks so that air can circulate around the meat as it dries.
- Set the oven on the lowest possible temperature and maintain at about 140 °F to 150 °F. (60° C to 65° C.). Use an oven thermometer to check the temperature.
- To prevent the meat from sticking to the racks, turn the strips over every hour or so.
- Keep the oven door slightly ajar to allow the moist air to escape and to control the oven temperature.
- An electric fan placed in front of the oven door will help the air circulate and shorten the drying time.
- When drying marinated meat, you may need to line the bottom of the oven with aluminium foil to catch the drippings. Oven drying takes from 10 to 12 hours.

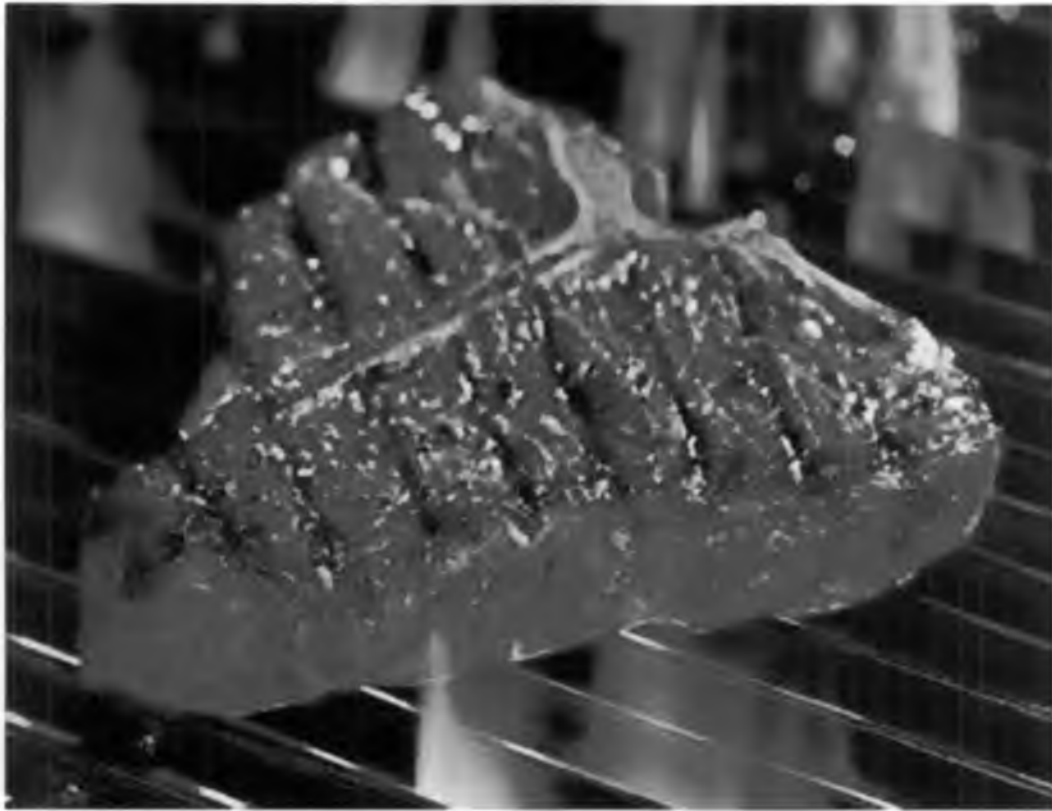


### **Drying in a Food Dryer**

- Use a food dryer for making jerky.
- Place the slices of meat on the racks.
- Put a piece of aluminium foil below the bottom rack if necessary to catch the drippings.
- Leave 1 inches of space around the foil to allow hot air to rise from the heating unit. Turn the strips of meat over occasionally to keep them from sticking to the rack.
- Do not dry seasoned meat at the same time you are drying other foods in the dryer because the meat will give a strong odour to the other foods.
- This is also true if you are drying meat in the oven.
- Making jerky in the food dryer will take a little longer than in the oven because the temperature is usually slightly lower.

### **Smokehouse Drying**

- If you have a smokehouse, you can use it for making jerky.
- Lay seasoned strips of meat on racks or hang them from the ceiling of the smokehouse.
- Starting temperature should be 80<sup>0</sup> F(27 <sup>0</sup>C.), then it should be increased gradually to 120<sup>0</sup> F(49 <sup>0</sup>C)
- Smoke the jerky until it is the desired texture (24 to 48 hours).
- Use any hardwood such as hickory or oak for smoking.
- **Do not use pine, fir, or conifers because the resin (sap) bums and creates an undesirable smoke.**
- Put aluminium foil or a metal tray under the meat to catch the drippings.
- **If you don't do this the drippings will bum and produce smoke that gives the meat an unpleasant flavour.**



## Air Drying



Meat strips can be air dried, but this requires very hot, dry weather. Place strips on the grill of an outdoor barbecue.

Or string them on heavy string or fishing line and hang outside in a sunny, airy place for several days.

Bring the meat indoors at night so that it doesn't absorb moisture.

Air drying is not as satisfactory as oven drying or smoking because the temperature cannot be controlled.

- Also, the meat may be exposed to unsanitary conditions from dirt in the air.
- Outdoor drying may invite unwanted guests such as dogs, cats, wild animals, and insects.
- In practical, cover the meat loosely with cheesecloth to prevent contamination.

## TESTING FOR DRYNESS

- Let the meat get too hard and dry for your taste.
-

- The jerky will spoil if it is not dried enough.
- The finished product is dark brown or almost black and feels hard and dry.
- Test a piece by bending it.
- It should break like a green twig -not snap clean like a dry stick.
- Be sure to let the jerky cool before testing.
- Because when it is warm, it will still be pliable no matter how dry it is.
- The final product will be about  $\frac{1}{4}$  of the original weight.

### STORING JERKY

- As soon as the meat is sufficiently dried, remove the racks from the oven or dryer and pat off any beads of melted fat that may have formed.
- Let the jerky cool first, then take it off the racks.
- Store in clean, airtight glass, crockery, or metal containers with tightfitting lids.
- Pack tightly to remove as much air as possible, but do not crush.
- Store in a cool, dry place such as the pantry, basement, or kitchen cupboards. It will last almost indefinitely, it starts to lose its flavour after a few months.



## Storing and Using Dried foods.

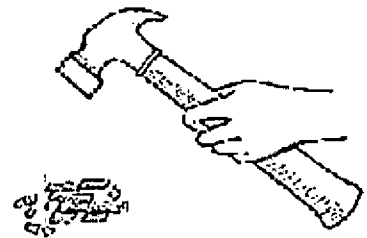


### BEFORE STORING

#### Testing for Dryness

- Many factors affect the length of time needed for drying foods: temperature, air circulation, humidity, the kind of food being dried, the amount of food on a tray, the size of the pieces of food, and the total amount of food in the oven or dryer.
- Pieces on the edges of the trays will dry faster than pieces in the centre.
- If slices are not all the same thickness, thin pieces will dry before the others. For these reasons you must test samples of the food from each batch you dry.
- Test only a few pieces at a time.
- Cool the pieces before testing.
- Warm food will feel soft and moist even when it is dry.
- Remove the pieces of food from the tray
- Test for dryness.
- Return the rest of the food to the oven or dryer until drying is complete.

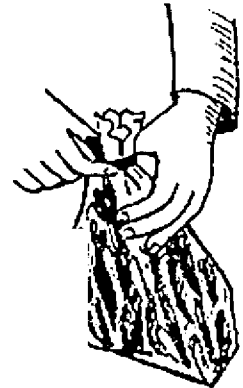
- When you think the food is dry, there are several ways you can test it to be sure.
- Test fruit by squeezing a handful.
- If the pieces of fruit spring apart and there is no moisture left on your hand when you open it, then drying is complete.
- To double check, cut through a piece of fruit
- There should be no moisture on the inside.
- Dried fruit should be pliable and leathery.
- Oven drying takes as little as 6 hours to more than 10 hours.
- Vegetables will be hard and brittle when completely dry.
- Dried piece will shatter when hit with a hammer. Exceptions are mushrooms, green peppers, and squash; they will be pliable and leathery. Vegetables usually dry in 4 to 12 hours.
- Herbs require 2 to 3 days' drying time when air dried and 2 to 3 hours if dried in the oven.
- Herbs are dried when they are brittle and the leaves can be easily crushed.
- Dried jerky is dark brown to black.
- To test for dryness, bend a piece.
- It should bend like a green twig, not break apart completely like a dry stick.
- There should be no moisture inside.



### Conditioning

- Evenly drying of all the pieces of food are very hard.
- Some pieces will be too dry and others will be not quite dry enough and it depends on the size, location on the tray. Condition food so that the whole batch will be uniformly dry.
- After the food is dried, cool it on the tray, then put the pieces of food in a large closed container such as a crock, a glass jar, or a coffee can.

- Make sure the food is cool, because it will sweat if it is put into the container while still warm.
- Keep the container covered in a warm, dry, airy room.
- Stir the food once a day for a week to 10 days.
- Then package the pieces of food in smaller airtight containers and store.
- This conditioning allows the moisture from the underdried pieces to be absorbed by the overdried pieces.
- If drops of moisture appear on the sides or lid of the container, the food is not dry enough.
- Return it to the dryer and dry it some more.



### **Pasteurizing**

- Dried food is sometimes contaminated by insects or moulds, which can cause spoilage.
- Sulphuring fruit usually prevents this type of contamination.
- After meat and vegetables have been dried, they can be pasteurized to make them safe.
- It is especially important to pasteurize food dried outdoors, where it was probably contaminated.
- To pasteurize, heat the oven to 175 ° F (80° C.).
- Set the pieces of dried food in a single layer on a tray or cookie sheet.
- Heat in the oven with the door closed for 15 minutes.
- Remove from the oven and allow the food to cool before packaging.
- Alternatively, the dried food can be pasteurized by freezing it for 1 to 2 weeks and then storing it.

### **STORING**

- After the food has been thoroughly dried, cooled, conditioned, and pasteurized, you can be sure of its quality and safety if you store it properly.

- Place dried food in moisture- and vapour proof containers with tight-fitting lids.
- Glass jars, coffee cans, and freezer bags or cartons may be used. Containers that keep out light are best.
- If you use a coffee can, place sulphured fruit in a bag first to prevent contact of the fruit with the metal.

- The sulphur can react with the metal and give an off-flavour to the fruit.



It is best to package food in small quantities. Use pint-sized containers or small plastic bags.

The bags should then be put into a large can or jar.

If food is stored in large quantities, the unused portion may become contaminated each time you open the container.

Be sure to pack the food tightly.

- Force out as much air as possible from the package before closing it. But take care not to crush the food.
- All dried food deteriorates over a period of time, but storing it in a cool, dry, dark place will help to preserve the colour and flavour.
- Kitchen cupboards or a pantry are good places if they don't get too hot.
- A dry basement or a closet on the north side of the house is also suitable.
- Store dried food in the refrigerator or freezer if you have the space.
- Once a package of dried food is opened, it should be resealed tightly and if possible stored in the refrigerator to prevent contamination and mould growth.
- Properly dried and stored, vegetables and jerky will keep about 6 months, fruits and herbs about a year.
- As a safety measure, examine stored food occasionally.
- If you find signs of a little moisture but no spoilage, pasteurize the food.
- If the food appears quite moist, repeat the drying process until thoroughly dry.
- Remember to cool the pieces before repackaging.
- **Any mould growth on the food, throw away the entire batch. It's not safe.**



## **Reconstitution of Dried Fruits**

### **Dried Fruits**

- Dried fruits make tasty snacks and are very handy for taking on camping or hiking trips.
- Dried fruits can also be chopped up and used dry with breakfast cereal, granola, or cookies.
- Fruit can be reconstituted for use in recipes by pouring just enough boiling water over it to cover and simmering it for 15 minutes.
- Or pour cool water over it to cover, then soak for a few hours.
- Soak only until the fruit is plump because soaking too long makes the fruit mushy and less flavourful.
- To retain nutrients, cook the fruit in the same water used for soaking.
- Most dried fruit needs no extra sugar because some of the starch in the fruit turns to sugar during the drying process.
- If you wish to sweeten the fruit, do so after cooking; otherwise the fruit will become mushy.
- Reconstituted fruit is especially good in cakes, pies, and other desserts. If the recipe calls for water, use the water in which the fruit was soaked.

### **Dried Vegetables**

- When dried vegetables are reconstituted, they should become nearly the same size they were when fresh.
- Add 1 to 2 cups of water to 1 cup of dried vegetables. Add more water later if necessary.
- Blanched dried vegetables should be soaked about 2 hours before cooking.
- Unblanched vegetables will take longer.
- Dried beans and peas can be soaked overnight or boiled 2 minutes and then soaked 1 hour before cooking.
- Dried vegetables taste best if used in soups, stews, or other dishes cooked with liquid and seasonings.

- The seasonings help to enhance the natural flavour of the vegetables.

### Herbs

- To become a successful, creative cook, start using some of the fine herbs such as sweet basil, marjoram, or summer savoury.
- But be miserly in your measure; herbs can easily overpower the flavour of the food they are used to season.
- You can make your own favourite blend of herbs for a variety of uses.
- A combination of marjoram, oregano, basil, and thyme used in equal parts is a good basic blend for soups, stews, sauces, casseroles, and salads.
- Sage, savoury, and rosemary may be added to the blend for use with poultry, Italian dishes, or other spicy foods. Adjust the amounts to suit your taste.
- Do not need to reconstitute herbs before using it.
- To substitute dried herbs for fresh herbs, use 1/4 teaspoon of dried herbs for 1 teaspoon of fresh.

### Jerky



Jerky makes a delicious snack or backpacking staple. Serve it as a party food for children or at cocktail parties. Your guests will be delighted.

It is very interesting to learn more details about Drying Techniques.

Refer the references for more information.

**Drying Techniques: Sun or solar drying / Freeze drying/ Drum drying /Spray drying  
Foam mat and vacuum belt/ Convection air & Superheated steam (tray, tunnel)  
/Osmotic drying/ Microwave Drying Techniques / Combination of different techniques/  
Vacuum- osmotic/ Osmotic – microwave/ Ultrasound pre-treatment followed by  
drying.Fluidized bed / Pulse combustion / Jet zone or impingement Drying Foods  
Outdoors /Sun Drying – Fruits safe to dry due to high acid and sugar content –  
Vegetables should not be dried outside.**

**They need constant temperature & airflow – Temperature of 30<sup>0</sup> C or higher for several days with humidity below 60%.**

**Cover to protect against insects/pests**

**Drying Outside-Solar Drying –Need to construct a dryer with panel(s) –**

**Need to stir and turn food several times a day –Need several days of sun in a row**

**Vine Drying –**

- Beans & Lentils Room Temperature
- Drying Method used mainly for herbs & hot peppers
- Strung on string or tied in bundles and suspended from overhead racks in air until dry

OR

- Enclosed in paper bags with openings for air circulation
- Herbs can also be dried in the microwave oven dry

**Dehydration Study – For eg. By Armel et al 2015.(see the reference)**

- Leafy vegetables are perishable plants foods which are subjected to postharvest losses.
- Therefore, there is a need to develop preservation and processing methods in order to extend their availability for consumers.
- This study aimed to evaluate the influence of sun drying method on the nutritive and antioxidant properties of five leafy vegetables (Abelmoschus esculentus, Celosia argentea, Ipomea batatas, Manihot esculenta and Myrianthus arboreus) widely consumed in Western Côte d'Ivoire.
- After 3 days of drying the contents of moisture, ash, crude fibres, proteins, carbohydrates, oxalates and phytates ranged within the following intervals: 3.81–

- 7.94%, 4.69 - 9.23% , 26.70–48.44%, 8.68–22.12%, 26.46– 47.78%,100 – 1261.2 mg/100g and 46.45 –66.96 mg/100g, respectively.
- The contents of minerals at 3 days of sun drying were: calcium (100.06– 231.35 mg/100g), magnesium (127.55–248.62 mg/100g), potassium (309.54–759.12 mg/100g), iron (17.61 -49.90 mg/100g) and zinc (9.57–16.89 mg/100g).
- The registered losses of carotenoids and vitamin C were estimated at 3 days sun drying as follow: 62.64 - 100%and 58.41 - 100%, respectively.
- The total phenolic content of the sun dried leafy vegetables increased (65.87 to 351.50 mg/100g) after 3 days of sun drying and the same phenomenon was observed with antioxidant activity (24.70 to 89.96%).
- **All these results showed that sun drying could be used as valuable method for preserving the nutritive potential of leafy vegetables.**

#### AIM :

To compare the sun dried and oven dried bitter gourd.

#### Characteristics:

- Drying is a traditionally used preservation method.
- Drying accomplished by removal of water, by different drying method that reduce amount of available water or moisture in food.
- Dehydration is removal of water under controlled condition.
- Drying inhibits the growth of bacteria, yeast and moulds which also extends the shelf life of product.
- Dehydration of fruit and vegetables is one of the oldest forms of food preservation techniques known to man and consists primarily of establishments engaged in sun drying or artificially dehydrating fruits and vegetables.
- Although food preservation is the primary reason for dehydration, dehydration of fruits and vegetables also lowers the cost of packaging, storing, and transportation by reducing both the weight and volume of the final product.
- Given the improvement in the quality of dehydrated foods, along with the increased focus on instant and convenience foods, the potential of dehydrated fruits and vegetables is greater than ever.
- Dried or dehydrated fruits and vegetables can be produced by a variety of processes. These processes differ primarily by the type of drying method used, which depends on the type of food and the type of characteristics of the final product.
- In general, dried or dehydrated fruits and vegetables undergo the following process steps:
  - Redrying treatments, such as size selection, peeling, and colour preservation;
  - Drying or dehydration, using natural or artificial methods

- Post dehydration treatments, such as sweating, inspection, and packaging. Pre drying Treatments –
- Pre drying treatments prepare the raw product for drying or dehydration and include raw product preparation and colour preservation.
- Raw product preparation includes selection and sorting, washing, peeling (some fruits and vegetables), cutting into the appropriate form, and blanching (for some fruits and most vegetables).
- Fruits and vegetables are selected; sorted according to size, maturity, and soundness; and then washed to remove dust, dirt, insect matter, mould spores, plant parts, and other material that might contaminate or affect the colour, aroma, or flavour of the fruit or vegetable.
- Peeling or removal of any undesirable parts follows washing.
- The raw product can be peeled by hand, with lye or alkali solution, with dry caustic and mild abrasion, with steam pressure, with high-pressure washers, or with flame peelers.
- For fruits, only apples, pears, bananas, and pineapples are usually peeled before dehydration.
- Vegetables normally peeled include beets, carrots, parsnips, potatoes, onions, and garlic.
- Prunes and grapes are dipped in an alkali solution to remove the natural waxy surface coating which enhances the drying process.
- Next, the product is cut into the appropriate shape or form (i.e., halves, wedges, slices, cubes, nuggets, etc.), although some items, such as cherries and corn, may by-pass this operation.
- Some fruits and vegetables are blanched by immersion in hot water (95 to 100 C (203<sup>0</sup>F to 212<sup>0</sup> F) or exposure to steam.
- The final step in the pre dehydration treatment is colour preservation, also known as sulphuring.
- The majority of fruits are treated with sulphur dioxide (SO<sub>2</sub>) for its antioxidant and preservative effects.
- The presence of SO<sub>2</sub> is very effective in retarding the browning of fruits, which occurs when the enzymes are not inactivated by the sufficiently high heat normally used in drying.
- In addition to preventing browning, SO<sub>2</sub> treatment reduces the destruction of carotene and ascorbic acid, which are the important nutrients for fruits.
- Sulphuring dried fruits must be closely controlled so that enough sulphur is present to maintain the physical and nutritional properties of the product throughout its expected shelf life, but not so large that it adversely affects flavour.

**PROCEDURE:**

Bitter guard is used for this experiment. It is thoroughly washed and cut into slices. The total quantity of sliced bitter gourd is divided into fewer portions, one portion is dried under sun in the normal temperature and one portion is dried under oven at 52<sup>o</sup> C for 16 hours. The initial and final moisture content was determined.

**CALCULATION:**

$$\text{Moisture} = \frac{\text{Initial weight of moistured sample} - \text{Final weight of dried sample}}{\text{weight of the sample}} \times 100$$

**OBSERVATION:**

Description	SUN drying	Oven drying
Weight of petridish alone	52.31	46.75
Weight of petridish + sample	56.64	50.54
Weight of the sample	4.33	3.79
Weight of petridish + sample after drying	52.55	46.9

Time taken for oven drying -15 hrs.

Time taken for Sun drying -20 hrs.

Moisture contents of the sun drying % =  $56.64 - 52.55 \times 100$  divided by  $56.64 = 7.22\%$

Moisture content of Oven drying % =  $50.54 - 46.9 \times 100$  divided by  $50.54 = 7.20\%$

**SENSORY EVALUATION OF SUN DRYING.**

Characteristics	No. of judges (n-7) stores							Mean
	1	2	3	4	5	6	7	
Colour	7	8	8	7	8	7	7	7
Appearance	7	8	8	7	8	7	7	7
Flavour	6	6	7	8	8	7	8	7
Texture	8	9	9	8	8	9	7	8
Taste	8	8	9	9	8	8	9	8
Overall acceptability	7	8	8	8	7	8	7	8

**SENSORY EVALUATION OF OVEN DRYING**

Characteristics	No. of judges (n-7) stores							Mean
	1	2	3	4	5	6	7	
Colour	7	6	6	7	8	7	7	7
Appearance	7	6	6	7	8	7	7	7
Flavour	6	6	7	8	8	7	8	7
Texture	8	8	9	9	8	8	9	8
Taste	7	8	8	9	8	8	8	8
Overall acceptability	7	8	7	8	7	7	8	7

**RESULTS:**Based on Hedonic scale organoleptic evaluation has carried out which that the colour and appearance was little very much same in sun drying. A low mean score was obtained for product dried by using oven. This is due to the prolonged drying. The texture and taste of both oven dried and sun dried products were similar.

**Activity:** Dry different types of fruits and vegetables or meat /fish or spices and condiments.

Do the organoleptic studies.Do quote more nutritional &health studies for all dried foods - its merits & demerits. Do substantiate your inference with more studies.

**References:**

- ❖ Advances in fresh –cut fruits and vegetables processing:food preservation technology series by Bellose Olga Martin &Fortuny Robert Soliva (Refer the latest version)

- ❖ Advances in preservation and processing technologies of fruits and vegetables by Rajarathnam Somasundram.2001.(Refer the latest version)
- ❖ Effect of Sun drying on nutritive and antioxidant properties of leafy vegetables consumed in western CÔTE D'IVOIRE. Armel F. Zoro\*, Lessoy T. Zoué, Niamkey J. Adom and Sébastien L. Niamké Biotechnology Laboratory, Biosciences Faculty, Félix Houphouët-Boigny University, PO Box 582, Abidjan 22, Côte d'Ivoire. E-mail:armelfabricezoro@yahoo.fr Received:24, Aug, 2015 Accepted:30, Sep, 2015.

**Excellent For Further Reading Refer the Latest versions:**

- ❖ **How to Dry Foods.** DeLong, D. HP Books, Tucson, Arizona, 1979.
- ❖ **How to Dry Fruits and Vegetables at Home.** Food Editors. Farm journal, Countryside Press, Philadelphia, Pennsylvania, 1975.
- ❖ **Putting Food By.** 3rd ed. Hertzberg, R., Vaughan, B., and Greene, J. Stephen Greene Press, Brattleboro, Vermont, 1982 (Refer all the latest versions)

**Adequate for further Reading**

- ❖ **Canning, Freezing and Drying.** Editors, Sunset Books and Sunset Magazine, Lane Publishing Company, Menlo Park, California, 1975 (Refer the latest)
- ❖ **Stocking Up.** Editors. Organic Gardening and Farming, Rodale Press, Emmaus, Pennsylvania, 1977 (Refer the latest)

**Reference:**

- ❖ Circular: prepared by Judy Troftgruben, Extension Specialist, Foods and Nutrition, and revised by Mary Keith, Assistant Professor, Foods and Nutrition, and Extension Specialist, Foods, Cooperative Extension Service, University of Illinois at Urbana-Champaign. April, 1984.
- ❖ Issued in furtherance of Cooperative Extension Work, Acts of May 8 and June 30, 1984, in cooperation with the U.S. Department of Agriculture. WILLIAM R. OSCHWALD, Director, Cooperative Extension Service, University of Illinois at Urbana-Champaign.(Refer all the latest version)

The Illinois Cooperative Extension Service provides equal opportunities in programs and employment.IOM--4-84--58767--znh

**N.B. Refer the latest version.**

- ❖ **Drying and Dehydration of Fruits and Vegetables** Rakesh Singh Department of Food Science and Technology The University of Georgia Athens, GA, USA Drying (Dehydration)– 1998.(Refer all the latest version)



## Experiment No.5

### PREPARATION OF PINEAPPLE SYRUP



#### **Introduction:**

To make **pineapple syrup**, cut up one whole, ripe **pineapple** into chunks and place into a large glass bowl. Add 1 cup of white sugar, stir to coat, cover with plastic wrap, and let sit in the refrigerator overnight. The next day, make a 2:1 simple **syrup** with 1 cup of sugar and 1/2 cup of water and set aside.

Syrup is a product which contain at **least 25% total fruit juice and 65% total solution solids. It also contains 1.3 to 1.5 % acid.**

#### **Ingredients**

Pineapple	-1 kg
Sugar	- 2.6 kg
Citric acid	-20 g
Water	-400 ml
Colour	- 1 pinch

KMS - 610 mg

Essence - 1ml

**Procedure:**

Remove the crown, peel and eyes of the pineapple and cut into small pieces, crush thoroughly and obtain a uniform mass. To this juice add sugar, citric acid and water. Heat the mixture until the sugar is dissolved. Strain the mixture through a Muslim cloth. Add KMS at 610 mg/kg of finished product. Add pineapple essence and lemon yellow colour and fill into sterilized bottles and leaving ahead space of 2.5 cm.

**Observation.**

**QUANTITY OF INGREDIENTS USED FOR PREPARATION OF PINEAPPLE SYRUP.**

INGREDIENTS	STANDARD METHOD
Pineapple juice	600 g
Sugar	1.5 kg
Citric acid	12 g
Pineapple essence	1 ml
Lemon yellow colour	1 pinch
Water	240 ml
KMS	3.66 mg

**COST ANALYSIS:**

Total quantity of syrup	1800 ml
Total cost	Rs.125
Market price for 700 ml	Rs.140

### SENSORY EVALUATION OF PINEAPPLE SYRUP

Characteristics	No. of judges (n-7) stores							Mean
	1	2	3	4	5	6	7	
Colour	8	9	8	8	9	9	9	9
Appearance	8	9	8	8	9	9	9	9
Flavour	7	8	8	7	8	7	8	8
Consistency	8	8	8	7	8	8	8	8
Taste	9	8	9	9	8	9	9	9
Overall acceptability	8	8	8	8	9	8	9	8

**Results:**

For 600 g of pineapple juice, the final quantity of syrup obtained is 1800 ml. The cost for pine apple syrup with 700 ml is around Rs.125 and the market price of pineapple syrup is Rs.140/700 ml. Based on organoleptic qualities the pineapple syrup colour, appearance, taste, consistency and overall acceptability were highly acceptable with an average score of 8.



**Activity:**

Do prepare different types of fruits Syrups.

Do the organoleptic studies.

Do the cost analysis.

Do the quality analysis

Do quote more nutritional& health studies different fruit syrups

Do substantiate your inference with more scientific studies.

**References:**

- ❖ Handbook of Food Preservation by M.Shafiur Rahman,New York,1999, World wide Web [http:// www.dekker.com](http://www.dekker.com) ,ISBN:0-8247-0209-3.(Refer the latest )
- ❖ Preservation of Fruits and Vegetables by Giridhari Lal,G. Siddappa & G.L. Tandon,1998. (Refer the latest edition)
- ❖ Post – harvest Management and Processing of Fruits and Vegetables by NS Rathore, G K Mathur & SS Chasta,ICAR, New Delhi, July 2012.
- ❖ Fruits and vegetables preservation by Ramesh Chand,2001.(Refer the latest version)
- ❖ Handling and preservation of fruits and vegetables by combined methods for rural areas technical manual by Canovas Gustavo V.et.al. 1998.(Refer the latest version)
- ❖ Technology of food Preservation by Desrosier NW,2008(Refer the latest version)

## Experiment No.6

### PREPARATION OF RTS



#### **Introduction:**

Ready to serve (RTS) beverage are consumed as such without dilution. This belongs to the category of non-alcoholic and carbonated beverage. Fruit juice are used for this products.

The RTS beverage belongs as per FSSAI and less than 10% total soluble solids and acid.

RTS are popular and regular in use due to longer shelf life and less losses of nutrients during the processing.

#### **Ingredients:**

Pineapple juice	- 125 g
Sugar	- 150 g
Water	- 725 ml
Citric acid	- 0.63 g

Essence - 1 ml  
Colour - 0.2 g

**Procedure:**

- Remove the inedible portion of the pineapple and cut into small pieces.
- It is then grind and filter it by using Muslim cloth.
- Add sugar, citric acid, water and heat until sugar is dissolved.
- Strain the sugar solution through Muslim cloth and mix with pineapple juice.
- Add lemon yellow colour and essence.
- Add 70 ppm KMS if it is to be preserved for 1-2 months.
- Heat the beverages to 90°C.
- Fill hot into clean, warm and sterilized narrow mouth bottles.

**OBSERVATION:**

**QUANTITY OF INGREDIENTS USED FOR THE PREPARATION OF RTS.**

INGREDIENTS	STANDARD METHODS
PINEAPPLE JUICE	200 ml
SUGAR	240 g
CITRIC ACID	1 g
PINEAPPLE ESSENCE	2 DROPS
LEMON YELLOW COLOUR	1 PINCH
WATER	1160 ml

**Cost analysis:**

TOTAL QUANTITY	1500 ml
TOTAL COST	260/1500ml
COST FOR 200ml	Rs.8/200 ml
MARKET PRICE	Rs. 10/200 ml

### SENSORY EVALUATION OF RTS

Characteristics	No. of judges (n-7) scores							Mean
	1	2	3	4	5	6	7	
Colour	9	9	9	9	9	9	8	9
Appearance	8	9	8	8	8	8	9	8
Flavour	9	9	8	9	8	9	9	9
Consistency	8	9	8	9	9	8	9	9
Taste	8	9	9	9	9	9	9	9
Overall acceptability	9	9	9	9	9	9	9	9

#### RESULT:

Good quality RTS was prepared using fresh pineapple and organoleptic evaluation was conducted. The mean score obtained for the appearance of RTS prepared was 8. The colour, flavour, consistency, taste and overall acceptability obtained mean score is 9.

The quantity of the RTS obtained was 1500ml from 200 ml of juice. The cost of RTS for 1500 ml is around Rs.8/200ml and the market price is around Rs.10/200 ml.

#### Activity:

- Do prepare different types of RTS.
- Do the organoleptic studies.
- Do the cost analysis.
- Do the quality analysis
- Do quote more nutritional & health studies different RTS
- Do substantiate your inference with more scientific studies.

#### References:

- ❖ Preservation of Fruits and Vegetables by Giridhari Lal, G. Siddappa & G.L. Tandon, 1998. Refer the latest edition
- ❖ Post-harvest Management and Processing of Fruits and Vegetables by NS Rathore, G K Mathur & SS Chasta, ICAR, New Delhi, July 2012.
- ❖ Home scale processing and preservation of fruits and vegetables by CFTRI, 2012..

### Experiment No.7

#### PREPARATION OF MANGO BAR



#### **Introduction:**

Mango fruit bar is a product prepared by mixing mango pulp with calculated amount of sugar and other ingredients, spreading on trays and drying in a drier until the moisture level is reduced to the required level. The dried sheet is cut into suitable size and packs it.

According to the FSSAI specification, the moisture content of the product should not be more than 20%. Total soluble solid should not be less than 75%. The fruit contents should not be less than 25%.



**Ingredients:**

Mango pulp	-1 kg
Sugar	-200g
KMS	-2.5 g
Citric acid	-2 g
Butter	- 5 g

**PROCEDURE:**

- ❖ Wash the mango and remove inedible portions and cut into small pieces.
- ❖ Blend the mangoes in a blender without using any water to have a thick pulp.
- ❖ To this pulp add sugar and mix thoroughly, until sugar is dissolved and add citric acid and KMS to the pulp.
- ❖ Pour this pulp into greased pan and dry it an oven at the temperature of 50<sup>0</sup> C.
- ❖ After drying, the layers are cut into small bars.

**OBSERVATIONS:**

**Quality of ingredients used for the preparation of Mango Bar.**

INGREDIENTS	QUANTITY
Mango pulp	900 g
Sugar	180 g
KMS	2.25g
Citric acid	1.8 g
Butter	4.5 g

### SENSORY EVALUATION OF MANGO BAR

Characteristics	No. of judges (n-7) stores							Mean
	1	2	3	4	5	6	7	
Colour	9	9	9	9	9	8	9	9
Appearance	9	8	8	9	8	8	9	8
Flavour	8	9	9	8	8	8	8	8
Consistency	8	7	5	6	7	6	7	7
Taste	8	8	8	9	9	8	9	8
Overall acceptability	8	8	8	8	8	7	8	8

#### Result

Organoleptic evaluation was conducted for mango bar based on the mean score. The colour of mango bar prepared was 9 (like extremely). The mean score of the consistency was 7 (like moderately). The appearance, flavour, taste and overall acceptability was obtained as a mean score 8 (like very much).

#### Cost Analysis

Quantity of Mango bar obtained was about 340 g from 200 g of pulp.  
The cost for 340 g is around Rs.80/340 g.

The market price is around Rs.65/200 g.

**Activity:** Do prepare different types of Fruit Bars.

Do the organoleptic studies.

Do the cost analysis.

Do the quality analysis

Do quote more nutritional & health studies different Fruit Bars

Do substantiate your inference with more scientific studies.

#### References:

- ❖ Handbook of Food Preservation by M.Shafiur Rahman, New York, 1999, World wide Web [http:// www.dekker.com](http://www.dekker.com) ,ISBN:0-8247-0209-3.(refer the latest Version)
- ❖ Preservation of Fruits and Vegetables by Giridhari Lal, G. Siddappa & G.L. Tandon, 1998. (Refer the latest edition)

- ❖ Post –harvest Management and Processing of Fruits and Vegetables by NS Rathore,G K Mathur & SS Chasta,ICAR, New Delhi, July 2012.
- ❖ Home scale processing and preservation of fruits and vegetables by CFTRI,2012 (Refer the latest version)
- ❖ Food Preservation V.1 by FAO ,1998(Refer the latest version)
- ❖ Freezing preservation of foods V.4 by Tressier D K ,1998,(Refer the latest version)
- ❖ Food Processing Industries by Suresh Chand,1998.(Refer the latest version)
- ❖ Nutritional Evaluation of Food processing by Harris R.S.2007.(Refer the latest version)

## Experiment No.8

### PREPARATION OF NUTMEG PICKLE



#### **Introduction:**

Preservation of foods in common salt or in vinegar are known as pickling. It is one of the ancient method of preserving fruits and vegetables. Pickle are good appetizers and added to the palatability of meal. This will stimulate the flow of gastric juice and helps in digestion.

Pickles are prepared with salt, vinegar, oil or mixture of salt, oil, spices and vinegar.

#### **Ingredients:**

Nutmeg rind	- 15 nos. (500 g)
Kashmiri chilli powder	-150 g
Ginger	-50 g
Garlic	-50 g
Vinegar	-150 ml
Gingerly oil	-200 ml

Mustard	-1 tsp
Fenugreek	- ½ tsp
Turmeric powder	- ½ tsp
Curry leaves	-2 spike
Asafoetida	-1 pinch
Sugar	-2 tsp
Salt	- 7.5 g

**PROCEDURE:**

- ❖ Remove the outer peel & nutmeg rind and cut into small pieces.
- ❖ Sprinkle about 7.5g salt to the nutmeg rind and keep aside for 10-15 minutes.

**OBSERVATION:**

**COST ANALYISS.**

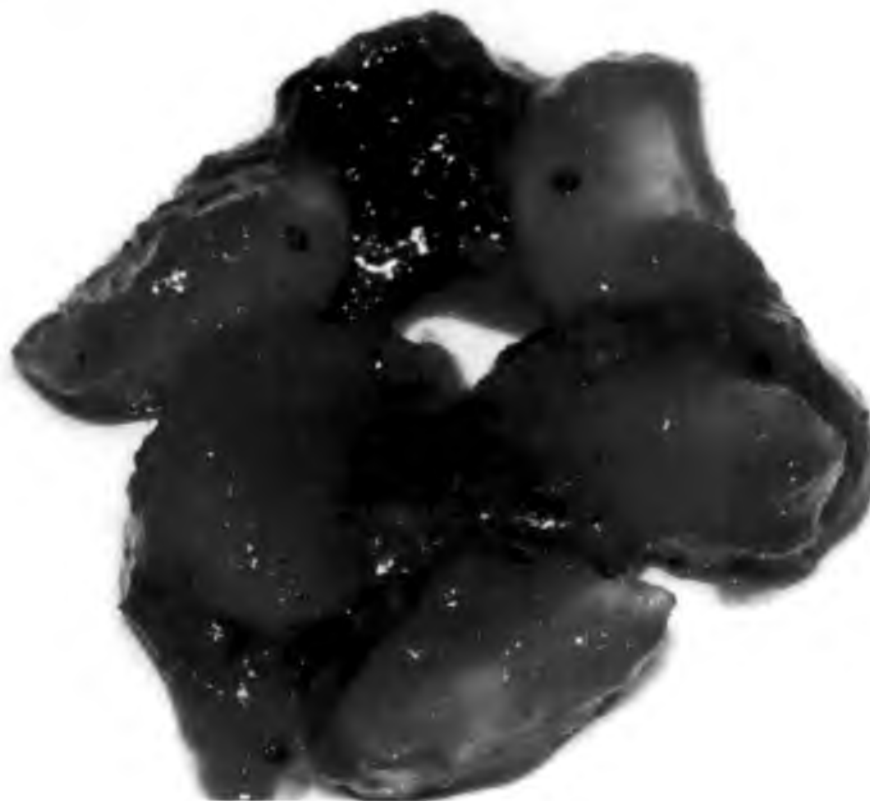
Total quantity	= 500 g
Cost for 500 g	= Rs.85/500g
Market price for500g	= Rs. 90/500 g



### SENSORY EVALUATION OF NUTMEG PICKLE

Characteristics	No. of judges (n-7) stores							Mean
	1	2	3	4	5	6	7	
Colour	8	8	8	9	8	9	8	8
Appearance	8	8	8	9	8	8	8	8
Flavour	8	8	9	9	9	9	8	8
Consistency	9	8	9	9	8	9	8	9
Taste	8	8	9	9	9	9	9	9
Overall acceptability	8	8	9	9	8	9	8	9

- ❖ Sauté the nutmeg in oil and keep aside
- ❖ In the same oil fry ginger and garlic and keep aside.
- ❖ To the oil 1tsp Mustard after cracking, sim the flame and add turmeric powder, chilli powder, sugar and other ingredients. Add fried ginger, garlic, nutmeg rind in to the mixture of above prepared ingredients.



**Result:**

Based on organoleptic qualities of nutmeg pickle, the mean score of colour and appearance was 8 (like very much). The consistency, flavour, taste and overall acceptability obtained as a mean score of 9 (like extremely).

The quantity of nutmeg pickle obtained about 500 g from 500 g of nutmeg rind.

The cost of 500 g is around Rs.85/500 g. Market price is around Rs.90/500 g.

**Activity:**

- Do prepare different types of Pickles.
- Do the organoleptic studies.
- Do the cost analysis.
- Do the quality analysis
- Do quote more nutritional & health studies different pickles
- Do substantiate your inference with more scientific studies.

**References:**

- ❖ Handbook of Food Preservation by M.Shafiur Rahman, New York, 1999, World wide Web [http:// www.dekker.com](http://www.dekker.com) ,ISBN:0-8247-0209-3.
- ❖ Preservation of Fruits and Vegetables by Giridhari Lal, G. Siddappa & G.L. Tandon, 1998. Refer the latest edition
- ❖ Post –harvest Management and Processing of Fruits and Vegetables by NS Rathore, G.K Mathur & SS Chasta, ICAR, New Delhi, July 2012.
- ❖ Advances in fresh –cut fruits and vegetables processing : food preservation technology series by Belloso Olga Martin & Fortuny Robert Soliva. (Refer latest version)

Charcutière sauce is made with mustard and cornichons. This sauce is pungent and flavorful. When served with pork, the sharpness of the sauce introduces a counterpoint flavour, cutting the meat's richness and providing a contrast that is pleasing but not startling to the palate.

The sauce brings out the pork's flavor but might overwhelm a more delicate meat like veal. A sauce that includes a flavor complementary to a food enhances the flavor of that food. Tarragon heightens the mild sweetness of poultry. A pungent green peppercorn sauce highlights the rich flavor of beef by deepening and enriching the overall taste.

### **Sauce add moisture or succulence**

A sauce can add moisture to naturally lean foods (e.g., poultry or fish) or when using cooking techniques that tend to have a drying effect, such as grilling or sautéing. Grilled foods are frequently served with a warm butter emulsion sauce like béarnaise, with compound butter, or with salsa or chutney. Beurreblanc is often served with shallow-poached lean white fish to add a bit of succulence to the dish.



### **Sauce add visual interest**

A sauce can enhance a dish's appearance by adding luster and sheen. Lightly coating a sautéed medallion of lamb with a jus lié creates a glossy finish on the lamb, giving the entire plate more eye appeal. Pooling a red pepper coulis beneath a grilled swordfish steak gives the dish a degree of visual excitement by adding an element of color.



## Experiment No.9

### PREPARATION OF SAUCE



#### INTRODUCTION

In cooking a **sauce** is a liquid, cream, or semi-solid food served on or used in preparing other foods. **Sauces** are not normally consumed by themselves; they add flavour, moisture, and visual appeal to a dish. **Sauce** is a French word taken from the Latin salsa, meaning salted.

Most sauces have more than one function in a dish. A sauce that adds a counterpoint flavor, for example, may also introduce textural and visual appeal. Sauces generally serve one or more of the following purposes.

#### **Sauces introduce complementary or counterpoint flavours**

Sauces that are classically paired with particular foods illustrate this function. *Suprême sauce* is based on a reduction of chicken velouté with chicken stock and finished with cream. This ivory colored sauce has a deep chicken flavor and a velvety texture. When served with chicken, the color and flavor of the sauce complement the delicate meat and help intensify its flavor. The cream in the sauce rounds out the flavors.

## Sauce adjust texture

Many sauces include a garnish that adds texture to the finished dish. A sauce finished with tomatoes and mushrooms enhances Chicken Chasseur, while a smooth sauce adds a textural contrast to pan-fried soft-shell crab.

In the culinary arts, the term "**mother sauce**" refers to any one of **five basic sauces**, which are the starting points for making various **secondary sauces** or "**small sauces**." They're called **mother sauces** because each one is like the head of its own unique family of **sauces**.

- **The 5 French Mother Sauces:**

Béchamel. This is roux whisked with milk or other dairy to make a white sauce.

Velouté A velouté is a light roux whisked with chicken, turkey, fish or any other clear stock. .

Espagnole. Sauce espagnole is a basic brown sauce. ...

Sauce Tomato.

Hollandaise.

Béchamel, Espagnole, Hollandaise, **Mayonnaise**, Tomato Sauce, and Velouté are the **mother sauces** of French cuisine. ... Fresh **Mayonnaise is a mother sauce**, processed **Mayonnaise**, not so much. **Mayonnaise is a thick sauce** made primarily from vegetable oil and egg yolks. Sauces are generally thinner and contain more solids (minimum 30%). Tomato, apple, pineapple, walnut are used for making sauces.

Tomato sauce is made from strained tomato juice or pulp and spices, salt, sugar and vinegar with or without onion or garlic and contains not less than 25% of total solids.

### Ingredients:

Tomato pulp	-1 kg
Sugar	- 60 g
Salt	-10 g
Chilli powder	-1 g
Masala powder	-5 g
Pepper powder	-0.5 g
Onion (chopped)	- 50 g
Garlic chopped)	- 10 g
Vinegar	- 50 ml
Sodium benzoate	- 0.025g

**Method:**

- Select uniform ripped tomatoes and wash thoroughly, blanch the tomatoes in hot water until the skin cracks. All of that tomatoes are put in to cold water
- Remove the outer skin, cut into small piece and make into pulp using blender.
- Prepare a spice bag with onion, garlic, curry leaves, coarsely grinded pepper, cardamom, cinnamon, and tied closely in a Muslim cloth. Put into the pulp.
- Prepare the sauce till it reaches the consistency in between pressing the spice bag.

**Observation: Accurate Ingredients used for preparation of Sauce:**

Tomato pulp	-900 g
Sugar	-54 g
Salt	-9 g
Chilli powder	-0.9 g
Masala powder	-4.5 g
Onion	-45 g
Pepper powder	-0.4 g
Garlic	-9 g
Vinegar	-45 ml
Sodium benzoate	-0.022 g

**COST ANALYSIS.**

Total quantity	= 400 g
Total cost	=Rs.95/400 g
Cost for 200g	=Rs.48/200 g
Market price	= Rs.51/200 g

**SENSORY EVALUATION OF TOMATO SAUCE**

Characteristics	No. of judges (n-7) stores							Mean
	1	2	3	4	5	6	7	
Colour	9	9	9	9	9	9	9	9
Appearance	9	8	9	8	8	8	8	8
Flavour	8	8	8	8	8	8	8	8
Consistency	9	9	9	9	9	8	9	9
Taste	9	8	8	9	9	8	9	9
Overall acceptability	9	8	8	9	8	8	8	8

**Procedure:**

- Heat the pulp in a low flame and add sugar (1/3<sup>rd</sup>) and spice bag. Crush the spice bag to extract the flavour of spices.
- Continue cooking till the pulp volume is reduced to 1/3<sup>rd</sup> portion.
- Remove the spice bag and squeeze to get spices extracts and add vinegar, salt and remaining sugar. Mix well and heat again.
- Dissolve sodium benzoate in a little amount of water and add to the product and mix thoroughly.
- Fill into sterilized narrow mouthed bottle up to brim and store in cool and dry place.



**Result:**

Based on organoleptic qualities of tomato sauce the mean score for colour, consistency and taste was 9 (like extremely). The appearance, flavour and overall acceptability obtained a mean score 8 (like very much).

The quantity of sauce obtained was 1100 g from 900 g of pulp. The cost for 400 g is around Rs.95/400 g and market price is Rs.51/200 g.

**Activity:**

Do prepare different types of Sauces.

Do the organoleptic studies.

Do the cost analysis.

Do the quality analysis

Do quote more nutritional & health studies different Sauces

Do substantiate your inference with more scientific studies.

**References:**

- ❖ Handbook of Food Preservation by M.Shafiur Rahman,New York,1999, World wide Web [http:// www.dekker.com](http://www.dekker.com) ,ISBN:0-8247-0209-3.(Refer the latest version)
- ❖ Preservation of Fruits and Vegetables by Giridhari Lal,G. Siddappa& G.L. Tandon,1998. (Refer the latest version)
- ❖ Post –harvest Management and Processing of Fruits and Vegetables by NS Rathore,G.K Mathur & SS Chasta, ICAR, New Delhi, July 2012.
- ❖ Home scale processing and preservation of fruits and vegetables by CFTRI,2012 (Refer the latest version)
- ❖ Food Preservation V.1 by FAO ,1998(Refer the latest version)
- ❖ Freezing preservation of foods V.4 by Tressier D K ,1998,(Refer the latest version)
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## Experiment No.10

### Preparation of Grape wine.



**Introduction:** Wine making is a natural process that requires little human intervention, but each **winemaker** guides the process through **different** techniques.

#### **Types of white wine grapes**

- Riesling. (Rees-ling)
- Gewürztraminer. (Gah-vurtz-tra-meener) A very aromatic variety.
- Chardonnay. (Shar-doe-nay) Chardonnay was the most popular white grape through the 1990's.
- Sauvignon blanc. (So-vee-nyon Blah)
- Syrah.
- Merlot.
- Cabernet sauvignon.
- Pinot noir.

## Types of wine

Here is a quick reference to the most popular wine varieties and how to pair wine with food. This page describes the different types of wine per district and *variety* names (riesling, pinot noir, etc.). It does not describe the styles of wines by colour, sweetness, or fizz. The repartition of wine types in a cellar is suggested in the buying guide.

Please find here below basic varietal descriptions and pronunciations, tasting terms, plus suggestions on pairing the wines with food.

A *variety* is the type of grape. It is written here with a *lower-case* initial. If only one variety is mentioned on the bottle label, then the wine is called *varietal* and is named after the grape with a *capital* initial (Riesling, Pinot Noir, etc.). A varietal wine primarily shows the fruit: the grape variety dominates the wine flavour.

## Types of white wine grapes

### Riesling

(Rees-ling)

**Food-wine pairing:** dry versions go well with fish, chicken and pork dishes.

**Districts:** the classic German grape of the Rhine and Mosel, riesling grows in all wine districts. Germany's great Rieslings are usually made slightly sweet, with steely acidity for balance. Riesling from Alsace and the Eastern USA is also excellent, though usually made in a different style, equally aromatic but typically drier (not sweet). California Rieslings are much less successful, usually sweet and lacking in acidity for balance.

**Typical taste** in varietal wine: Riesling wines are much lighter than Chardonnay wines. The aromas generally include fresh apples. The riesling variety expresses itself very differently depending on the district and the winemaking. Rieslings should taste fresh. If they do, then they might also prove tastier and tastier as they age.



Old Vine of riesling

## Gewürztraminer



(Gah-vurtz-tra-meener) A very aromatic variety.

**Food-wine pairing:** ideal for sipping and with Asian food, pork and grilled sausages.

**Districts:** best-known in Alsace, Germany, the USA West Coast, and New York.

**Typical taste** in varietal wine: fruity flavours with aromas of rose petal, peach, lychee, and allspice. A

## Gewürztraminer

Gewürztraminer often appears not as refreshing as other kinds of dry whites.

## Chardonnay



### Chardonnay vine

(Shar-doe-nay) Chardonnay was the most popular white grape through the **1990's**. It can be made sparkling or still.

**Food-wine pairing:** it is a good choice for fish and chicken dishes.

**Districts:** chardonnay makes the principle white wine of Burgundy (France), where it originated. Chardonnay is grown with success in most viti cultural areas under a variety of climatic conditions.

**Typical taste** in varietal wine: often wider-bodied (and more velvety) than other types of dry whites, with rich citrus (lemon, grapefruit) flavours. Fermenting in new oak barrels adds a buttery tone (vanilla, toast, coconut, toffee). Tasting a USD 15 Californian Chardonnay



should give citrus fruit flavours, hints of melon, vanilla, some toasty character and some creaminess. Burgundy whites can taste very different.

## Sauvignon blanc



## Sauvignon blanc

(So-vee-nyon Blah)

**Food-wine pairing:** a versatile food wine for seafood, poultry, and salads.

**Districts:** New Zealand produces some excellent Sauvignon Blancs. Some Australian Sauvignon Blancs, grown in warmer areas, tends to be flat and lack fruit qualities. Of French origin, sauvignon blanc is grown in the Bordeaux district where it is blended with semillon. It is also grown extensively in the upper Loire valley where it is made as a varietal wine.

**Typical taste** in varietal wine: generally lighter than Chardonnay — Sauvignon blanc normally shows a herbal character suggesting bell pepper or freshly mown grass. The dominating flavours range from sour green fruits of apple, pear and gooseberry through to tropical fruits of melon, mango and blackcurrant. Quality unoaked Sauvignon Blancs will display smoky qualities; they require bright aromas and a strong acid finish; they are best grown in cool climates..

## Types of red wine grapes

### Syrah



### Syrah vine picture

(Sah-ra or Shi-raz) Shiraz or syrah are two names for the same variety. Europe vine growers and winemakers only use the name syrah.

**Food-wine pairing:** meat (steak, beef, wild game, stews, etc.)

**Districts:** syrah excels in France's Rhône Valley, California and Australia.

**Typical taste** in varietal wine: aromas and flavours of wild black-fruit (such as blackcurrant), with overtones of black pepper spice and roasting meat. The abundance of fruit sensations is often complemented by warm alcohol and gripping tannins.

Toffee notes if present come not from the fruit but from the wine having rested in oak barrels.

The shiraz variety gives **hearty, spicy** reds. While shiraz is used to produce many average wines it can produce some of the world's finest, deepest, and darkest reds with intense flavours and excellent longevity. You'll discover Syrahs of value and elegance by reading my reviews of French wines.

### Merlot



### Merlot vine picture

(Mer-lo) **Easy to drink.** Its softness has made it an "introducing" wine for new red-wine drinkers.

**Food-wine pairing:** any will do.

**Districts:** a key player in the Bordeaux blend, merlot is now also grown on the US West Coast, Australia, and other countries.

**Typical taste** in varietal wine: black-cherry and herbal flavours are typical. The texture is round but a middle palate gap is common.

## **Cabernet sauvignon**



## **Cabernet sauvignon**

(Ka-ber-nay So-vee-nyon) Widely accepted as one of the world's best varieties. Cabernet sauvignon is often blended with cabernet franc and merlot. It usually undergoes oak treatment.

**Food-wine pairing:** best with simply prepared red meat.

**Districts:** cabernet sauvignon is planted wherever red wine grapes grow except in the Northern fringes such as Germany. It is part of the great red Médoc wines of France, and among the finest reds in Australia, California and Chile.

**Typical taste** in varietal wine: full-bodied, but firm and **gripping** when young. With age, rich **currant** qualities change to that of **pencil box**. **Bell pepper** notes remain.

Vanilla notes if present come not from the fruit but from the oak treatment. They increase review ratings but may overwhelm the varietal taste.

Another article deals with the health benefits of polyphenols.

## Pinot noir



(Pee-no Nwar) One of the noblest red wine grapes — difficult to grow, rarely blended, with no roughness.

**Food-wine pairing:** excellent with grilled salmon, chicken, lamb and Japanese dishes.

**Districts:** makes the great reds of Burgundy in France, and good wines from Austria, California, Oregon, and New Zealand.

## Pinot noir

**Typical taste** in varietal wine: very unlike Cabernet Sauvignon. The structure is delicate and fresh. The tannins are very soft; this is related to the low level of polyphenols. The aromatics are very fruity (cherry, strawberry, plum), often with notes of tea-leaf, damp earth, or worn leather.

Yet pinot noir is very transparent to the place where it is grown. The staggering range of wines produced makes it pointless to define which personality is the best expression of the variety.

## 5 STAGES OF THE WINE MAKING PROCESS



Wine making has been around for thousands of years. It is not only an art but also a science. Wine making is a natural process that requires little human intervention, but each wine maker guides the process through different techniques. In general, there are five basic components of the wine making process: harvesting, crushing and pressing, fermentation, clarification, and aging and bottling.

Wine makers typically follow these five steps but add variations and deviations along the way to make their wine unique.

### **Harvesting**

Harvesting is the first step in the wine making process and an important part of ensuring delicious wine. Grapes are the only fruit that have the necessary acids, esters, and tannins to consistently make natural and stable wine. Tannins are textural elements that make the wine dry and add bitterness and astringency to the wine.

The moment the grapes are picked determines the acidity, sweetness, and flavour of the wine. Determining when to harvest requires a touch of science along with old fashioned tasting. The acidity and sweetness of the grapes should be in perfect balance, but harvesting also heavily depends on the weather.

Harvesting can be done by hand or mechanically. Many wine makers prefer to harvest by hand because mechanical harvesting can be tough on the grapes and the vineyard. Once the grapes are taken to the winery, they are sorted into bunches, and rotten or under ripe grapes are removed.

### **Crushing and Pressing**

After the grapes are sorted, they are ready to be de-stemmed and crushed. For many years, men and women did this manually by stomping the grapes with their feet. Nowadays, most wine makers perform this mechanically. Mechanical presses stomp or trod the grapes into what is called must. Must is simply freshly pressed grape juice that contains the skins, seeds, and solids. Mechanical pressing has brought tremendous sanitary gain as well as increased the longevity and quality of the wine.

For white wine, the wine maker will quickly crush and press the grapes in order to separate the juice from the skins, seeds, and solids. This is to prevent unwanted colour and tannins from leaching into the wine. Red wine, on the other hand, is left in contact with the skins to acquire flavour, colour, and additional tannins.

### **Fermentation**

After crushing and pressing, fermentation comes into play. Must (or juice) can begin fermenting naturally within 6-12 hours when aided with wild yeasts in the air. However, many wine makers intervene and add a commercial cultured yeast to ensure consistency and predict the end result.



Fermentation continues until all of the sugar is converted into alcohol and dry wine is produced. To create a sweet wine, wine makers will sometimes stop the process before all of the sugar is converted. Fermentation can take anywhere from 10 days to one month or more.

### **Clarification**

Once fermentation is complete, clarification begins. Clarification is the process in which solids such as dead yeast cells, tannins, and proteins are removed. Wine is transferred or “racked” into a different vessel such as an oak barrel or a stainless steel tank. Wine can then be clarified through fining or filtration.

Fining occurs when substances are added to the wine to clarify it. For example, a wine maker might add a substance such as clay that the unwanted particles will adhere to. This will force them to the bottom of the tank. Filtration occurs by using a filter to capture the larger particles in the wine. The clarified wine is then racked into another vessel and prepared for bottling or future aging.

### **Aging and Bottling**

Aging and bottling is the final stage of the wine making process. A wine maker has two options: bottle the wine right away or give the wine additional aging. Further aging can be done in the bottles, stainless steel tanks, or oak barrels. Aging the wine in oak barrels will produce a smoother, rounder, and more vanilla flavoured wine. It also increases wine’s exposure to oxygen while it ages, which decreases tannin and helps the wine reach its optimal fruitiness. Steel tanks are commonly used for zesty white wines. After aging, wines are bottled with either a cork or a screw cap, depending on the wine maker’s preference.

#### **Characteristics:**

Wine is one of the oldest alcoholic beverages. It is a fermented alcoholic beverage produced by fermentation of fruits juice using yeast.

$C_6H_{12}O_6 = \text{Yeast/Anaerobic condition} \rightarrow 2 C_2H_5OH + CO_2$ .

Wine generally denotes fermented product from grape wine. Other fruits wines prepared from fruits like pineapple wine, Plantain wine, Pear wine, Plum wine, Jack fruit wine etc. From vegetables too wines are made. Eg. Beetroot wine.

#### **Grape Wine**

##### **Ingredients:**

Grapes	-1 kg
Sugar	-1 kg
Boiled and cooled water	-1 litre
Yeast	- 5 g

**Procedure:**

Remove stalk of grapes, wash the grapes thoroughly in water and wipe out moisture present on grapes with a clean cloth. Crush the grapes with a ladle. Arrange grape and sugar in alternate layers in a earthen pot and add water, yeast, crushed spices, wet & crushed wheat etc. Close air tight and keep it for 21 days. Shake the contents daily. After 21 days, strain and bottle the wine and seal it in air tight and store in a clean dry place (dark room).

**COST ANALYSIS**

Total quantity produced 1800 ml

Total Cost =Rs. 135

Market price = Rs.230.

**SENSORY EVALUATION OF GRAPE WINE**

Characteristics	No. of judges (n-7) stores							Mean
	1	2	3	4	5	6	7	
Colour	7	4	5	7	7	7	6	7
Appearance	7	5	6	6	7	7	7	7
Flavour	8	8	8	9	8	7	8	8
Consistency	7	7	7	6	7	6	7	7
Taste	9	8	9	9	9	8	9	9
Overall acceptability	8	7	7	8	7	7	8	8

**Result:**

Based on Organoleptic qualities of Grape wine, the mean score for colour, appearance and con of wine obtained was pale hence the obtained score is 7.

The colour of wine obtained was pale, hence organoleptic score was low.

Poor colour of wine was due to the presence of many immature fruits. For the flavour and overall acceptability obtained score is 8. Flavour was good due to the production of alcohol contents. The taste of the grapes wine with mean score was 9.

**Cost analysis**

The quantity of grapes wine obtained was 1800 ml.

The cost of production was Rs.135

Market price for 1 litre wine was Rs.230.

**Activity:**

Do prepare different types of Wine using different fruits and vegetables.

Do the organoleptic studies.

Do the cost analysis.

Do the quality analysis

Do quote more nutritional & health studies different Wines

Do substantiate your inference with more scientific studies.

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