BHARATHIDASAN UNIVERSITY TIRUCHIRAPPALI-620 024 TAMIL NADU,INDIA

Programme : M.Sc., Biochemistry

Course Title : Value Addition in food Couse Code :BC003VAC

UNIT-II

FRUOTS AND VEGETABLES

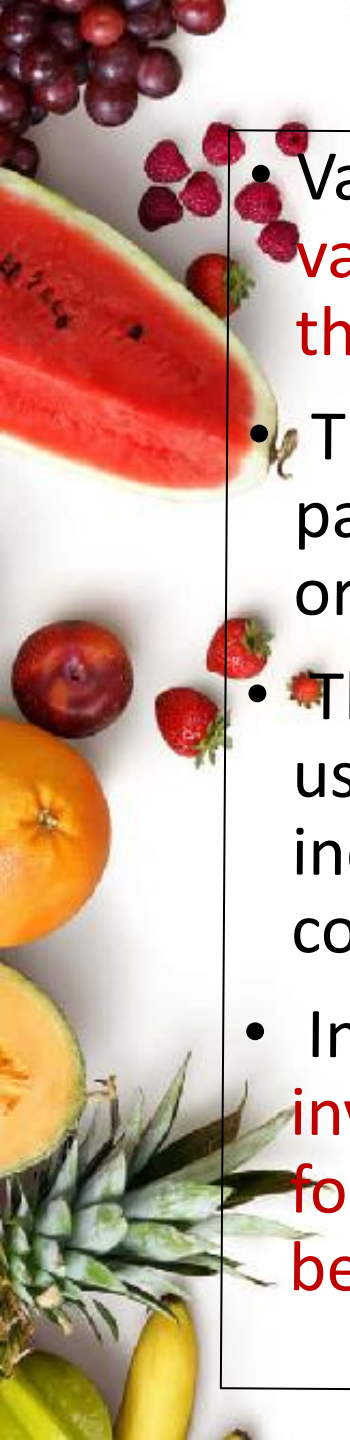
Dr . T.PRABHASH

Department of Biochemistry

VALUE ADDITION OF FOOD

- What is meant by value addition?
- What is meant by the value addition of Fruits?
- What is meant by the Value addition of Vegetables?
- How the fruits and vegetables are stored?
- .Fruit Juice, Jam ,Jelly , Marmalade,Squash and candies

What is mean by value addition ?



- Value addition refers to the process of enhancing the value of a product by altering its current state through various means
- This can involve physical changes - processing or packaging, or intangible improvements, like branding or marketing
- The goal is to make the product- more appealing, useful, or convenient for consumers, thereby increasing its market value and potentially commanding a higher price.
- In the context of agriculture, value addition often involves transforming raw agricultural products into forms that have a longer shelf life, improved safety, better taste, or higher nutritional value

VALUE ADDITION OF FRUITS

- Value addition of fruits refers to processes and methods that enhance the economic value of fresh fruits by transforming them into a variety of products

VALUE ADDITION OF FRUITS INCLUDES

- PROCESSING:

FRESH FRUITS

- PACKAGING
- Innovative and attractive packaging solutions not only extend the shelf life of fruit products but also enhance their market appeal.

- BRANDING AND MARKETING:
- Developing a brand and marketing the fruit products effectively can significantly boost their value and consumer demand.

VALUE ADDITION OF VEGETABLES

- Value addition in vegetables refers to the process of enhancing the economic value and consumer appeal of raw vegetables through various methods such as processing, packaging, and marketing.

- This practice not only improves the shelf life and usability of vegetables but also maximizes profitability for farmers and businesses involved in the agricultural sector.
- By transforming vegetables into more desirable products like frozen goods, pickles, canned foods, and other processed items, value addition plays a crucial role in the agri-business ecosystem.

IMPORTANTANCE OF VALUE ADDITION

ECONOMIC BENEFITS:

Increase revenue for farmers

Sell products at higher prices compared to raw vegetables

REDUTION OF POST HARVEST LOSESSES

help reduce wastage and spoilage, ensuring that more of the harvest reaches consumers

MARKET EXPANSION

Processed vegetable products can reach broader markets, including international ones, which might not be feasible with fresh vegetables due to their perishable nature.

- **EMPLOYMENT OPPORTUNITIES:** processing, packaging, and marketing, which create job opportunities in rural and urban areas
- **NUTRITIONAL VALUES :**Proper processing and preservation can help retain the nutritional quality of vegetables, making them available year-round in different forms.

CHALLENGES IN VALUE ADDITION

- **High Initial Investment:** Establishing processing facilities and acquiring modern technology require substantial capital investment.
- **Lack of Skilled Labor:** There is often a shortage of trained personnel who can handle the sophisticated equipment and processes involved in value addition
- **Market Competition:** Competing with established brands and products can be challenging for new entrants.
- **Quality Control:** Ensuring consistent quality and meeting regulatory standards is crucial but can be demanding.

JAM

- Fruit jam is a popular preserved food made from the cooking of fruit with sugar, resulting in a spreadable consistency.
- It has been a staple in households for centuries, known for its sweet flavor and versatility.
- The process of making jam not only preserves the fruit for a longer time but also enhances its flavor, making it a delightful addition to various meals and snacks.

IMPORTANCE

- Preservation ,Nutritional Value ,Versatility,Economic Value

BASIC STEPS IN PREPARING JAM

Preparation ------Cooking --------Addition of pectin---------Boiling--------Jarring

Fruit jam is a delightful and versatile food product that captures the essence of fresh fruit in a preserved form. Its ability to transform surplus fruit into a long-lasting, flavorful spread has made it a cherished part of culinary traditions worldwide

FRUIT JUICE

- Fruit juice is a beverage made by extracting or pressing the natural liquid from fresh fruits. Valued for its refreshing taste and nutritional benefits, fruit juice is a popular drink consumed worldwide.
- It can be enjoyed on its own, mixed with other beverages, or used as an ingredient in various culinary applications.

- Fruit juice is a good source of vitamins, minerals, and antioxidants. Key nutrients include:
- Vitamin C: Boosts the immune system and aids in the absorption of iron.
- Potassium: Helps regulate blood pressure and maintain heart health.
- Folate: Essential for cell growth and metabolism.

- BENEFITS: Hydration, Nutrient Boost, Antioxidants
- POTENTIAL DRAWBACKS : High sugar content (weight gain ,Dental issues), Lack of fiber .
- PRESERVATION AND STORAGE :
- Fruit juice should be stored in a cool, dark place or refrigerated to maintain its freshness. Pasteurized juices have a longer shelf life, while freshly squeezed juice should be consumed quickly to prevent spoilage.

JELLY

- Jelly is a translucent, sweet spread made from fruit juice, sugar, and a gelling agent, typically pectin.
- Known for its smooth texture and vibrant color, jelly is a popular accompaniment to bread, pastries, and various desserts.
- It differs from jam in that it uses only the juice of the fruit, resulting in a clear and firm consistency.

- **PREPARATION**
- Juice Extraction ----- Mixing (sugar and lemon juice) ------Boiling (pectin)----canning

- **NUTRITIONAL VALUE**
- Jelly provides quick energy due to its high sugar content.
- It retains some of the vitamins and antioxidants from the fruit juice, but the nutrient density is lower compared to whole fruits or jams with fruit pulp.
- Consuming jelly in moderation is advisable, especially for individuals monitoring their sugar intake.

PRESERVATION AND STORAGE

- Properly prepared and sealed jelly can be stored at room temperature for up to a year.
- Once opened, it should be refrigerated and consumed within a few weeks.
- The high sugar content helps preserve the jelly by inhibiting the growth of microorganisms.

MARMALADE

- Marmalade is a type of preserve made from the juice and peel of citrus fruits, boiled with sugar and water.
- Unlike jams and jellies, marmalade typically includes the rind of the fruit, which gives it a distinctive, slightly bitter flavor that complements its sweetness.
- It is most commonly made from bitter oranges but can also be made from lemons, limes, grapefruits, and other citrus fruits.

PREPARATION

Fruit preparation ----> Boiling ---> Adding sugar ---

-->Canning

NUTRTIONAL VALUE

Marmalade provides a good source of vitamin C, derived from the citrus fruits used. However, it is also high in sugar and should be consumed in moderation. The peel in marmalade offers some dietary fiber, but the overall fiber content is still relatively low compared to whole fruits.

BENEFITS : Vitamin C, Antioxidants,Flavor and Versatility

DRAWBACKS: High sugar content, Bitterness

SQUASHES

- Fruit squashes are concentrated fruit syrups that are diluted with water to make refreshing beverages.
- They are made by extracting the juice from fruits and combining it with sugar and sometimes additional flavorings or preservatives.
- Fruit squashes are popular for their ability to capture the essence of fresh fruits and provide a convenient way to enjoy fruit-flavored drinks.

PREPARATION

Juice Extraction ---> Boiling --->Straining and Bottling --->Dilution

NUTRITIONAL VALUE

Fruit squashes provide vitamins and minerals from the fruits used, especially vitamin C from citrus fruits.

However, they are high in sugar and should be consumed in moderation.

Diluting with water reduces the sugar content per serving.

CANDIES

- Fruit candies are sweet confections that capture the natural flavors of fruits through various forms and textures.
- These candies are enjoyed for their fruity taste, vibrant colors, and often chewy or hard textures.
- Fruit candies are popular among both children and adults as a delightful treat or snack.

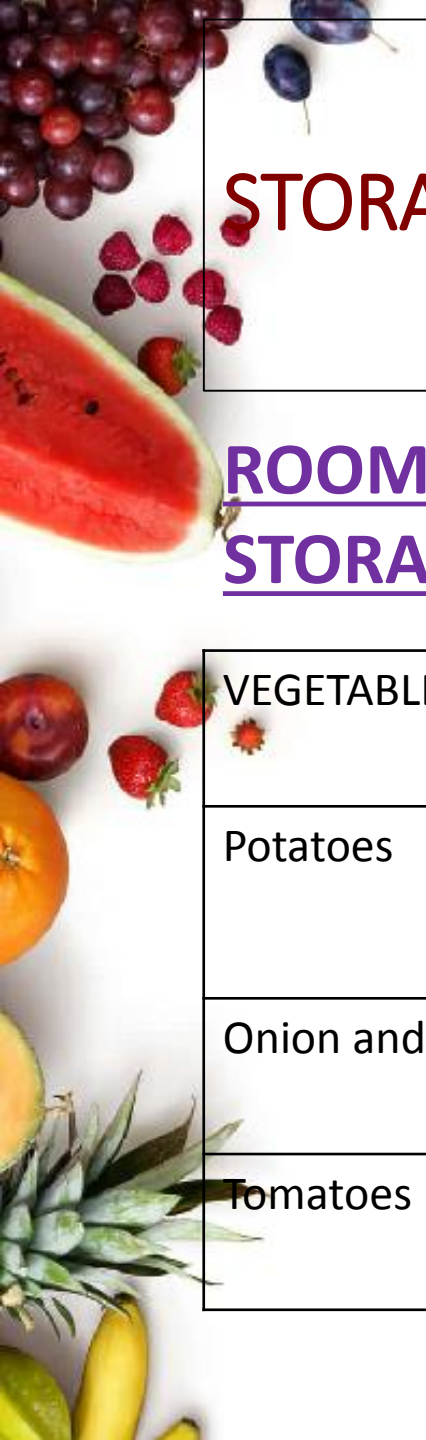
PREPARATION

Flavor and Color Mixing---> Cooking ---> Molding or Shaping --->Cooling and packaging

NUTRITIONAL CONSIDERATIONS

Fruit candies are primarily composed of sugar and may contain added colors and artificial flavors.

While they provide quick energy, they are low in nutritional value and should be consumed in moderation as part of a balanced diet.



STORAGE OF FRUITS AND VEGETABLES

Temperature, Humidity,Air Circulation

ROOM TEMPERATURE STORAGE

VEGETABLES	STORAGE	PURPOSE
Potatoes	cool, dark place like a pantry.Avoid refrigeration	To prevent sweet taste and altering of texture
Onion and Garlic	well-ventilated area at room temperature.	To avoid sprouting
Tomatoes	room temperature	To maintain flavor and texture.

REFRIGERATION

VEGETABLES	STORAGE	PURPOSE
Leafy greens	kept in the crisper drawer with high humidity. Store in plastic bags with some air circulation.	To prevent spoilage
Carrots, Celery, and Radishes	crisper drawer. Wrap in damp paper towels to maintain moisture.	To maintain the moisture content and texture
Broccoli and Cauliflower:	Keep in a plastic bag in the crisper drawer	To prevent spoilage
Bell Peppers, Cucumbers, and Zucchini	Store in the crisper drawer.	To avoid wrinkling

STORAGE OF FRUITS

FRUITS	STORAGE	PURPOSE
Bananas	Room temperature	Refrigeration can cause the skin to turn brown
Citrus Fruits	room temperature	For longer storage, refrigerate.
Stone Fruits	Peaches ,plum - room temperature	For ripening
Melons	Room temperature	once cut refrigerate
Apples and Pears	refrigerator	To maintain crispness
Berries	refrigerator	To avoid spoilage
Grapes	Refrigerate - Plastic bag or container	To avoid spoilage
Cherries	refrigerator, unwashed, until ready to eat	To avoid spoilage

Value addition and storage of vegetables

Introduction

- Value addition refers to the process of increasing the value of a product or raw material through various methods, such as processing, packaging etc..
- Here we can see the some of the value addition and storage of vegetables as :

  - tomato sauce
  - ketchup
  - puree
  - chips
  - pickles.

Difference between tomato sauce and ketchup

- Ingredients:- Tomato sauce: Made from fresh tomatoes, onions, garlic, olive oil, salt, and herbs like basil and oregano.- Tomato ketchup: Made from tomatoes, sugar, vinegar, salt, and spices like cinnamon, nutmeg, and cayenne pepper.
- Texture:- Tomato sauce: Thicker and more liquid, with a coarse texture from the tomato pieces.- Tomato ketchup: Smoother and thicker, with a more uniform consistency.

- Taste:- Tomato sauce: Has a more acidic and savoury flavour, with a stronger tomato taste.- Tomato ketchup: Sweeter and milder, with a balanced flavour.
- Usage:- Tomato sauce: Used as a base for pasta sauces, pizza sauces, and other Italian dishes.- Tomato ketchup: Used as a condiment for burgers, fries, scrambled eggs, and other breakfast foods.
- Preparation method:- Tomato sauce: Cooked for a longer time to reduce the liquid and intensify the flavors.- Tomato ketchup: Cooked for a shorter time and sweetened with sugar to balance the acidity.
- Sugar content:- Tomato sauce: Very little or no added sugar.- Tomato ketchup: Significant amount of added sugar to balance the acidity.

Value addition and storage of tomato sauce

- 1.Flavor Enhancement: Add herbs and spices to create unique flavour profiles, like: - Italian-style (basil, oregano, garlic) - Spicy (red pepper flakes, jalapeño) - Smoky (smoked paprika, chipotle)
- 2. Ingredient Addition: Introduce new ingredients to increase nutritional value or texture, such as: - Vegetables (bell peppers, carrots, onions) - Protein sources (ground beef, turkey, or plant-based options) - Healthy fats (olive oil, avocado oil)
- 3. Processing Techniques: Employ specialized processing methods to create distinct products, like: - Roasting: Roast tomatoes before blending for a deeper flavour - Grilling: Grill tomatoes for a smoky flavour - Sun-drying: Sun-dry tomatoes for a concentrated flavour

- Storage condition: Cool, Dry Place, Airtight Containers, Refrigeration, Freezing and Canning.
- Chemical Additives for Longer Shelf Life:
- 1. Acidifiers: - Citric acid (E330): Maintains acidity and inhibits bacterial growth. - Lactic acid (E270): Controls pH and prevents spoilage.
- 2. Preservatives: - Sodium benzoate (E211): Inhibits microbial growth and extends shelf life. - Potassium sorbate (E202): Prevents mold and yeast growth.
- 3. Antioxidants: - Vitamin C (E300): Protects against oxidation and spoilage. - Vitamin E (E307): Prevents rancidity and maintains flavor.
- 4. Texture Modifiers: - Xanthan gum (E415): Improves texture and prevents separation. - Guar gum (E412): Enhances viscosity and stability.

Value addition and storage of ketchup

- 1. Flavour Enhancement: Introduce new flavour profiles, like: - Spicy ketchup (with added hot sauce or spices) - Smoky ketchup (with added smoky flavour or chipotle peppers) - Herb and garlic ketchup
- 2. Ingredient Addition: Introduce new ingredients to increase nutritional value or texture, such as: - Organic or non-GMO ingredients - Fresh or dried herbs (e.g., basil, oregano) - Spices (e.g., cumin, coriander) - Vegetable purees (e.g., carrot, beet)
- 3. Processing Techniques: Employ specialized processing methods to create distinct products, like: - Artisanal or small-batch production - Handcrafted or homemade-style ketchup - Fermented ketchup (using lactic acid fermentation)

- 1. Preservatives: - Sodium benzoate (E211): Inhibits microbial growth and extends shelf life. - Potassium sorbate (E202): Prevents mold and yeast growth.
- 2. Acidifiers: - Citric acid (E330): Maintains acidity and inhibits bacterial growth. - Lactic acid (E270): Controls pH and prevents spoilage.
- 3. Antioxidants: - Vitamin C (E300): Protects against oxidation and spoilage. - Vitamin E (E307): Prevents rancidity and maintains flavor.
- 4. Texture Modifiers: - Xanthan gum (E415): Improves texture and prevents separation. - Guar gum (E412): Enhances viscosity and stability.

Value addition and storage of puree

- A vegetable puree is a smooth, blended mixture of cooked vegetables that have been liquefied to create a creamy, velvety texture.
- Examples of vegetable purees include:- Carrot puree, Spinach puree, Sweet potato puree , Butternut squash puree.
- Vegetable purees can be used as a base for soups, sauces, or as a side dish on their own.

- 1. Flavor Enhancement: Add herbs, spices, or other seasonings to create unique flavor profiles.
- 2. Ingredient Addition: Introduce new ingredients to increase nutritional value or texture, such as: - Fruits or vegetables for added flavor and nutrients - Nuts or seeds for crunch and healthy fats - Spices or herbs for flavor and antioxidants
- 3. Processing Techniques: Employ specialized processing methods to create distinct products, like: - Roasting or grilling to bring out natural flavors - Fermentation to create probiotic-rich purees - Dehydration to create powdered purees.
- Storage and chemicals for shelf life is common as ketchup and tomato sauce.

Value addition and storage of chips

- 1. Flavor Enhancement: Add seasonings or herbs to create unique flavor profiles, like: - Spicy chips with chili powder or paprika - Sour cream and onion chips with dried onion and lactic acid - Barbecue chips with smoke flavor and spices.
- 2. Ingredient Addition: Introduce new ingredients to increase nutritional value or texture, such as: - Vegetable chips with sweet potato or beet - Protein-enriched chips with pea protein or lentil flour - Fiber-rich chips with chia seeds.
- 3. Processing Techniques: Employ specialized processing methods to create distinct products, like: - Kettle-cooked chips for a crunchier texture - Baked chips for a lower-calorie option.

- Cool, Dry Place: Store chips in a cool, dry place, away from direct sunlight and heat sources.
- Airtight Containers: Use airtight containers, such as plastic bags or cardboard boxes, to prevent moisture and air from entering.
- Room Temperature: Store chips at room temperature (around 70-75°F/21-24°C) to preserve flavor and texture.
- Avoid Humidity: Keep chips away from humid environments, as moisture can cause chips to become stale or soggy.
- Avoid Light: Light can cause chips to become stale or develop off-flavors, so store them in a dark or dimly lit area.
- Stackable Containers: Use stackable containers to store chips, making it easy to access and dispense them.
- Bay Leaves: Place bay leaves in the container to absorb moisture and help preserve freshness.
- The chips packs are filled with nitrogen gas to prevent oxidation.

Value addition and storage of pickles

- 1. Flavor Enhancement: Add unique seasonings or spices to create different flavor profiles, like: - Garlic dill pickles - Sweet and sour pickles - Spicy pickles with hot peppers
- 2. Ingredient Addition: Introduce new ingredients to increase nutritional value or texture, such as: - Pickles with added probiotics for gut health - Pickles with omega-3 fatty acids for heart health - Pickles with antioxidants like turmeric or ginger
- 3. Processing Techniques: Employ specialized processing methods to create distinct products, like: - Fermented pickles with live cultures - Quick-pickled vegetables for a tangy snack - Pickle juice with added electrolytes for a post-workout drink

- 1. Preservatives: - Sodium benzoate (E211): Inhibits microbial growth and extends shelf life. - Potassium sorbate (E202): Prevents mold and yeast growth.
- 2. Acidulants: - Vinegar (acetic acid): Maintains pH and acts as a preservative. - Lemon juice (citric acid): Adds flavor and acts as a preservative.
- 3. Antioxidants: - Vitamin C (E300): Protects against oxidation and spoilage. - Vitamin E (E307): Prevents rancidity and maintains flavor.
- 4. Texture Modifiers: - Calcium chloride (E509): Improves texture and prevents softening. - Alum (E520): Improves texture and prevents spoilage.
- 5. Flavor Enhancers: - Sugar or high-fructose corn syrup: Balances flavor and sweetness. - Salt: Enhances flavor and acts as a preservative.

DEHYDRATED FRUITS AND VEGETABLES

FERMENTED FOODS AND BEVERAGES

BEVERAGES FROM FRUITS AND VEGETABLES

Drying and Dehydration of fruits and vegetables

INTRODUCTION:

- Dehydrated fruits and vegetables are fruits and vegetables that have had most of their water removed through a process called drying.
- Drying is a food preservation method that removes enough moisture to prevent the growth of bacteria, yeast, and mold.
- It also reduces enzyme activity ity and microbial growth, which helps maintain the quality of the fruit or vegetable.

FRUITS AND VEGETABLE SUITABLE FOR DRYING:

Apples	Beets
Apricots	Carrots
Bananas	Sweet corn
Cherries	Garlic
Coconuts	Horseradish
Dates	Mushrooms
Figs	Okra
Grapes	Onions
Nectarines	Parsnips
Peaches	Parsley
Pears	Peas
Pineapples	Peppers (red, green, and chili)
Plums	Potatoes

DRYING TECHINQUES:

- Sun or solar drying
- Freeze drying
- Drum drying
- Spray drying
- Foam mat and vacuum belt
- Convection air C Superheated steam
- Osmotic drying
- Microwave

SUN DRYING:

- Fruits safe to dry due to high acid and sugar content.
- Vegetables should not be dried outside.
- They need constant temperature C airflow.
- Temperature of 30 C or higher for several days with humidity below 60%
- Cover to protect against insects/pests.

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.

FREEZE DRYING:

- Freeze-drying, also known as lyophilisation, or cry desiccation, is a dehydration process typically used to preserve a perishable material or make the material more convenient for transport.
    - Freeze-drying works by freezing the material and then reducing the surrounding pressure to allow the frozen water in the material to sublimate directly from the solid phase to the gas phase.

OVEN DRYING:

- By combining the factors of heat, low humidity and air flow, an oven can be used as a dehydrator.
- Oven drying is slower than dehydrators becaus ϵ it does not have a built-in fan for the air movement.
- It takes about two times longer to dry . The food in an oven than it does in a dehydrator.
- Thus, the oven is not as efficient as a dehydrator and uses more energy.

ROOM TEMPERATURE FOR DRYING:

- Method used mainly for herbs C
  hot peppers
- Strung on string or tied in bundles and suspended from overhead racks in air until dry.
- Enclosed in paper bags with openings for air circulation.
- Herbs can also be dried in the microwave oven.

TEMPERATURE FOR DRYING:

- The ideal temperature for drying or dehydrating foods is 60-70 C.
- If higher temperatures are used, food cooks instead of dries
- Avoid “case hardening” – dried on outside but moisture trapped inside allowing mold growth.
- Temperature close to glass transition gives better products.

FACTORS AFFECTING DRYING:

- Temperature
- Humidity
- Air velocity
- Direction of air flow
- Type of dryer
- Type and size of food

THE PROCESS:

- Prepare the fruit: wash, core and peel if desired
- Fruits can be halved or sliced and some left whole
- Thin, uniform, peeled slices dry fastest
- If fruit is whole, “check” or crack the skin to speed drying.

FERMENTED BEVERAGE

- Fermented fruit beverage is a fruit juice which has undergone alcoholic fermentation by yeast like (Saccharomyces cerevisae).
- Examples: wine, port, sherry, tokay, muscat, perry, orange wine, berry wine and cider

WHY ARE THE PREPARED:

- Lightly fermented drinks are an excellent source of beneficial bacteria and yeast that help to support digestive system health.
- Benef  e them

HISTORY:

- Lavoisier (1789)- analyzed the chemical composition of sugar and its components like ethanol, carbon di oxide and traces of acetic acid.
- Louis Pasteur- demonstrated the existence of other compounds like glycerol and succinic acids.
- Grape wine is the oldest example.

WINE:

- Wine is a beverage resulting from the fermentation by yeasts of the grape juice with proper processing and addition.
- Light wine
- 7 to9% alcohol
- Medium wine – 9 to 16% alcohol
- Strong wine
- 16 to 21% alcohol

GRAPE:

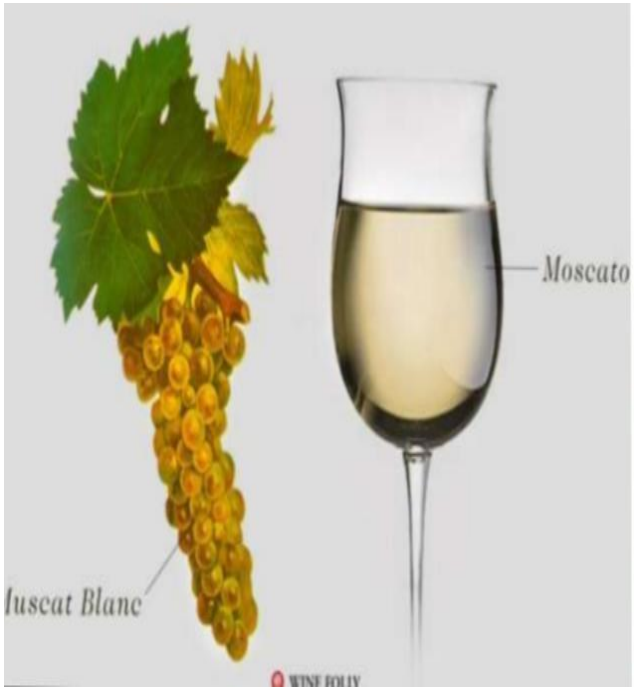
- Rich in natural sugar.
- Natural association of fermentative yeasts with berries
- nitrogenous matters promotes growth of yeast.
- High juice acidity favourable for yeast.
- High alcohol and acid content.

CIDER:

- Fermentation of special grade of apples which have a high tannin content of 0.1- 0.3%.
- Cider apples are so chosen that their juice contain higher percentage of sugar (i 12.5%) than normal apple juice .

PORT:

- It is a fortified, sweet red wine made originally in Portugal, but now in other countries also.
- SHERRY –Spanish wine, matured by placing the barrels for 3 to 4 months in sunlight, where the temperature is as high as 54 to 60°C.
- MUSCAT -It is prepared from Muscat grapes in Italy, California, Spain and Australia



- PERRY -Wine made from pears is known as Perry. Wastes, culled fruits and trimmings left over from canning may also be used for making perry.
- ORANGE WINE -Orange juice is sweetened by adding sugar and then allowed to ferment. Orange oil should not be added as it may hinder fermentation.
- BERRY WINE -Wines prepared from berries like strawberry, blackberry and elderberrys.

- NIRA -It is prepared from the juice of the palm tree.
- FENI - This is a fermented wine made from cashe Goa.

ADVANTAGES;

- Support the digestive system.
- Support liver health.
- Probiotic-rich foods and drinks also support oral health.
- Probiotic-rich foods helps incombatting illness and in mitigating autoimmune disease.
- DISADVANTAGES:
- On excessive consumption it may lead to:
- heart problems
- stork
- fatty liver disease
- liver damage
- mental health conditions
- certain cancers
- pancreatitis