

# SYRUP



# SYRUP

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## Definition:

- Syrup is a **nearly saturated** aqueous solution of **sugar** such as sucrose in water, with or without medicinal or flavouring ingredients.
- When the syrup contains some added medicinal substances, it is called **medicated** syrup.
- **Flavoured** syrup is one which is not medicated but contains flavoured substances, and it is used as **flavoured vehicle**.

➤ It is important that the concentration of sucrose **approach but not quite reach** the saturated point.

➤ In dilute solution, sucrose provides an excellent nutrient for many microorganisms.

➤ Its concentrated solution on the other hand, retards their growth. However, a saturated solution may lead to crystallization of a part of the sucrose under conditions of changing temperature.

# PRESERVATION OF SYRUPS

- ✗ Many of the official syrups do not contain preservative other than an adequate sucrose concentration.
- ✗ The concentration of sucrose is an important factor in inhibiting molds growth.
- ✗ Nearly **saturated solutions** of sucrose if properly stored **do not need a preservative**. As these solutions do not contain free water so they are anhydrous medium with respect to growth, of microorganisms.



- ✓ Certain syrups may contain preservatives.
- ✓ If the concentration of sucrose is **less than 85 % w/v** of sucrose, a preservative should be added. The preservatives used may be the following :



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Preservative	Concentration (%)
Benzoic acid	0.1-0.2
Sodium benzoate	0.1-0.2
Butyl paraben	0.02
Propyl paraben	0.05
Methyl paraben	0.1
Sorbic acid	0.1
Alcohol	15-20

Benzoates, parabens and sorbic acid are most effective in acid syrups and are ineffective in alkaline syrups

## **CALCULATION OF THE AMOUNT ADDED PRESERVATIVE TO SYRUPS:**

- ✗ The amount of added preservative to syrup containing a reduced amount of sugar **depends on the amount of "free water "**,
- ✗ e.g. 100 ml of a 65 % w/v sucrose solution is equivalent to 76.5 ml of 85 % w/v syrup and 23.5 ml of water.

That is

100 ml containing 85 gm sucrose

x ml containing 65 gm sucrose

$$x = (65 \times 100) / (85) = 76.5 \text{ ml}$$

✓ In 65 % w/v sucrose containing 76.5 ml of syrup containing the official concentration (85%) and the amounts of free water is calculated as:

$$✓ \text{Free water} = 100 - 76.5 = 23.5 \text{ ml}$$



✓The amount of preservative is proportional to the amount of the free water.

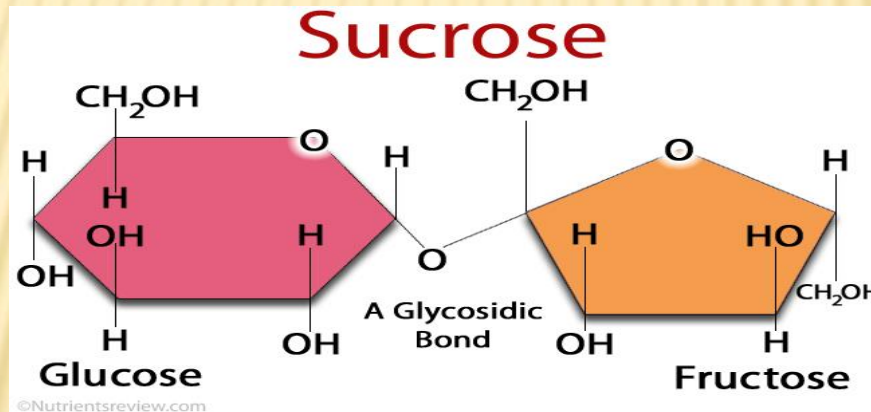
✓The more the free water, the more, the added preservative.

✓ In some syrup alcohol is, present in small amounts. It serves as a solvent for certain ingredients. The concentration of the alcohol is not sufficient to act as a preservative. But some authors believe that alcohol evaporates on the surface of the syrup and thus prevents the growth of surface molds.

# SUGARS USED IN PREPARING SYRUPS:

## × Sucrose:

- × It is a disaccharide which undergoes hydrolysis to give the monosaccharides dextrose (glucose) and levulose (fructose).



Sucrose

Dextrose (d) + Levulose (1)

✓ As a result of this reaction. the following take place:

1. Solutions of inverted sugar are **more subjected to fermentations** than the solution of sucrose.
2. After hydrolysis or inversion the solution is sweeter i.e. if sucrose is rated 100 dextrose is rated 74 & levulose 173, **thus invert sugar is 1.23 times as sweet as sucrose.**

3. The **levulose** is also responsible for the **brown discolouration** which develops in some colourless syrup. This change is called **caramelization**, it also takes place in syrups containing strong acids because the hydrogen ion catalyses the inversion of sucrose.





## *The advantages of sucrose are:*

1. Its purity.
2. Its high degree of sweetness,
3. Relatively cheap,
4. Readily soluble in water,
5. Lack of colour ,
6. Ease of handling.

## •Dextrose:

- ✓ Dextrose appears in a few of official syrups in USP as a substitute for sucrose in **syrup** containing **strong acid** in order to **eliminate the discoloration associated with carmelization**.
- ✓ It forms a saturated solution at 50 % which is less viscous than simple syrup .
- ✓ Its saturated solution readily supports the growth of micro-organisms.
- ✓ Dextrose dissolves more slowly, It is less sweet.

# PREPARATION OF SYRUPS

- 1-Solution Method with Heat .
- 2- Agitation Method.
- 3-addition of a Medicated Liquid to Syrup.
- 4- Percolation Method.

# SIMPLE SYRUP

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✕ (Sirupus Simplex)

BP

EP

USP and

✕ R/ Sucrose

667 gm

850 gm

✕ Purified Water ad

1000 gm

1000 ml



## *Preparation of simple syrup in EP*

- 1- **Put** the weighed amount of sucrose in a previously weighed porcelain dish. Add distilled water to the dish till the contents of the dish weigh 1000 gm.
- 2- **Transfer** the dish with its contents to a boiling water bath and heat with constant stirring with a glass rod till the sugar is completely dissolved.
- 3- **Cool** the dish and **ascertain** the weight again adding boiling water to complete to 1000 gm if necessary.
- 4- **Filter** while hot through a piece of lint or filter paper into a dry bottle.
- 5- **Shake** occasionally till completely cold.

# *Preparations of simple syrup in USP*

- 1- **Dissolve** the required amount of sugar in a beaker with the required amount of boiling water. The solution is hastened by heating on boiling water bath with stirring with a glass rod taking care to remove the flame from time to time in order to **prevent over heating of the syrup**
- 2- When the sugar is completely dissolved, **filter** rapidly while hot through a filter paper.
- 3- **Adjust** to the required volume with boiling water.
- 4- **Transfer** to a dry clean bottle and shake continuously till it cools well.

# Percolation Method

1. **Place** the sucrose in a suitable percolator, the neck of which is nearly filled with loosely packed cotton moistened, after packing with a few drops of water.
2. **Pour** carefully about 450 ml of purified water upon the sucrose; regulate the outflow to a steady drip of percolate.
3. **Return** the percolate if necessary until all of the sucrose has dissolved. Then **wash** the inside of the percolator and the cotton with sufficient purified water to, bring the volume of the percolate to 1000 ml and mix.



## **Description:**

A clear heavy viscous liquid.

## **Specific gravity**

1.313

## **Storage**

In tight containers, at a temperature not more than 25 °C.

## **Incompatibilities:**

1. with preparations containing **high percentage of alcohols** as crystallization of sucrose will take place simple syrup can be mixed with 10% alcohol without crystallization
2. Concentrated acids aid the hydrolysis of sugars.



# THE ACTIONS AND USES OF SYRUPS:

1. Syrups are used as **vehicles** for drugs such as **antibiotics, Antihistaminic, antitussives and vitamins** .
2. The **reducing sugars**, dextrose and levulose formed in the syrup as the result of inversion, are of value in **retarding the oxidation** of other substance.
3. Concentrated sucrose solutions **prevent decomposition of vegetable extracted drugs**; such action is due to great osmotic pressure exerted by sucrose solution, inhibiting the development of bacteria, fungi and molds, which cause decomposition.

4. Because they contain no or very little alcohol, particularly for children to the alcoholic vehicle elixirs .
5. They possess remarkable masking for the saline drugs.
6. Their lack of alcohol makes them superior as solvents for water-soluble substances.

# NOTES

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✧ Syrups prepared by hot method are characterized by:

1. It has a light amber colour due to slight **caramelization**.
2. It keeps better than syrup made by the cold process because it is **sterilized by the heat**.
3. Excessive heating of syrups at the boiling temperature is undesirable since **inversion of sucrose occurs** with an increased tendency to ferment

4. Upon using heat for preparing syrups the containers must be shaken occasionally till quite cold for fear of the **water which condenses** on the inside surface or the upper surface may fall to dilute the upper layer of the syrup and thus becomes liable to fermentation.



## ARTIFICIAL SYRUPS. NON NUTRITIVE SYRUPS:

- ✖ Many formulae are needed to be administered to persons who must regulate their sugar e.g. persons suffering from **diabetes mellitus, which is characterized by hyperglycemia.**
- ✖ These formulae must be **sugar-free**, the artificial syrups (non nutritive) are intended as substitutes for syrups.

# GLYCERIN

- ✖ It is characterized by its sweet taste and it is a viscous liquid, but its **disadvantage is that it is a glycogenetic substance** i.e. material converted into glucose in body either directly or indirectly.



# ARTIFICIAL SIMPLE SYRUP

- ✖ Later on an artificial simple syrup was recommended as a **diabetic simple syrup**:

R/

- |                                      |      |
|--------------------------------------|------|
| ✖ Sodium carboxymethyl cellulose     | 1.5% |
| ✖ Compound sodium cyclamate Solution | 2.8% |
| ✖ Preservative                       | Q.S. |
| ✖ Purified water                     | Q.S. |

- ✖ The function of sodium carboxy methyl cellulose is to give a viscous syrup.

# SACCHARIN SODIUM:(SUCARYL SODIUM)

- ✗ Is a synthetic sweetener which has significantly bitter after taste. It is 300 to 400 times as sweet as sucrose. So, its often used in combination with the compound cyclamate sodium solution.
- ✗ The mixture of 10 parts cyclamate to 1 part saccharin is common and take advantage of the synergitic sweetening effect that saccharin has on sucaryl, with minimum bitter after taste.



# SORBITOL – BASED SYRUPS

- ✖ Sorbitol is a **hexahydric alcohol** ( $C_6H_{14}O_6$ ) made by **hydrogenation of glucose** and is used as a substitute for sucrose Syrups.
- ✖ *Sorbitol solution is superior to simple syrup because:*
  1. Sorbitol is not irritating to the mouth and throat.
  2. It does not cause dental caries.
  3. No significant hyperglycemia has been found after its absorption, so it is used as component of non-nutritive vehicles.

4. Sorbitol solution is about 60% as sweet as sucrose and half as viscous as simple syrup but it has **excellent mouth feel** and lacks the acrid characteristics of some polyols (e.g. propylene glycol).
5. Sorbitol is added to sucrose-based syrups to **reduce the tendency of concentrated sugar solutions to crystallize**.
6. Sorbitol **inhibits the sticking or loking of bottle caps** which occurs with high concentrations of sucrose.
7. Sorbitol is **chemically stable and practically inert**, so many drugs are more stable in sorbitol

# Potassium chloride syruo

R/

potassium chloride		3.3 gm
sucrose		70 gm
purified water	to	100 ml

Mitte 50 ml

Sig: MDU

- ✓ Calculations
- ✓ Preparation
- ✓ Label

✓ Use : k supplement for treatment and prophylaxis of hypokalemia