Lab. 2 Pharmaceutical Technology

Syrups

Submitted by:

Dr. Hayder Kadhim Drais

PhD and MSc in pharmaceutics

Syrups: Are sweet, viscous aqueous liquids, they are concentrated aqueous preparations of sugar or sugar substitute with or without flavoring agents and medicinal substances.

Medically they are divided into two types:-

1. **Non medicated syrups:-(flavoring syrups):** These syrups are intended to serve as pleasant –tasting vehicles for medicinal substances (example **cherry syrup, orange syrup, simple syrup**)

2. **Medicated syrups :-**These contain ingredients giving them therapeutic value. (example: **Antitussive, antihistamines**).

Pharmaceutical classification of syrups according to their basic (sugar) formulation:

1. Sugar based syrups:

These are concentrated solutions of sugar (e.g. sucrose, dextrose). The use of sucrose is preferred in the pharmaceutical preparation due to:

A. It's purity **B.** Degree of sweetness **C.** Lack of color

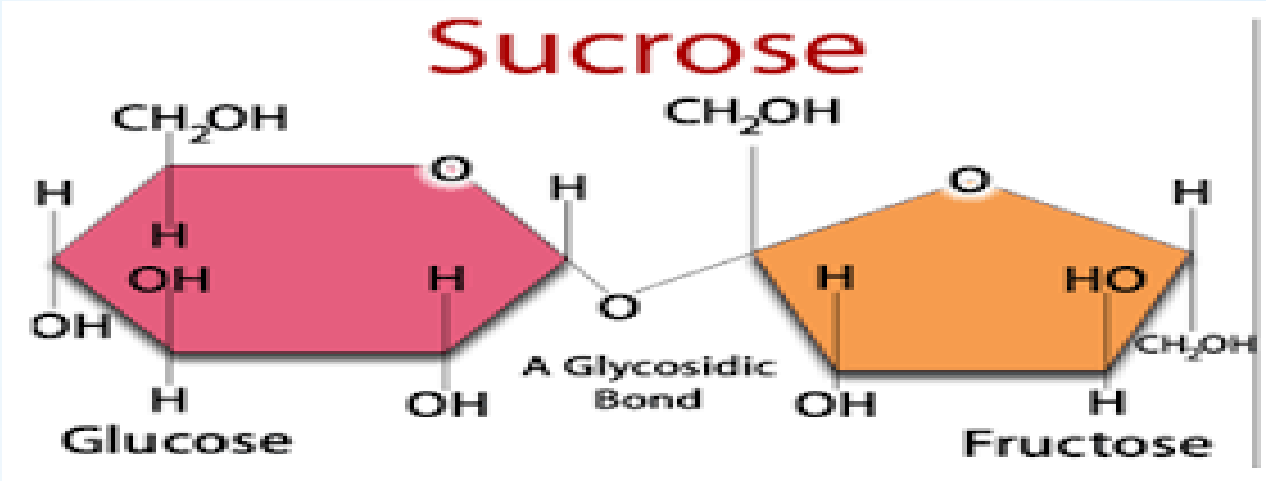
D. Ease of handling **E.** It's inertness.

2. Sugar free syrups:

These are formulated with **artificial sweetening agents**.(e.g. Saccharin, Aspartame and sorbitol). Advantages of artificial sweeteners are:

1. Weight Control: If someone wants to lose weight, then they should use an artificial sweetening agent as virtually it **carries zero calories**. **One gram of sugar carries 4 calories.**

2. Diabetes mellitus: It also helps in controlling diabetes as it does not raise the blood sugar levels because it does not contain the carbohydrates in it.


Sucrose
CH2OH
O
H
H
OH
H
OH
H
OH
Glucose
A Glycosidic Bond
CH2OH
O
H
H
HO
CH2OH
OH
H
Fructose

Problems associated with sucrose: it subject to two degradative pathways:

√ Fermentation √ Hydrolysis

1. Fermentation of sucrose:

‣ Sucrose as carbohydrate in dilute solution provide nutrient media for the growth of micro-organisms (M.O) as **mold and yeasts**.

‣‣ The steps of M.O. growth include: turbidity (change in colour) ,(change in odour) ,(change in taste).

‣‣‣ The concentration of sucrose is an important factor in inhibition of mold growth, the **saturated solution** of sucrose if stored properly will be self preserving (contain no free water, thus they behave as anhydrous media with respect to growth of M.O and this will lead to shrinkage and lyses of M.O.

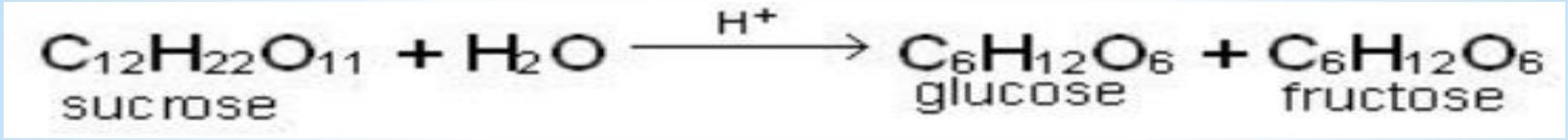
* Preservatives which are suitable for use in syrups: benzoate, parapens, sorbic acid, mixture of methyl parapen and alcohols.

* In some syrups alcohol present in small amount **(not more than 10%)** which serve as **solubilizing agent** for alcohol soluble ingredient, also alcohol concentrated by evaporation above the syrup and **prevent the growth of surface molds**.

2. Hydrolysis of sucrose

Sucrose is a disaccharide and can be hydrolyzed to give monosaccharides dextrose (glucose) and fructose (levulose)

* The hydrolytic reaction is acid specific (i.e. hydrogen ion act as a catalyst) this reaction called inversion.



The invert sugars (dextrose and fructose) have specific properties:

- They are fermented more easily than sucrose
- They are sweeter (together) than sucrose
- Degradation of laevulose (which is formed by inversion) is responsible for brown color of some colorless syrups. This change called caramelization, this phenomena is take place in syrup containing acids.

Storage of syrup

Generally syrups are stored at room temperature, in tightly stoppered well filled bottles, **saturation and refrigeration will inhibit both mold growth and inversion, but less than 4°C will cause crystallization (large crystals difficult to redissolved.)**

Simple syrup B.P

Rx

Sucrose 667 g

D.W Q.S 1000 g

Method :

1. Weigh the beaker empty and weigh the sucrose in it

2. Add small quantity of water with stirring to dissolve the sucrose on gentle heating (using water bath).

3. Weigh again to complete the weigh by hot water

Simple syrup U.S.P.

Rx

Sucrose 850 g

D.W Q.S 1000 ml

Methods : Prepare by using boiled water

Ipecac syrup

Rx

Ipecac fluid extracts 70 ml

Glycerin 100 ml

Simple syrup Q.S 1000 ml

Sig fʒ ss t.i.d p.c

Method:

Mix the fluid extract with glycerin then add enough syrup to make the product measure 1000 ml and mix thoroughly.

Note :

Ipecac used as an expectorant in small dose (25 -100 mg), at larger dose it is used as an emetic agent (vomiting occur within 30 min) due to irritation of GIT. Emetic dose in adult 10-30 ml ,in children 10 -15 ml.

Tolu balsam syrup U.S.P

Rx

Tr. of tolu balsam 50 ml

Mg carbonate 10 g

Sucrose 820 g

D.W Q.S 1000 ml

Sig fʒ ss p.r.n

Method:

1. Mix tolu balsam tr. with10 gm Mg carbonate and sucrose 60 g in a mortar.
2. Gradually add 430 ml D.W with trituration and filter
3. Dissolve the remainder of sucrose (760 g) in the clear filtrate with gentle heating (not over 50 c)
4. Strain the syrup while warm and add D.W through strainer to make product, then mix thoroughly .

Uses and directions

✓Tolu balsam syrup used as expectorant , flavouring agent.

✓Tolu balsam is soluble in alcohol , ether, chloroform but it is insoluble in water because it contain resins.

✓Mg carbonate is very soluble in water and partially soluble in alcohol.

✓Mg carbonate used as distributing agent for tolu balsam tr. Because it is alkaline and this help in dissolving the resinous content of the tolu balsam .

Mist diuretic (acidic):

Rx

Potassium citrate 300 g

Citric acid 50 g

Lemon spirit 5 ml

Quillaia tr. 10 ml

Syrup 250 ml

Chloroform water double strength 300 ml

Water Q.S 1000 ml

Method

1. Dissolve the solids in a mixture of the CHCl3 water and syrup by shaking or vigorous stirring. **2.** Add quillaia tr. **3.** Add lemon spirit in small amounts ,shake after each addition **4.** Complete the volume and mix.

Note:

➢Double strength chloroform water is twice the concentration of ordinary aromatic water

➢Acidic mist . diuretic used for hypertensive patient.

Mist diuretic (alkaline)

Rx

Pot. citrate 20 g

Na bicarb. 20 g

Conce. infusion of buchu 20 ml

Syrup of orange 40 ml

Chloroform water Q.S 300 ml

Method

1. Weigh the solids and dissolve them in the mixture of chloroform and syrup by shaking

2. Add conc. Infusion of bucha

3. Complete the volume and mix.

Dextrose based syrup

Dextrose is used instead of **sucrose** in syrups containing **strong acids** to prevent caramelization.

Differences between sucrose and dextrose

1. The saturated solution of dextrose is **70% (less viscus)**, so the dextrose based syrup susceptible to the growth of micro-organism, therefore **glycerin (30-45%v/v)** used as a preservative, increase the viscosity and also give additional sweetness to the preparation .

2. Dextrose **dissolve more slowly** than sucrose.

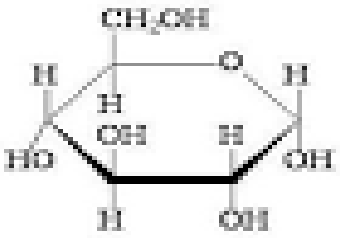
3. The sweetness of dextrose **is less than the sweetness of sucrose** .

Note :-

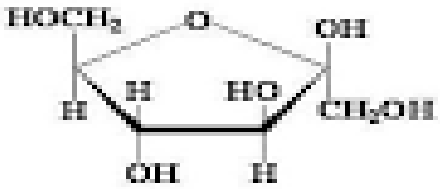
We prefer using glycerin as preservative in dextrose based syrup why? To increase the viscosity and also give additional sweetness to the preparation.

Caramelization process is a non-enzymatic browning sugar used extensively in cooking for the resulting sweet nutty flavor and brown color. The brown colors are produced by three groups of polymers: caramelans ($C_{24}H_{36}O_{18}$), caramelens ($C_{36}H_{50}O_{25}$), and caramelins ($C_{125}H_{188}O_{80}$). As the process occurs, volatile chemicals such as diacetyl are released, producing the characteristic caramel flavor.

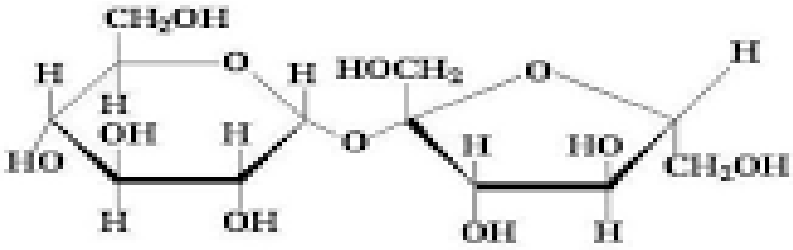
Note: The key difference between dextrose and sucrose is that the dextrose (glucose) is a monosaccharide whereas the sucrose is a disaccharide.



glucose



fructose



sucrose

Sugar-free syrup (non-nutritive syrup)

Sugar free syrup: it is called artificial syrup ,this type of syrup given to patients suffering from diabetes mellitus.

General formula of non-nutritive syrups:

1. Sweetening agent: sorbitol , saccharine , aspartame.

2. Viscosity builder: carboxymethyl cellulose (CMC), Sodium alginate.

3. Preservative : benzoic acid, sodium benzoate.

4. Purified water.

Sorbitol-based syrup

Sorbitol has the following properties:

✓Used for diabetic patient (not cause hyperglycemia).

✓Not cause dental carries.

✓Sorbitol is 60 % as sweet as sucrose.

✓Have a good taste.

✓Chemically stable.

✓Not absorbed from GIT as rapid as sucrose.

✓Not irritating to the mouth and throat membrane.

✓Has a laxative effect if ingested in large quantity.

✓Has half the viscosity of simple syrup.

Sorbitol syrup USP

Rx

Sorbitol 70 g

D.W QS 100 g

Method: by simple solution method

Chloral hydrate syrup (U.S.P) official

Rx

Chloral hydrate 0.5 g

Simple syrup Q.S 100 ml

Ft. mist

Sig. fʒ ss o.n (every night)

Method:

Dissolve chloral hydrate in 75 ml of simple syrup, stir well, filter, then complete the volume of filtrate to 100 ml by simple syrup.

Chloral hydrate syrup (non-official)

Chloral hydrate 0.5 g

Sorbitol 70 g

D.W Q.S 100 ml

Method:

1. Dissolve chloral hydrate and sorbitol in 75 ml of water .
2. Stir well to enhance solubility.
3. Strain by cotton.
4. Complete the volume to 100 ml by D.W.

Preparation of medicated syrup

Drug 300mg

Alcohol 2ml

Sucrose 10g

Glycerin 1ml

Flavor 1ml

Coloring agent 1ml

Purified water QS 100ml

Method

1. 70 water + drug + sucrose (gentle heat and mix)
2. add alcohol + coloring agent + glycerin + flavor
3. complete the volume
4. store in bottle

Report requirements

1. Name of experiment
2. Date
3. Name of students
4. materials and equipment
5. Calculations
6. Procedure of preparation
7. The medical uses
8. Role each ingredient in Rx

Common systems of measurements and intersystem conversion:

1. The International System of Units (SI) is the official system for weights and measures as stated in the United States Pharmacopeia—National Formulary.

2. The apothecaries' system of measurement is the traditional system of pharmacy, and although it is now largely of historic significance, components of this system are occasionally found on prescriptions.

3. The avoirdupois system is the common system of commerce, employed along with the SI in the United States.

Apothecaries' Fluid Measure

60 minims (♏) = 1 fluidrachm or fluidram (f℥ or ℥)[a]
8 fluidrachms (480 minims) = 1 fluidounce (f℥ or ℥)[a]
16 fluidounces = 1 pint (pt)
2 pints (32 fluidounces) = 1 quart (qt)
4 quarts (8 pints) = 1 gallon (gal)

Apothecaries' Measure of Weight

20 grains (gr) = 1 scruple (℈)
3 scruples (60 grains) = 1 drachm or dram (℥)
8 drachms (480 grains) = 1 ounce (℥)
12 ounces (5760 grains) = 1 pound (℔)

Avoirdupois Measure of Weight

437½ or 437.5 grain (gr) = 1 ounce (oz.)
16 ounces (7000 grains) = 1 pound (lb.)

Thank you