Syrup Formulation I

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Outline

Definition

Classification

Components

Methods of preparation

Preservation

Storage

SYRUPS

- Syrups are highly concentrated aqueous solutions of sugar or sugar substitute that traditionaly contain flavoring agent (Cherry syrup, orange syrup, raspberry syrup)

Classification

1. **Simple Syrup** :concentrated solution of sucrose in purified water alone.

2. **Non-Medicated Syrups**: Syrups containing flavoring agents, but not medicinal substances are called non-medicated or flavored vehicles (syrups).

3. **Medicated Syrups**: Contain ingredients giving them therapeutic value.

- Therapeutic agents may either be directly incoporated into non-medicated syrup or maybe added as medicated syrup.

COMPONENTS OF SYRUP

1. Sugar (sucrose), or sugar substitute (artificial sweeteners) used to provide sweetness and viscosity.
2. Purified water
3. Antimicrobial Preservatives
4. Flavoring agent
5. Coloring agent
6. Viscosity Modfiers
7. Miscellaneous special solvents, solubilizing agents, thickeners or stabilizers.

- **Pharmaceutically, Syrups are classified into two :**
- Sucrose Based: Concentrated solutions
- Non-Sucrose Based: Formulated with artificial sweetening agents and viscosity builders.

Pharmaceutical Classification based on their basic formula

- ***Sucrose- and Non-sucrose-Based Syrups :***

- ***Sucrose*** is the sugar most frequently employed in syrups sometimes it may be replaced in whole or in part by other sugars or substances such as ***sorbitol, glycerin, and propylene glycol.***

- Most syrups contain a high proportion of sucrose, usually 60% to 80%, not only because of the desirable sweetness and viscosity of such solutions but also because of their inherent stability

Sucrose

- Sucrose is the most widely used sweetener.
- It is a white crystalline powder, soluble in water and alcohol.
- It inhibits the growth of micro-organisms in solution at concentrations above 65% by reducing the water activity coefficient.
- During the preparation of sucrose solution, avoid charring and caramelization caused by heat.
- Sucrose is chemically and physically stable in the pH range of 4.0–8.0.

Sucrose

- It is frequently used in conjunction with sorbitol, glycerin, and other polyols, which reduce its tendency to crystallize.
- Sugar syrups promote significant ‘‘cap-ÿlocking’’—the crystallization of the sugar on the cap and bottle thread, but the addition of glycerin (10–20%) minimizes this effect.
- Glycerin is seldom used as a single sweetener in pharmaceuticals because it has a characteristic mouth warming and burning effect

Dextrose

- Dextrose may be used as a substitute for sucrose in syrups containing strong acids in order to eliminate the discoloration associated with caramelization (hydroiodic syrup)
- The difficulty or problem with dextrose are as follows:

1.It forms a saturated solutions in water at 70%w/v which is less viscous than simple syrup.

2.Dextrose dissolves more slowly

3.Dextrose is less sweet

Dextrose

So, with the use of dextrose, it is necessary to improve the keeping qualities by adding:

1. Preservatives which may be glycerin in 30 to 45% which is also serves to increase viscosity.

2. Sweeting agent

Characteristics of Sorbitol

- Sorbitol solution is not irritating to the membrane of the mouth and the throat
- Unlike sucrose, it does not contribute to the formation of dental caries
- Although it is metabolized and converted into glucose it is not absorbed from the GIT as rapid as sugars, so no significant hyperglycemia is formed

Sorbitol Based Syrups

- Although it is 60% as sweet as sucrose and half as viscous as simple syrup, it has excellent “mouth feel”
- Sorbitol is compatible with other polyol and simple syrup
- Sorbitol is chemically stable and inert.
- Sorbitol inhibits the sticking and locking of bottle caps which occurs high with high concentration of sucrose, so they are usually combined
- Many drugs are more stable in sorbitol than in sucrose solution thus, may have extended shelf life

Flavorants for Syrup

- Most syrups flavored either with synthetic flavorants or with naturally occurring materials as volatile oil, vanillin, and others, to give the syrup pleasant tasting.
- Since syrups are aqueous preparations, these flavorings must possess sufficient water solubility.

Flavor and taste

- Syrups of cinnamon, orange, citric acid, cherry, cocoa, wild cherry, or raspberry can be used to effectively mask salty and bitter tastes in a number of drug products.

Flavors that may be used to mask a salty taste include:

1. apricot
2. peach
3. vanilla
4. wintergreen mint

Colorants for Syrups

- To enhance appeal of the syrup, a coloring agent is generally used which correlates with the flavoring agents

- When used in combination with flavors, the selected color should match the flavor of the formulation, e.g., green with mint-flavored solutions, red for strawberry-flavored.

water-soluble

non-reactive with other components

Sweeteners

- Non-nutritive, synthetic sweetening agents required in the formulation

- Saccharin sodium may be used in concentration of 0.1 to 0.2% but characterized by a bitter after taste.

- Others like Na cyclamate and aspartame.

Sweeteners

Non-nutritive, synthetic sweetening agents required in the formulation

- Saccharin : Sucrose substitute for DM. 500 time sweeter than sucrose. .
- Aspartame: 200 times sweeter than sucrose.
- Sucralose: 600 times sweeter than sucrose

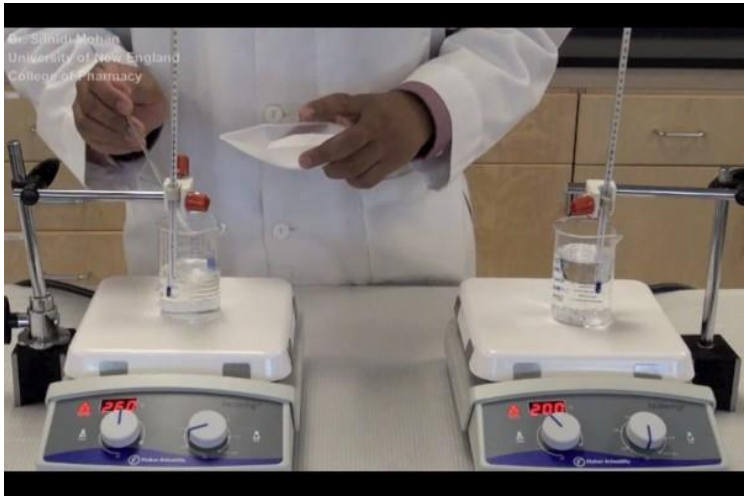
Dry Syrup

- Dry syrup preparations are powdered or granular formulations prepared for reconstitution.

- The main reason for the development of dry syrups is the instability of the active ingredient in the liquid state.
- They have to be used within a limited period after conversion

PREPARATION METHODS

- Solution with heat
- Agitation without heat
- Percolation



1. Solution with heat

This method can be used for:

- Non-volatile medications
- Thermostable ingredients
- Rapid preparations.
- Excessive heating of syrup results formation of caramel
- Caramelization: Evidenced by yellow to brown coloring due to burning of sucrose.
- Exp: Acacia syrup, NF; Cocoa Syrup, NF; Syrup USP (85% sugar, made by cold and hot process, percolation

Syrup-USP & BP

Simple Syrup

- According to USP Sucrose 85% w/v
- According to BP Sucrose 67.7 % w/w

Procedure

1. Add the sugar to the purified water and heat until solution is affected.
2. Heat stable components are added to the hot syrup
3. Cool and made up to volume.
4. If other components are heat labile, they are added after cooling like alcohol and oil.

2. Agitation without heat

- Useful when volatile agents are used in formulation
- Preparation is done in a bottle with a stopper twice the volume of syrup desired.
- Exp. Ferrous Sulfate Syrup, Ephedrine Sulfate, Citric acid Syrup, and Glycyrrhiza Syrup

Agitation without heat

1. Sucrose and other formulative agents maybe dissolved in purified water.

2. Place the ingredients in a bottle of greater capacity than the volume of syrup.

3. Agitate the mixture

3. Percolation

- Purified water is passed slowly through a bed of sucrose
- Percolator is plugged at the neck with cotton ball or glass wall with sucrose on top
- Flow of percolate is regulated by suitable stopper
- Syrup devoid of particles of sucrose is ensured by recycling percolate
- Exp. Wild cherry syrup & Syrup USP

Percolation

Rx

- Sucrose 85 gm
- DW q.s. 100 mL

- Place sucrose in suitable percolator, the neck of which is nearly filled with packed glass wool or cotton, moistened with distilled water.
- Pour carefully a portion of distilled water over sucrose and regulate the outflow to steady drip
- Return the flow from drip back over the sucrose until the sucrose has dissolved
- Use sufficient amount of DW to complete volume to 100 mL.

Tolu Balsam syrup -flavor for cough syrup

Preservation and Storage of Syrups

- Generally, syrups are stored at room temperature in tightly closed bottle and well- filled bottles.

Antimicrobial Preservatives

- The amount of preservatives required in a syrup varies with the proportions of water available for microbial growth.

Preservatives include:

1. Benzoic acid. 0.1% to 0.2%
2. Sodium benzoate – 0.1 to 0.2%
3. Combination of methyl, propyl, butyl parabens totaling 0.1%