

## CHAPTER – 1

### SYRUPS – INTRODUCTION

Definition: syrups are defined as pharmaceutical preparations containing one or more active ingredients dissolved or suspended in a concentrated aqueous solution of sugar or a sugar substitute. These preparations are typically used for oral administration and are intended to be palatable and easy to swallow. Syrups in pharmacopeial standards must meet specific quality criteria regarding their composition, stability, and packaging to ensure their efficacy and safety for medicinal use.

#### FORMULATORY INGREDIENTS

The formulation of syrups can vary depending on their intended use, but some common ingredients used in their preparation include:

**Sugar:** Typically, sucrose, but sometimes other sugars or sugar substitutes like glucose or fructose are used.

**Water:** Used as the solvent for dissolving the sugar and other ingredients.

**Flavors:** Natural or artificial flavors such as fruit extracts, essential oils, or synthetic flavor compounds are added to impart desired taste.

**Preservatives:** Substances like benzoic acid, sorbic acid, or sodium benzoate may be included to prevent microbial growth and extend the shelf life of the syrup.

**Colorants:** Optional color additives may be used to enhance the appearance of the syrup, especially if it's flavored with fruits or herbs.

**Thickening agents:** These can include natural thickeners like agar, pectin, or gum Arabic to adjust the viscosity of the syrup.

**Acidulants:** Citric acid or other acids may be added to adjust the pH of the syrup and enhance its flavor.

**Medicinal Ingredients:** In pharmaceutical syrups, active pharmaceutical ingredients (APIs) are added in specific concentrations to provide therapeutic effects.

### **CLASSIFICATION OF SYRUPS:**

#### **Simple Syrups:**

- Simple syrups are basic syrups made by dissolving sugar in water over heat until the sugar is completely dissolved.
- These syrups are primarily used as sweeteners in beverages and desserts.
- Simple syrups are versatile and can serve as a base for flavored syrups or be infused with additional ingredients for various culinary purposes.

#### **Medicated Syrups:**

- Medicated syrups are pharmaceutical preparations containing active medicinal ingredients dissolved or suspended in a syrup base.
- They are formulated to deliver specific therapeutic effects and are often used for oral administration.
- Common examples include cough syrups, antacids, expectorants, and other over-the-counter or prescription medications.

#### **Flavored Syrups:**

- Flavored syrups are syrups infused with natural or artificial flavors to enhance taste and aroma.
- These syrups can be used in both culinary and beverage applications to add flavor and sweetness.
- Flavored syrups are available in a wide variety of flavors, including fruits (e.g., strawberry, raspberry), herbs (e.g., mint, lavender), spices (e.g., cinnamon, vanilla), and specialty flavors (e.g., caramel, chocolate).

#### **Preparation of Syrups:**

##### **Simple Solution method with the help of heat: -**

This method is used when the substances are thermostable and non-volatile in nature.

Ex: - Simple Syrup., Tolu Syrup N.F., cocoa syrup N.F act. It is less time-consuming method

##### **Simple solution method by agitation: - [without heat]**

This method is suitable for thermolabile substances and volatile substances.

- Syrups prepared by this method have maximum stability.

Ex: Ephedrine sulphate syrup. Codeine phosphate syrup.

**Percolation [extraction] method:**

In this method, Sucrose is percolated with purified water as a menstrum.

Ex: Tolu Syrup Squill Syrup.

**Advantages:**

- Syrups retard the oxidation of drugs; because sucrose itself gets hydrolyzed to laevulose and dextrose which are reducing sugars.
- They are sweet in taste. Therefore, bitter taste of drugs can be reduced.
- Syrups prevent microbial decomposition of many vegetable drugs.

**Disadvantages:**

- On continuous intake syrups promote dental decay and cause gingivitis because it is a very good supplement for bacterial growth
- Syrups are not suitable for diabetic patients and patients who are on a restricted calorie intake.
- Aluminum salts cannot be included in syrups as these are incompatible with sucrose
- Syrups are not suitable for acidic drugs as they promote crystallization of sucrose.

**Date:** **Experiment - 01**

**SIMPLE SYRUP IP'66**

**Aim:** To prepare and submit Simple Syrup IP

**Type of product:** Syrup

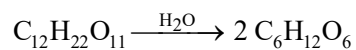
**Category:** Sweetened vehicle, Pharmaceutical aid

**Composition:** Sucrose 66.67% w/w (IP) or 85% w/v (USP)

**Apparatus:** Glass beaker, glass rod, measuring cylinders, spatula, dispensing balance.

**Principle:** Syrups are concentrated aqueous preparations of sucrose or sugar substitutes with or without flavoring agents and medicinal substances. Syrup USP is 66.7% w/v solution of sucrose in 33.3% of purified water as the solvent prepared by simple dissolution with the aid of heat. Simple syrups do not contain active ingredients. They are not intended to be administered as such but are used as vehicle for their flavoring and sweetening properties. Syrups should be freshly prepared (extemporaneous preparation) unless they contain suitable anti-microbial properties. Syrup IP has optical rotation of +56° to +60°.

The solubility of sucrose is 1 in 0.5 parts of water. The quantity of water 33.3% is just enough to dissolve sucrose. Heating enhances the solubility and reduces the viscosity of syrup which permits proper stirring. During preparation, boiling water is added to compensate the water loss by evaporation and to adjust weight. But excess water should not be used to prepare syrup because this leads dilution of concentration of syrup which in turn prone to microbial attack. Moreover, excessive heating is restrained to prevent inversion of sucrose.



Invert sugar so formed readily gets fermented and cause brown coloration to the product. The concentration 66.67% w/w of sucrose doesn't provide microbial growth due to high osmotic pressure is present in saturated solution of sucrose.

**Procedure:**

1. Add water to sucrose in a tared beaker and heat on a water bath until sucrose dissolves.
2. Add sufficient boiling water to produce sufficient quantity.
3. Filter hot syrup if it is not clear. Cool. (0.15% methyl paraben may be added as preservative)

**Storage:** Store in a cool and dark place.

**Simple Syrup Formula:**

S. No	Ingredients	Quantity Given	Quantity Taken (factor X quantity given)
1	Sucrose	667 g	
2	Purified water q. s	1000 g	

**Calculations:**

Factor = Required quantity/Quantity Given

**LABEL**

(Students shall write all aspects of labelling in the space provided below)

SIMPLE SYRUP, IP. (ml)		
<p><b>USE:</b> Pharmaceutical aid</p> <p><b>STORAGE:</b> Store in a well closed container at a temperature not exceeding 25°C</p>	<p>A non-medicated syrup contains: Sucrose:66.7% w/w Wt. Per ml:1.315 to 1.317 Name of the institution</p>	<p>Lic.no. _____ Mfg. Date: _____ Batch no. _____ Expiry date _____</p>

**Report:**

**Date:** Experiment - 02

## **COMPOUND SYRUP OF FERROUS PHOSPHATE BPC'68**

**Aim:** To prepare and submit 25 ml of Compound Ferrous Phosphate syrup.

**Synonyms:** Parish food or parish syrup or chemical food.

**Type of product:** Syrup

**Category:** Haematinic.

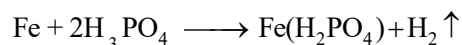
**Composition:** Iron 0.4% w/v, Calcium 0.5% w/v.

**Dose:** 2 to 8ml

**Apparatus:** Glass beaker, glass rod, measuring cylinders, spatula, dispensing balance.

**Principle:** Diet with insufficient supply of iron leads to a condition called anaemia. In such cases, iron supplement, ferrous phosphate syrup is prescribed. Ferrous phosphate syrup is a preparation containing iron along with electrolytes, calcium, potassium, and sodium. These electrolytes overcome the deficiency which is most common in anemic condition. Ferrous phosphate is prepared by a reaction between iron and phosphoric acid. The reaction is expressed in the following equations.

### **1. Preparation of ferrous acid phosphate.**

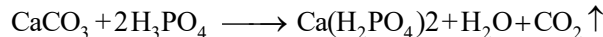


Allign as per above reaction

1. Iron
2. Phosphoric acid
3. Ferrous acid Phosphate

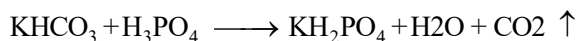
Electrolytes are also supplied in their phosphate form. The reaction between phosphoric acid and calcium carbonate, potassium carbonate, sodium phosphate are as follows. This syrup contains 0.4 -0.45% of iron and 0.5 – 0.58% w/v of calcium. This syrup is prepared by chemical reaction method. The chemical reactions involved in the preparation of syrup are as follows:

2. Preparation of solution containing acid phosphate of calcium, potassium and sodium.

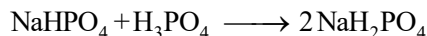


These move to above under reaction

1. Calcium carbonate
2. Phosphoric acid
3. Calcium acid Phosphate



1. Potassium bicarbonate
2. Phosphoric acid
3. Potassium acid Phosphate



1. Sodium Hydrogen Phosphate
2. Phosphoric acid
3. Sodium acid Phosphate

The reactions do not complete at this stage, because the amount of phosphoric acid is insufficient. Hence, excess of phosphoric acid is included in the formula to complete the reactions.

Aqueous extract of Colchicine acts as a coloring agent. It also acts as a masking agent to mask color change of the preparation during storage due to oxidation of constituents. Orange flower water acts as flavoring agent. Since iron is essentially supplied orally, syrup (sucrose) is used as a major ingredient as sweetening agent.

This preparation is a Haematinic and is used in iron deficiency.

### Procedure:

#### Part -1: Preparation of medicinal contents:

1. Phosphoric acid is diluted with water and divided into 2 portions.
2. To one portion of diluted phosphoric acid, iron is added. The contents are heated on a water bath until iron dissolves. Heating on a water bath minimizes evaporation of water. If evaporation of water takes place, a solid mass is formed, which will not dissolve in water.
3. Calcium carbonate, potassium bicarbonate and sodium phosphate are dissolved in a second portion of diluted phosphoric acid in a beaker by stirring. Carbon dioxide (effervescence) is allowed to evolve.
4. The contents of 2<sup>nd</sup> step are mixed with the contents of 3<sup>rd</sup> step.

## 18 Pharmaceutics – I: A Practical Manual

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5. The reactions are completed. The resulting solution contains impurities like ironcarbide, which are derived from the iron solution. The contents are filtered to remove these unwanted substances.

### Part-2: Preparation of vehicle:

1. Coloring agent is extracted from Colchineal by boiling it for 15 minutes with water.
2. Sugar is added to the above-colored solution and heating is continued until sugar completely dissolves.
3. The hot syrup containing coloring agent is cooled, strained and washed with water to produce a specified volume.

### Part-3: Mixing of part 1 and 2:

1. The colored syrup is now mixed with mixture containing medicaments.
2. To the above mixture orange flower water is added and the final volume is adjusted with water.
3. The contents are transferred into a tightly closed container, capped, labelled and submitted.

**Storage:** Store in a tightly closed container in a cool place.

### Formulation table:

S. No.	Ingredients	Quantity Given	Quantity Taken (factor X quantity given)
1.	Iron	4.3g	
2.	Phosphoric acid	80ml	
3.	Calcium carbonate	13.6g	
4.	Sodium phosphate	1.0g	
5.	Potassium bicarbonate	1.0g	
6.	Colchineal	3.5g	
7.	Sucrose	700g	
8.	Orange flower water	50ml	
9.	Purified water q.s	1000ml	



**Calculations:**

Factor = Required quantity/Quantity Given

**Label:** (Students shall write all aspects of labelling in the space provided below)

<b>COMPOUND SYRUP OF FERROUS PHOSPHATE</b>		
USE: Iron and electrolyte supplement	A medicated syrup contains: Iron 0.4% w/v, Calcium 0.5% w/v.	Lic.no. _____
STORAGE: Store in a tightly closed container in a cool place.	<b>Dose:</b> 2 to 8ml Name of the institution	Mfg. Date: _____ Batch no. _____ Expiry date _____

**Report:**