Syrup

Syrups are sweet, viscous, aqueous liquid with a relative high specific gravity.

Medicinally syrup is divided to:

1) Flavoring syrup (non-medicated) which is used as vehicle to prepare medicated syrup
2) Medicated syrup which contain ingredients that give them a therapeutic value

Pharmaceutically classified: the syrup may be grouped according to their basic formula to:

1) Sugar based syrup, which are concentrated aqueous solution of sugar (Sucrose, dextrose)
2) Sugar free syrup (non-nutritive) which are formulated with artificial sweetening agent and viscosity builder

Sugar based syrup

Sucrose is one of the purest commercially available substance and the perfect carbohydrate for syrup, because:

- Purity
- Degree of sweetness
- Lack of color
- Ease of handling
- Inert
- Its availability

Stability of sucrose based syrup

Sucrose is subjected to 2 degradative pathways in aquous solutions

1) Fermentation 2) Hydrolysis

Fermentation: as a carbohydrate, sucrose in diluted aqueous solution provides a nutrient media which will support the growth of many micro-organisms especially yeast and mold.

The consequences of their growth are turbidity, fermentation and change in taste.

The ability of these micro-organisms to grow is decreased as the concentration of sucrose is increased, therefor syrup should contain enough sucrose to approach saturation.

Nearly saturated (66.7% w/w) solution of sucrose, if stored properly is self-preservative, because it does not contain free water H2O so they behave as anhydrous medium with respect to the growth of micro-organisms.

So to prevent Fermentation we should:

- Add preservative
- Saturate the solution

Many of the official syrups do not contain any preservative other than adequate sucrose concentration to prevent fermentation or the growth of other micro-organisms, a few syrups contain 0.1-0.2% W/V of sodium benzoate or benzoic acid which is efficient for its purpose.

Hydrolysis: in the presence of water and strong acid sucrose is a disaccharide, it undergo hydrolysis to give a molecule each of Monosaccharide, dextrose(glucose) and levulose(fructose).

This reaction is called inversion because a solution of sucrose rotate polarized light to the right while the same solution after hydrolysis rotate the light to the left because the levulose has a greater rotating power than dextrose.

This reaction is interfering for 3 reasons:

1) Solution of inverted syrup or sugar are more subjected to fermentation than solution of sucrose
2) After inversion the solution is sweeter, if sucrose is rated with sweetness of 100 dextrose is rated 74 while levulose is 173
3) The levulose formed by inversion seems to be responsible for brown discoloration which develop in some colorless syrups, this change is called caramelization and it take place in syrups

containing strong acid because hydrogen catalyzes the inversion of sucrose

To eliminate this discoloration of certain colorless syrup containing acid dextrose is used in place of sucrose

Storage of syrup

1) Syrup is stored at room temperature in a tightly stoppered and well filled bottle to avoid the presence of micro-organisms
2) Refrigeration inhibits both fermentation and hydrolysis but cooler than 4^{o}C cause crystallization of sugar which result the formation of large crystals which are difficult to re-dissolve, this proceeds sufficiently to yield a sucrose concentration greatly below saturation.

Prescriptions

℞ **Simple Syrup B.P (66.7% w/w)**

Sucrose 667gm

D.W. q.s to 1000gm

Mitt 100g

100-66.7=33.3 gm of water

Procedure:

1) Weigh the beaker only (empty) and weigh 66.7gm of sucrose in it
2) Add about (20ml) D.W. and stir to dissolve with gentle heating by using water bath
3) Weigh again and complete the weight by hot water to 100gm (adjustment of weight)
4) Put in clear, dry, bottle and label it.

℞ **Simple syrup U.S.P (85% w/v)**

Sucrose 850gm

P.W. qs 1000ml

Mitt 20ml

Prepared by simple solution

Note: use purified boiling water

℞ **Acacia syrup**

Acacia granulated or powder		100g
Sodium benzoate		1g
Tr. of vanilla		5ml
Sucrose		800g
D.W	Q.s	1000ml

Fit mist

Mitt 20ml

Procedure

1- Mix acacia, sodium benzoate and sucrose
2- Add about 10 ml of p.w mix well by stirrer
3- Heat mixture on water bath until solubility is complete
4- Cool, add Tr. of vanilla and sufficient D.W to complete the volume to 20 ml
5- Strain if necessary

This syrup has higher viscosity than simple syrup

Sodium benzoate is used as preservative instead of benzoic acid because of its greater solubility in H2O.

℞ **ferrous sulfate syrup (hematinic syrup)**

Ferrous sulfate 1 gm

Citric acid 0.05 gm

Peppermint oil 0.02ml

Alcohol 0.1ml

Water 10 ml

Syrup qs to 25ml

Sig. ʒII tid a.c

Mitt 25 ml

Procedure:

1) Dissolve ferrous + citric acid in 10 ml DW
2) Dissolve the oil in alcohol
3) Then add aq. to the alcohol Solution and complete the volume to 25ml

Care must be taken in preparing aq. Solution of ferrous sulfate since Fe++ will precipitate as basic ferric salt, discoloring the solution, so citric acid prevent discoloration of syrup from green to reddish brown it does this by chelating Fe+++(Stabilizing agent ,reducing agent inhibit the oxidation)

Dextrose based syrup

Dextrose may be used as a substitute in syrup containing strong acid in order to eliminate the discoloration associated with caramelization.

The formula in which dextrose is used in place of sucrose syrup:

1)Hypophosphite

2)Compound syrup of hypophosphite.

3)hydroiodic acid (HI) syrup was the only the official syrup using dextrose.

4)Ferrous iodide syrup containing dextrose has been formulated.

Dextrose based syrup do not become brown in the acidic solution but other difficulties are introduced

***The differences between dextrose and sucrose are*:**

1)Dextrose formulated a saturated solution in water at 70% w/v which is less viscous than simple syrup.

2)Dextrose dissolve more slowly than sucrose

3)Dextrose is less sweet than sucrose its sweetness 74% as sweet as sucrose

4) The saturated solution of dextrose readily support the growth of microorganism consequently its more easily fermented while the saturated solution of sucrose is self preservative, so they need preservative to prevent the fermentation of dextrose based syrup.

Glycerin is used in concentration of 30-40% v/v to act as

1- preservative 2-sweetener and viscosity builder.

℞ **Hypophosphite syrup**

Ca^{+2} hypophosphite 35 g

Na^{+} hypophosphite 18g

K^{+} hypophosphite 18g

Hypophosphorous acid 1ml

Dextrose 250g

Glycerin 300ml

P.W Q.S 1000ml

Ft.Mist

Mitt 25 ml

Sig:One tablespoonful tid

Nutritive syrup for element supplement.

Method

1-Dissolve Ca,Na ,K hypophosphite in 500 ml P.W

2-Filter to reagent bottle containing acid dextrose and glycerol

3- mix acid dextrose and acid

4-Shake from time to time until solubility is completed

5-Complete the volume to 1000 ml with P.W.

Sugar free syrup(Non nutritive syrup)

Several formula are intended as a substitutes for syrup which are administered to person who are suffering from diabetes mellitus .some early formula included glycerin in order to take advantages of its sweetness ad viscocity. However glycerin well as alcohol and propylene glycol are glycogenitic substances i.e they are material that are converted directly or indirectly to glucose in body.

Substances to be used in non nutritive syrup should be non glycogenetic.

General formula of non nutritive syrup

Viscosity builder Q.S

Sweetening agent Q.S

Preservative Q.S(sodium benzoate ,or benzoic acid)

P.w

Viscosity builder

1)Natural gum: like acacia and tragacanth are used as viscosity builder. However syrup prepared from these gum are not colorless and tend to change their characteristics upon aging.

2)Sodium alginate ,methyl cellulose and sodium carboxymethylcellose: has been used as the base of sugar free syrup these substances are non glycogentic and produce clear and colorless syrup.

Sweeteing agent

1)Saccharin sodium : rated 300- 550 time as sweet as sucrose (has excellent acid and heat stability).It may be used in concentration of 0.1-0.2% but it characterize by bitter after taste.

2)Sodium cyclamate: is 30-40 times as sweet as sucrose, has less after taste than saccharin, but its carcinogenic substance.

3)New synthetic sweetness: will be developed example aspartylphenylalanin methyl ester(Aspartam)about 160 times as sweet as sucrose in aqueous solution.

4)Sorbitol:

a. sorbitol is hexahydric alcohol made by hydrogenation of glucose

b. Its used in concentration 70% w/w aqueous solution which is not support growth of M.O. Preservative should be used in solution containing less 60% w/w

c. chemically stable

d. sorbitol solution is not irritating to the membrane of mouth and throat. Unlike sucrose, it does not contribute to dental caries

e. Sorbitol metabolized slowly and converted to glucose, however it is not absorbed from GITas rapidly as sugar(low solubility) , so no significant hyperglycemia has been found

f. The ingestion of excessive quantity of sorbitol may have laxative effect

g. Its about 60% as sweet as sucrose and half as viscous as simple syr.

h. Show no crystallization growth around the bottle in refrigeration which is happens in sucrose

℞ **Chloral hydrate syrup**

Chloral hydrate 0.5 g

Simple syrup QS 100 ml

Mitt. 20 ml

Procedure:

1. Wt. 0.1 g of chloral hydrate
2. Dissolve in 10 ml of simple syrup
3. CompleteAA the volume to 20 ml by simple syrup

℞

Acacia 1g

Saccharin 0.2 g

Na. benzoate 0.1 g

D.W Q.S 100 ml

Mitt. 25 ml