

Experiment 1

Analysis of following pharmaceutical aids by chemical tests

- Tragacanth
- Acacia
- Agar
- Gelatin
- Starch
- Honey
- Castor oil

PHARMACEUTICAL AIDS

INTRODUCTION

- These substances, which have little or no therapeutic value, are essentially used in manufacture or compounding of various pharmaceuticals, are called pharmaceutical aids.
- *Source:* Animals, vegetables, minerals, synthetic
- They are not API

Classification (based on their uses)

- Acidulants
- Colors
- Disintegrating agent
- Diluents
- Emulsifying agent
- Suspending agent
- Filter aids
- Flavor
- Lubricant
- Sweetening agent
- Thickening agent

Acidulants

- It gives a sharp taste to food

- Assist in the setting of gel and as a preservative, e.g. tamarind, lemon juice, tomatoes, etc.

Colors

- Which impart the color with stability and nontoxicity, e.g. caramel, turmeric, saffron, indigo.

Disintegrating Agent

- Use in tablet manufacturing.
- To reduce the breakup of the tablet into smaller fragments, e.g. starch, CMC, microcrystalline cellulose.

Diluents

- Used to treat too viscous fluid, e.g. cinnamon water, peppermint water, corn oil, peanut oil, sesam oil, glucose, lactose.

Emulsifying Agent

- This is soluble in both fat and water and enables fat to be uniformly dispersed in water as an emulsion.
- Also in backing to aid the smooth, e.g. acacia, agar, bentonite, gelatin etc.

Suspending Agent

- It prevents cracking at bottom, e.g. acacia, agar, bentonite, gelatin, etc.

Filter Aids

- Help infiltration of colloids, fine particles, gel.
- Ex talc, bentonite, diatomite
- It should be porous, irregular in shape, rigid particle, not produce filter cake, dispersing, low bulky, suspending, chemically stable and inert.

Flavor

- It provides a sensory impression to food
- It becomes a sweet, sour taste.
- Examples: Cardamom, rose, cocoa, lemon, orange.

Lubricant

- Introduce between 2 surfaces to reduce friction between them.
- Improve efficiency
- Examples: Stearate, talc, cocoa butter

Sweetening Agent

- Which provide a sweet taste to food
- Examples: Honey, saccharin, glycyrrhiza

Thickening Agent

- Increase viscosity, stability, e.g. pectin, tragacanth, methylcellulose

TRAGACANTH

- **Synonyms:** Gum tragacanth, tragacanth
- **Biological source:** It is the dried gummy exudation obtained by incision from stem and branches of *Astragalus gummifer* L., *Astragalus membranaceus*, and other species of *Astragalus*, Family, Leguminosae.
- **Description:**
 - *Colour:* White or pale yellowish
 - *Odor:* Odourless
 - *Taste:* Mucilaginous shape
 - *Solubility:* It is partly soluble in water and insoluble in alcohol
- **Chemical constituents:** It contains two fractions:
 - *Tragacanthin* 8–10% : Water-soluble.
 - *Bassorin* 60–70%: Insoluble in water.
- **Chemical tests of tragacanth:** There are the following chemical tests which are used for the identification of tragacanth (Table 1.1)

Table 1.1: Chemical tests of tragacanth

S. No	Test	Observation	Inference
1.	Tragacanth boil with freshly prepared 10% ferric chloride solution	Deep yellow ppt	Tragacanth is present
2.	Tragacanth + conc. ammonium hydroxide + precipitated copper oxide	White ppt	Tragacanth is present
3.	Tragacanth (0.1gm) + N/50 iodine solution	Green color	Tragacanth is present
4.	Tragacanth power + Fehling's solution	Red ppt	Tragacanth is present
5.	0.5% w/v drug solution + 20%w/v solution of lead acetate	White ppt	Tragacanth is present
6.	Tragacanth power + 5% alcoholic KOH	Coronary yellow color	Tragacanth is present
7.	With ruthenium red solution	No color produce	Tragacanth is present
8.	An aqueous solution of tragacanth on boiling with conc. HCl	No red color	Tragacanth is present

- **Uses:** Tragacanth is used as:
 - Demulcent and emollient
 - Thickening agent
 - Suspending agent
 - Emulsifying agent.

ACACIA

- **Synonyms:** Gum arabic, gum acacia, gondi.
- **Biological source:** It consists of the dried gummy exudation obtained from the stem and branches of *Acacia arabica* Wild (*Acacia senegal*), Family: Leguminosae.

- **Description**
 - ✧ *Form*: Rounded ovoid tears.
 - ✧ *Size*: Variable.
 - ✧ *Color*: Colorless to a slight yellowish tint.
 - ✧ *Fracture*: Brittle.
 - ✧ *Odor*: Odorless.
 - ✧ *Taste*: Bland and mucilaginous.
- **Solubility**: Soluble in water and insoluble in alcohol
- **Chemical constituents**:
 - ✧ Polysaccharide arabic (mixture of calcium, magnesium, and potassium salts of arabic acid). Arabic acid on hydrolysis gives D-galactose, L-arabinose, L-rhamnose, and D-glucuronic acid.
 - ✧ Also, contain enzyme oxidase and peroxidase.
- **Chemical tests of acacia**: There are the following chemical tests which are used for the identification of acacia (Table 1.2)

Table 1.2: Chemical tests of acacia

S. No	Test	Observation	Inference
1.	A hot aqueous solution of the gum	Acidic	Acacia is present
2.	Boil acacia solution in dilute HCl and make the resulting solution alkaline by adding a few ml of caustic soda. When Fehling's solution is added to the resulting solution and heated	Red precipitate	Acacia is present
3.	Dissolve 0.2 g acacia in 10 mL of water and add 4 drops of lead subacetate	White ppt	Acacia is present
4.	Boil solution of gum in dilute HCl + barium chloride solution	No White ppt	Acacia is present (distinction from agar)
5.	On adding iodine solution to an aqueous solution of gum	No blue or brown color	Acacia is present (absence of starch and dextrin)
6.	On adding ferric chloride solution to an aqueous solution of the gum	No bluish-black color	Acacia is present (indicating the absence of tannins)
7.	Dissolve 1 g acacia in 2 mL of water, add 2 mL of ethanol (~750 g/L), and shake	A white, gelatinous mucilage is formed which becomes fluid on adding 10 mL of water	Acacia is present

- **Uses**
 1. Demulcent.
 2. Emulsifying agent.
 3. Suspending agent.
 4. Binding agent.
 5. Used in inflammation of intestinal mucosa.

6. Used to cover inflamed surfaces such as bums, sore nipples, etc.
7. Used in the manufacture of adhesive and ink.

AGAR

- **Synonym:** Agar-agar, vegetable gelatin.
- **Biological source:** It is the dried gelatinous substance obtained by extraction with water from *Gelidium amansii* or various species of red algae like *Gracilaria* and *Pterocladia*, belonging to the family Gelidaceae (*Gelidium* and *Pterocladia*), Gracilariaceae (*Gracilaria*).
- **Descriptions**
 - *Form:* Thin, membranous strips or flattened bands.
 - *Color:* Colorless, translucent, greyish yellow.
 - *Size:* 30 to 50 cm in length and 4 mm wide.
 - *Surface:* Micaceous coiled.
 - *Odor:* None.
 - *Taste:* Mucilaginous
 - *Solubility:* It is insoluble in cold water, but forms a gelatinous mass after cooling hot solution. It is soluble in boiling water and insoluble in organic solvents.
- **Chemical constituents**
 - *Carbohydrate:* Polysaccharides.
 - Heterogeneous polysaccharides consisting of two components
 - a. *Agarose* (70%): Agarose is responsible for the gel strength of agar
 - b. *Agaropectin:* Agaropectin is responsible for the viscosity of agar solutions.
- **Chemical tests of agar:** There are the following chemical tests which are used for the identification of agar (Table 1.3)

Table 1.3: Chemical tests of agar

S. No	Test	Observation	Inference
1.	Boil 1.5 gm agar with 100 ml water. Cool the solution to temperature.	It forms a stiff jelly	Agar is present
2.	When mounted in the solution of ruthenium red and examined under a microscope, the mounted particles acquire	Pink color	Agar is present
3.	0.2% solution of agar in water, add a solution of tannic acid	No ppt is produced	Agar is present (distinction from gelatin).
4.	Sample + N/50 iodine	Deep crimson to brown color	Agar is present
5.	Sample + Soda lime	No NH ₃ is produced	Agar is present
6.	Sample + Million's reagent	No ppt is produced	Agar is present

Contd.

Table 1.3: Chemical tests of agar (*Contd.*)

S. No	Test	Observation	Inference
7.	Aqueous solution of drug + 0.5 ml of dilute HCl H ₂ O bath divide into 2 parts. After 30 minutes a. 1st part + 10% caustic soda solution + 2ml of Fehling's solution in a H ₂ O bath b. 2nd part + BaCl ₂ (10%) solution	Reddish-brown color ppt White ppt.	Agar is present

- **Uses**

- Emulsifying agent.
- It is used in the preparation of jellies.
- It is used in the preparation of bacteriological culture.

GELATIN

- **Synonyms:** Gelatina, gel foam, puragel.
- **Biological source:** Gelatin is a protein extracted by partial hydrolysis of animal collagenous tissue like skins, tendons, ligaments, and bones with boiling water.
- **Description**
 - *Form:* Sheets, shreds, or coarse or fine powder. It has a characteristic
 - *Odor:* Characteristic
 - *Colour:* Faintly yellow to amber color.
 - *Solubility:* It is insoluble in cold water, but soluble in hot water. In cold water, it swells, softens, and absorbs about 5–10 times its weight of water. With hot water, it forms a jelly on cooling. It is soluble in a mixture of glycerin and water, but insoluble in fixed and volatile oils, alcohol, chloroform, and ether. In drying conditions, gelatin remains stable in the air, but when moist may be degraded due to microbial attack.
- **Chemical constituents:** Gelatin is composed of gluten proteins. As a protein, chemically, it contains different amino acids out of which major is lysine, an essential amino acid, but does not contain tryptophan.
- **Chemical tests of gelatin:** There are the following chemical tests which are used for the identification of gelatin (Table 1.4)

Table 1.4: Chemical tests of gelatin

S. No	Test	Observation	Inference
1.	Biuret reaction: Alkaline solution of gelatin (2 ml) + a dilute solution of copper sulfate	A red or violet color is formed	Gelatin is present
2.	Xanthoproteic reaction: Gelatins usually form a yellow color when warmed with concentrated nitric acid.	This color becomes orange when the solution is made alkaline	Gelatin is present

Contd.

Table 1.4: Chemical tests of gelatin (*Contd.*)

S. No	Test	Observation	Inference
3.	Millon's reaction: Millon's reagent (mercuric nitrate in nitric acid containing a trace of nitrous acid) + gelatin solution	White ppt is produced, which turns red on heating	Gelatin is present
4.	Ninhydrin test: Aqueous solution of gelatin + alcoholic solution of ninhydrin—heated.	A red to violet color is formed.	Gelatin is present
5.	On heating gelatin (1 g) with soda lime	The smell of ammonia is produced	Gelatin is present
6.	A solution of gelatin (0.5 g) in water (10 ml) + a few drops of tannic acid (10%).	Precipitated to white buff-colored precipitate	Gelatin is present
7.	With picric acid gelatin forms	Yellow precipitate	Agar is present

- **Uses:** Gelatin is used to prepare pastilles, pastes, suppositories, capsules, pill-coatings, gelatin sponge; as suspending agent, tablet binder, coating agent, as a stabilizer, thickener, and texturizer in the food.

STARCH

- **Synonyms:** Amylum
- **Biological source:** Consists of polysaccharides granules obtained from grains of maize (*Zea mays* L.) Rice (*Oryza sativa*) or wheat (*Triticum aestivum* L.), Family: Gramineae or from tubers of potato (*Solanum tuberosum* L.), family Solanaceae
- **Description:** Starch occurs as fine powder or irregular, angular masses.
 - ✧ *Colour:* Rice starch—white, wheat—cream, and potato—slightly yellowish.
 - ✧ *Odor:* Odorless
 - ✧ *Taste:* Mucilaginous
- **Chemical tests of starch:** There are the following chemical tests which are used for the identification of starch (Table 1.5)

Table 1.5: Chemical tests of starch

S. No	Tests	Observation	Inference
1.	Molisch's test: 1 ml starch + 2 or 3 drops of Molisch's reagent. Mix well and add 1–2 ml Conc. Sulphuric acid along the sides of the test tube without shaking	A reddish-violet ring at the junction of two liquids	Starch is present
2.	2 ml starch + add 2–3 drops of iodine solution	Deep blue color	Starch is present
3.	5 ml Benedict's reagent + add 8 drops of starch solution. Boil it for 2 minutes.	No colored precipitate	Starch is present

Contd.

Table 1.5: Chemical tests of starch (Contd.)

S. No	Tests	Observation	Inference
4.	5 ml starch + add 4 drops of Conc. HCl + keep in boiling water bath for 10 min + cool under running water + neutralize by adding 5 drops of 10% sodium carbonate, till the effervescence ceases	The solution is hydrolyzed	Starch is present
5.	Boil 1 g of starch with 15 ml of water and cool.	The translucent viscous jelly is produced.	Starch is present

- **Uses**

- ✧ Nutritive
- ✧ Demulcent
- ✧ Protective
- ✧ Absorbent
- ✧ It is used as an antidote to iodine poisoning,
- ✧ Disintegrating agent in pills and tablets

HONEY

- **Synonyms:** Madhu, honey purified, mel.
- **Biological source:** Honey is a viscid and sweet secretion stored in the honeycomb by various species of bees, such as *Apis mellifera*, *Apis dorsata*, *Apis florea*, *Apis indica*, and other species of *Apis*, belonging to family Apidae (Order: Hymenoptera).
- **Description:**
 - ✧ *Colour:* pale yellow to yellowish-brown
 - ✧ *Odor:* Characteristic, pleasant. Odor and taste depend very largely on the flowers used in their preparation.
 - ✧ *Taste:* Sweet and faintly acid.
 - ✧ *Solubility:* It is soluble in water and insoluble in alcohol.
- **Chemical constituents:** Honey is an aqueous solution of glucose 35%, fructose 45%, and sucrose about 2%.
- **Chemical tests of honey:** There are the following chemical tests which are used for the identification of tragacanth (Table 1.6).

Table 1.6: Chemical tests of honey

S. No	Tests	Observation	Inference
1.	Fiehe's test for artificial invert sugar: Honey (10 ml) is shaken with petroleum or solvent ether (5 ml) for 5–10 min. The upper ethereal layer is separated and evaporated in a china dish. In addition to 1% solution of resorcinol in hydrochloric acid (1 ml)	A transient red color is formed in natural honey while in artificial honey the color persists for some time	Pure honey is confirmed

Contd.

Table 1.6: Chemical tests of honey (Contd.)

S. No	Tests	Observation	Inference
2.	Reduction of fehling's solution: To an aqueous solution of honey (2 ml) Fehling's solutions A and B are added and the reaction mixture is heated on a steam bath for 5–10 min.	A brick red color is produced	Pure honey is present
3.	Limit tests: The limit tests of chloride, sulfate, and ash (0.5%) of honey	Compared with the pharmacopoeial specifications	Pure honey is confirmed

- **Uses:** Honey is used as a demulcent and sweetening agent.

CASTOR OIL

- **Synonyms:** Castor bean oil, castor oil seed, oleum ricini, ricinus oil, oil of palma christi, cold-drawn castor oil.
- **Biological source:** Castor oil is the fixed oil obtained by cold expression of the seeds of *Ricinus communis* Linn., belonging to the family Euphorbiaceae.
- **Chemical Constituents:** Castor oil consists of glyceride of ricinoleic acid, isoricinoleic, stearic, and dihydroxy stearic acids. Ricinoleic acid is responsible for the laxative property.
- **Chemical tests of castor oil:** There are the following chemical tests which are used for the identification of castor oil (Table 1.7)

Table 1.7: Chemical tests of castor oil

S. No	Tests	Observation	Inference
1.	Castor oil + petroleum ether	Completely soluble in petroleum ether	Castor oil is present
2.	Castor oil + equal volume of alcohol	Clear liquid at cool at 0°C for (3 hours)	Castor oil is present

- **Uses**
 - ✦ Purgative
 - ✦ Fungistatic
 - ✦ Ointment base
 - ✦ Plasticizer
 - ✦ Wetting agents
 - ✦ Lubricating agent.