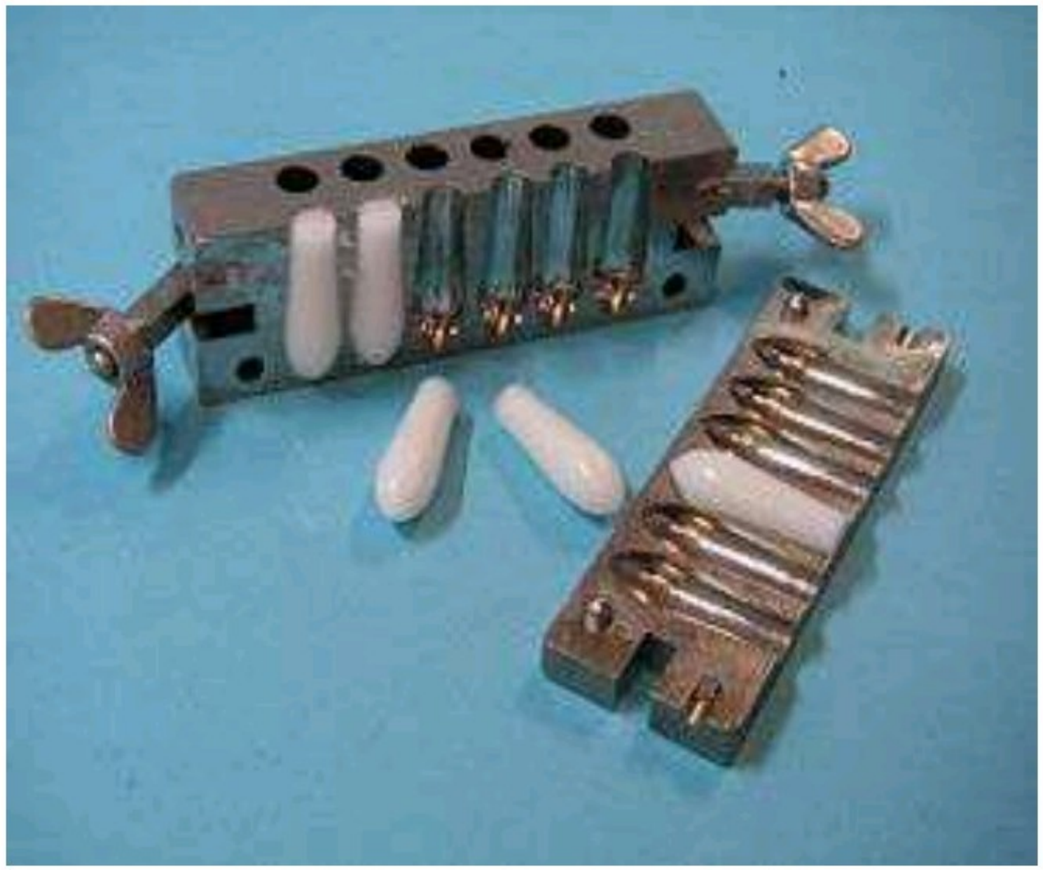
SUPPOSITORIES & PESSARIES



Defination

- “Suppositories are solid dosage forms intended for insertion in to body cavities or orifices (Rectum, Vagina & Urethra) where they melt or dissolved & exert localized or systemic effect.”

Advantages

(1) These can be easily administered to children, old persons and to unconscious patients who cannot swallow the drug easily.

(2) These are inserted into body cavity to produce local effect of the medicament incorporated in the base.

(3) These are inserted into the rectum to exert a direct and rapid action on the rectum.

(4) These are inserted into the rectum to promote evacuation of the bowel.

(5) Suppositories are unit dosage form of drugs.

(6) These are convenient mode of administration of drugs which irritate gastro-intestinal tract, cause vomiting and destroyed in the acidic pH of the gastric juice of stomach.

(7) The drugs in suppositories are slowly absorbed giving sustained action.

Disadvantages

Irritant drug cant administered

Embarrassment to patients

Need to store at low temp.

Cant easily prepared

Cost-expensive.

fluid content of the rectum is much less than that of the small intestine; this may effect dissolution rate, etc.

Some drug may be degraded by the microbial flora present in the rectum.

Suppository available in different sizes and shape.

Types of Suppositories

1. **Rectal suppositories.**
2. **Vaginal suppositories.**
3. **Urethral suppositories.**
4. **Nasal suppositories.**
5. **Ear cones.**

Newer Concept of Suppositries

- Tablet Suppositories
- Layered Suppositories
- Coated Suppositories
- Capsule Suppositories

Tablet suppositories

- This type of tablets prepared by compression like tablets.
- Such type of suppositories used for rectal & vaginal purposes.
- Pessaries tablet suppositories are present in almond like shape.
- Rectal tablets covered with thin layers of materials such as polyethylene glycol for protecting.

Layered Suppositories

- In that type of suppositories are contains different drugs in different layers.
- So that, incompatibility drugs can be separated from each other.
- Similarly drugs having different melting points can be incorporated to control the absorption rate.

Coated Suppositories

- In that type of suppositories contains polyethylene glycol, cetyl alcohol etc.
- Those materials controls their disintegration rate, to impart lubricant properties & to provide protection action during storage.

Capsule Suppositories

- Soft gelatin capsules of different shapes & size are prepared in that type of suppositories.
- In that type of capsule suppositories are filled with liquids, semisolids or solids.
- These type of capsules are increasing in popularity.

Suppository Bases

- Suppository bases plays important role in maintaining their shape, solidity & also play important role when inserted into the body cavity.
- There are large number of bases used but theobroma oil, glycerogelatin base & polyethylene glycol fulfill the above mentioned requirements.

Ideal Properties of Bases

- It must retain the shape and size.
- It should melt at body temperature.
- It should be non-irritant.
- It should shrink sufficiently to remove from mould.
- It should not interfere in release or absorption of drug.
- It should permit incorporation of drug.
- It should be compatible with variety of drugs.
- It should be physically stable on storage.
- It should not be soften or harden on storage.

TYPES OF SUPPOSITORY BASES

- **Oily Bases or Oleaginous bases**

- **Water Soluble & Water miscible bases**

Or

Hydrophilic bases

- **Emulsifying/Synthetic bases**

Oily Bases or Oleaginous bases

- Cocoa butter or Theobroma Oil
- Emulsified cocoa butter.
- Hydrogenated oils.

Cocoa butter or Theobroma Oil

- Cocoa butter is fat obtained from the roasted seed of Theobroma cocoa.
  - At room temperature it is a yellowish, white solid having a faint, agreeable chocolate like odour.
  - Chemically, it is a triglyceride (combination of glycerin and one or different fatty acids) primarily of oleopalmitostearin and oleodistearine.
  - It melts at 30 - 35^0C

Advantages

- Melting just below the body temperature.
- Maintaining its solidity at usual room temperatures.
- Readily liquefy on heating and solidify on cooling.

Disadvantages

- Rancidity.
- Stick to mould.
- Leakage from body cavity.
- Costly.
- Immiscibility with body fluid.
- Chloral hydrate or lactic acid liquefy it.

Emulsified cocoa butter or Emulsified Theobroma Oil

- Emulsified theobroma oil may be used as a base when large quantities of aqueous solutions are to be incorporated.

- 5% glyceryl monostearate, 10% lanette wax, 2-3% cetyl alcohol & 4% bees wax is recommended for emulsified theobroma oil.

Hydrogenated Oils

- Hydrogenated oils are used as a substitute of theobroma oil.
- E.g. Hydrogenated edible oil, coconut oil, hydrogenated pea oil, stearic acids, palm kernel oil etc.

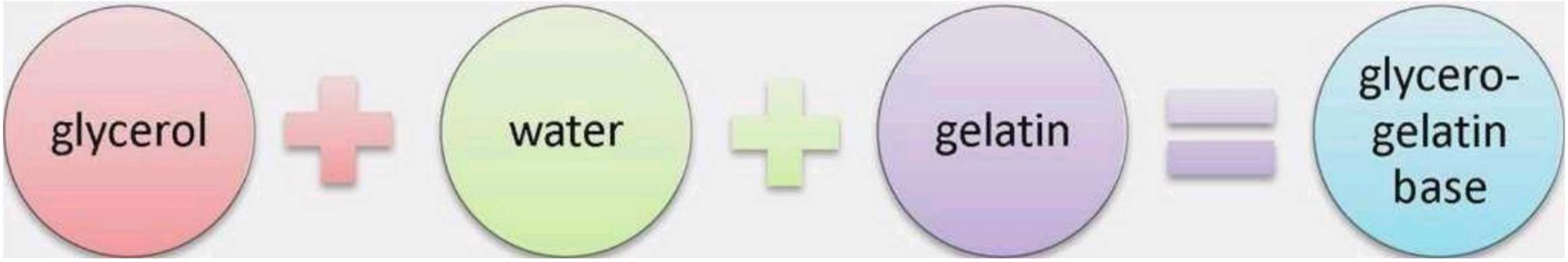
- Advantages
  - Overheating does not affect the solidifying point.
  - They are resistant to oxidation.
  - Lubrication of the mould is not required.
  - Their emulsifying & water absorbing capacity are good.

- Disadvantages
  - On rapid cooling they become brittle.
  - When melted they are more fluid than theobroma oil & result in greater sedimentaion of the added substance.

Water Soluble & Water miscible bases
Or
Hydrophilic bases

- Glycero-gelatin base.
- Soap-glycerin base.
- Polyethylene glycol.

Glycero –Gelatin Bases



It is a mixture of glycerin and water which is made stiff by the addition of gelatin.

Properties:

It is colourless, transparent, translucent in nature.
It is soft to touch.
It melts at 30 - 35^{0}C.

Used for vaginal suppositories.

- **Advantages**:
  - It melt at body temperature.
  - It mix with body fluid.
  - Not rancid.
  - It can be used to prepare suppositories using boric acid, chloral hydrate bromides, iodides, iodoform opium etc.
- **Disadvantages**:
  - Difficult to prepare and handle.
  - Chance of bacterial growth.
  - Hygroscopic in nature. (become hard on drying and soft in cont with moisture)
  - Laxative in action.
  - Incompatible with tannic acid, ferric chloride etc.

Polyethylene Glycols/ Macrogols

- These are commonly known as carbowaxes & Polyglycols.
- These are available in solid, liquid or semi-solid state depending on molecular weight.
- Those polymers having the molecular weight betw. 200 to 1000 are liquids & those having M.W higher than 1000 are wax like solids.
- They are chemically stable & physiologically inert substances & do not allow the bacterial or mold growth to take place.

Advantages:

- They are chemically stable.
- Inert, Non-irritant.
- Do not allow bacterial growth.
- Physical properties changes according to molecular weight.
- Provide prolonged action.
- Do not stick to mould.
- Suppositories are clean and smooth in appearance.

Emulsifying/Synthetic bases

- Witepsol
- Massa estarinum
- Massuppol.

Advantage of Emulsifying bases

- They solidify rapidly.
- They are non-irritant.
- The lubrication of mould is not required.
- Overheating does not affect the physical properties of the base.
- They can absorb fairly large amount of water or aqueous liquids.
- The white, odourless, clean and attractive suppositories are produced.
- They are less liable to get rancid.

Disadvantage of Emulsifying bases

- They should not be cooled rapidly in a refrigerator because they become brittle.
- They are not very viscous on melting, so the medicaments incorporated with the base settle down rapidly.

Witepsol

- They consist of triglycerides of saturated vegetable fatty acid with varying percentage of partial esters.
- A small amount of beeswax is added for use in hot climate.
- It should not be cooled rapidly as it become brittle and fracture.
- Lubrication is required.

Massa Estarinum

- It is a mixture of mono, di and triglycerides of saturated fatty acids.
- It is a white, brittle, almost odourless and tasteless solid.
- It has a m.p. 33.5 to 35.5^{0}C.
- They are available in various grades but grade B is commonly used in dispensing.

Method of preparation

- Hand rolling.
- Fusion method.
- Cold compression.

Hand Rolling

- It is the oldest and simplest method of suppository preparation and may be used when only a few suppositories are to be prepared in a cocoa butter base.
- It has the advantage of avoiding the necessity of heating the cocoa butter.
- A plastic-like mass is prepared by triturating grated cocoa butter and active ingredients in a mortar.

- The mass is formed into a ball in the palm of the hands, then rolled into a uniform cylinder with a large spatula or small flat board on a pill tile.

- The cylinder is then cut into the appropriate number of pieces which are rolled on one end to produce a conical shape.

- Effective hand rolling requires considerable practice and skill.

Fusion Method

1. Melting the suppository base
2. Dispersing or dissolving the drug in the melted base.
3. The mixture is removed from the heat and poured into a suppository mold.
4. Allowing the melt to congeal
5. Removing the formed suppositories from the mold.

- The fusion method can be used with all types of suppositories and must be used with most of them.

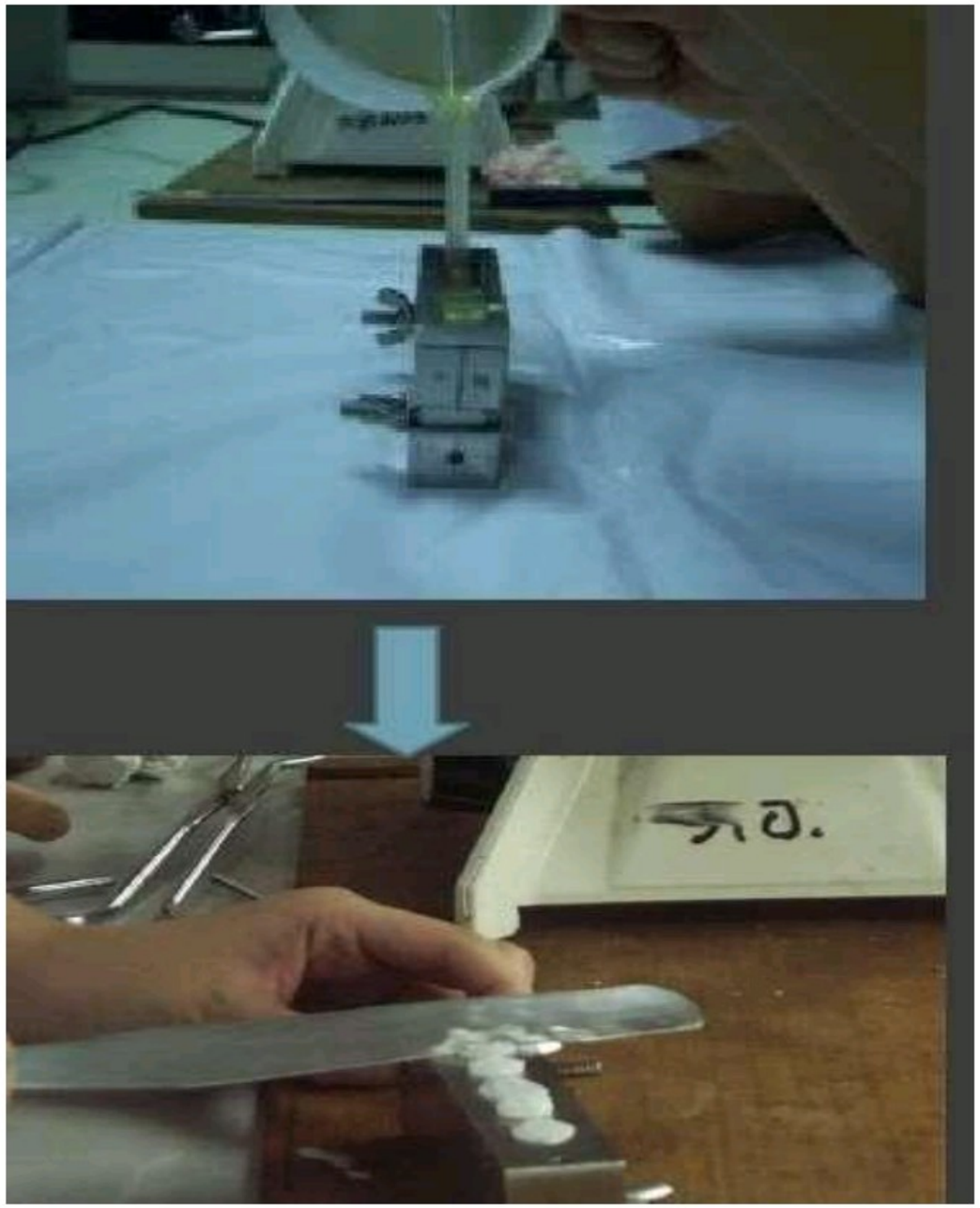
- Small scale molds are capable of producing 6 or 12 suppositories in a single operation.

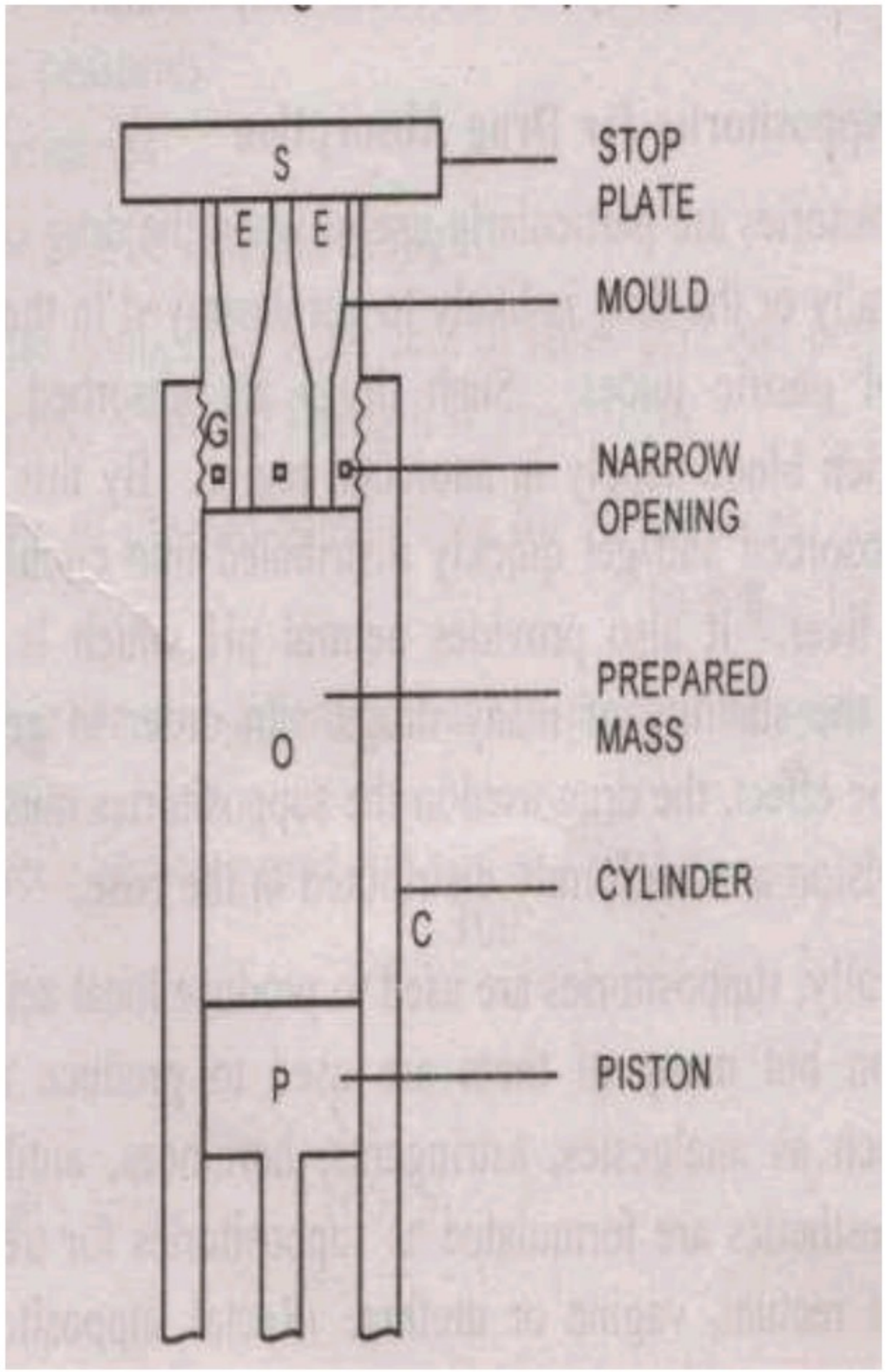
- Industrial molds produce hundreds of suppositories from a single molding.

Suppository mould **Lubrication is essential in case of** cocca butter,GGBase,
Different types of lubricant used for different type of suppository base

Calibration of mould is an also important thing

Fusion Method




S
E
E
G
O
P
STOP
PLATE
MOULD
NARROW
OPENING
PREPARED
MASS
CYLINDER
C
PISTON

(C) Cold compression method : The method is useful for thermolabile and insoluble drugs because heating and stirring of the base with medicament is not required. The various steps involved in this method are as under:—

(1) Cocoa butter is grated. The ingredients are mixed with an equal quantity of grated cocoa butter. Add the remaining amount of grated cocoa butter. While calculating the amount of cocoa butter to be incorporated with the medicaments, allowances are made for unavoidable wastage during the preparation.

(2) The compression of the prepared mass is done on hand or power-operated compression machines. The prepared mass is placed in a cylinder 'C' and forced through a narrow opening 'O' by means of a

piston 'P' into a mould. The threads of mass passing into mould 'G' are compressed until a homogeneous fused mass is formed. On the removal of retaining stop plate 'S' the suppositories are ejected by further pressure. The operation of the machine is shown diagrammatically in Fig 12.2.

The moulds are of different sizes and contain several cavities. The mass and the compression cylinder of the machine may be chilled to prevent heat of compression from making the mass too fluid.

The method is not suitable for suppositories in which glycero-gelatin base or any other base in which melting is essential for its preparation.

Displacement Value

- Def^{n} :- “The quantity of the drug which displaces one part of the base is known as displacement value.”

Determination of displacement value

e.g. Determination the displacement value of a medicament in theobroma oil suppositories containing 40% medicament, prepared in 1 gm mould. The weight of 10 suppositories is 14.66 gm.

Solution:

1. Wt.of 10 suppo. Cont. theobroma oil alone prepared in 1 gm capacity mould=1 x 10=10 gm
2. Wt.of 10 suppo. Cont. 40% of medicament = 14.66gm
3. Amt. of theobroma oil present = 60/100 x 14.66=8.79 gm
4. Amt. of medicament present = 40/100 x 14.66= 5.86 gm
5. Amt. of theobroma oil displaced by 5.86 gm of medicament = 10 –8.79 = 1.20 gm

So,

Displacement value of medicament = 5.86/1.20 = 5 (Approx.)

Packaging and storage

- Suppositories are usually packed in tin or aluminum, paper or plastic.
- Poorly packed suppositories may give rise to staining, breakage or deformation by melting.
- Both cocoa butter and glycerinated gelatin suppositories stored preferably in a refrigerator.
- Polyethylene glycol suppositories stored at usual room temperature without the requirement of refrigeration.

Use of Suppositories for Drug Absorption

Suppositories are particularly useful when the drug cannot be administered orally or the drug is likely to get destroyed in the stomach due to acidity of gastric juices. Such drugs are absorbed by rectal route through rich blood supply in anorectal region. By this route, drugs are rapidly absorbed and get quickly distributed into circulation which bypass the liver. It also provides neutral pH which is very helpful to maintain the stability of many drugs. In order to get the maximum therapeutic effect, the drug used in the suppositories must be in fine state of subdivision and uniformly distributed in the base.

Generally, suppositories are used to produce local action at the site of application but many of them are used to produce systemic action. Drugs such as analgesics, astringents, hormones, antibiotics, steroids, local anaesthetics are formulated as suppositories for treating local conditions of rectum, vagina or urethra. Rectal suppositories are mainly used for the treatment of constipation and haemorrhoids. These suppositories are also used to produce systemic action.

PESSARIES

They are meant for introduction into the vagina. They are larger than rectal suppositories and vary in weight from 4 to 8 gramme or more. The pessaries may be conical, wedge shaped or rod shaped. Nowadays, special shaped suppositories are manufactured and are supplied with applicators to facilitate insertion into the vagina.

The pessaries are also available as tablets and capsules and are known as vaginal tablets and capsules respectively. The pessaries of ichthammol, crystal violet, lactic acid are manufactured by using glycero-gelatin base.

Moulded pessaries are packed similar to glycero-gelatin suppositories while tablet containers are suitable for the compressed type pessaries. Sometimes instructions are given on the label to moisten pessaries with water before insertion into vagina to reduce the stinging caused by osmotic withdrawal of the water from the tissues during solution in the vagina. Di-iodohydroxyquinoline and nystatin, pessaries should always be labelled with this advice. Pessaries should be stored in a cool place.