

Outbreeding Devices :- (contrivances to ensure cross-pollination)

Majority of flowering plants produce bisexual flower and pollen grains are likely to come in contact with stigma of same flower.

Continued self-pollination results in inbreeding depression.

Flowering plants have developed many devices to discourage self-pollination and to encourage cross-pollination.

(1) **Dichogamy** :- Pollen release & stigma receptivity are not synchronised. Means they mature at different time.

Protandry :- Anther mature earlier
Protogyny :- stigma mature earlier

(2) Anther & stigma are placed at different position so that pollen can not come in contact with stigma of same flower. [is prevent autogamy] [heterostyly]

(3) **Self sterility** :- (self-incompatibility)
This is genetic mechanism and prevents self-pollen from fertilizing the ovule by inhibiting pollen germination or pollen tube growth in the pistil

"(heterostyly & heterogamy in detail left)"

(4) **Dioecy (unisexual)** :- Production of unisexual flower.

If Male & female flower not on same plant such as Castor and Maize (Monoecious)

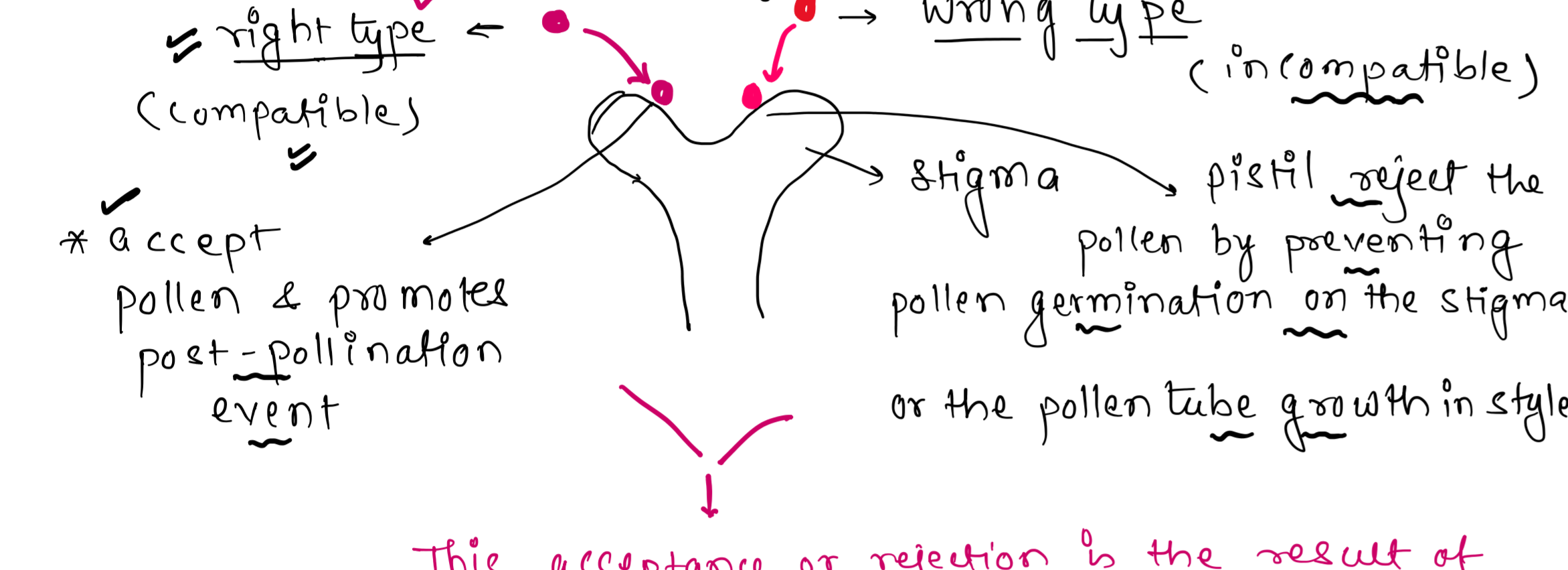
it prevents autogamy but not geitonogamy.

In diececy condition → Both autogamy & geitonogamy is prevented.
▷ Papaya, Date Palm

Pollen-pistil Interaction :- (by chance)

Pollination does not guarantee the transfer of right type of pollen (compatible pollen of the same species as the stigma).

Pollen-pistil interaction is the group of event that occur from the time of pollen deposition over the stigma to the time of pollen tube entry into ovule. It is a dynamic process which has checks at several places for promotion or inhibition of pollen growth.



This acceptance or rejection is the result of continuous dialogue b/w pollen grain and pistil. Dialogue is mediated by chemical components

In recent years botanists have been able to identify some of pollen and pistil components and the interaction: leading to the recognition, followed by acceptance or rejection.

A large number of pollen grains come to germinate over the stigma.

The compatible pollens are able to absorb water & nutrients from the surface of stigma. They germinate and produce pollen tube. Pollen tube grow in style.

The pollen tube eats its way through the solid part of stigma and style by secreting pectinases and hydrolytic enzymes.

Pollen tube travel intercellularly and chemotropically along the conc. gradient of Ca-B-inositol sugar complex.

In some plant → Pollen shed at ② called stage
In such plants generative cell divides and forms the two gametes during the growth of pollen tube in the stigma.

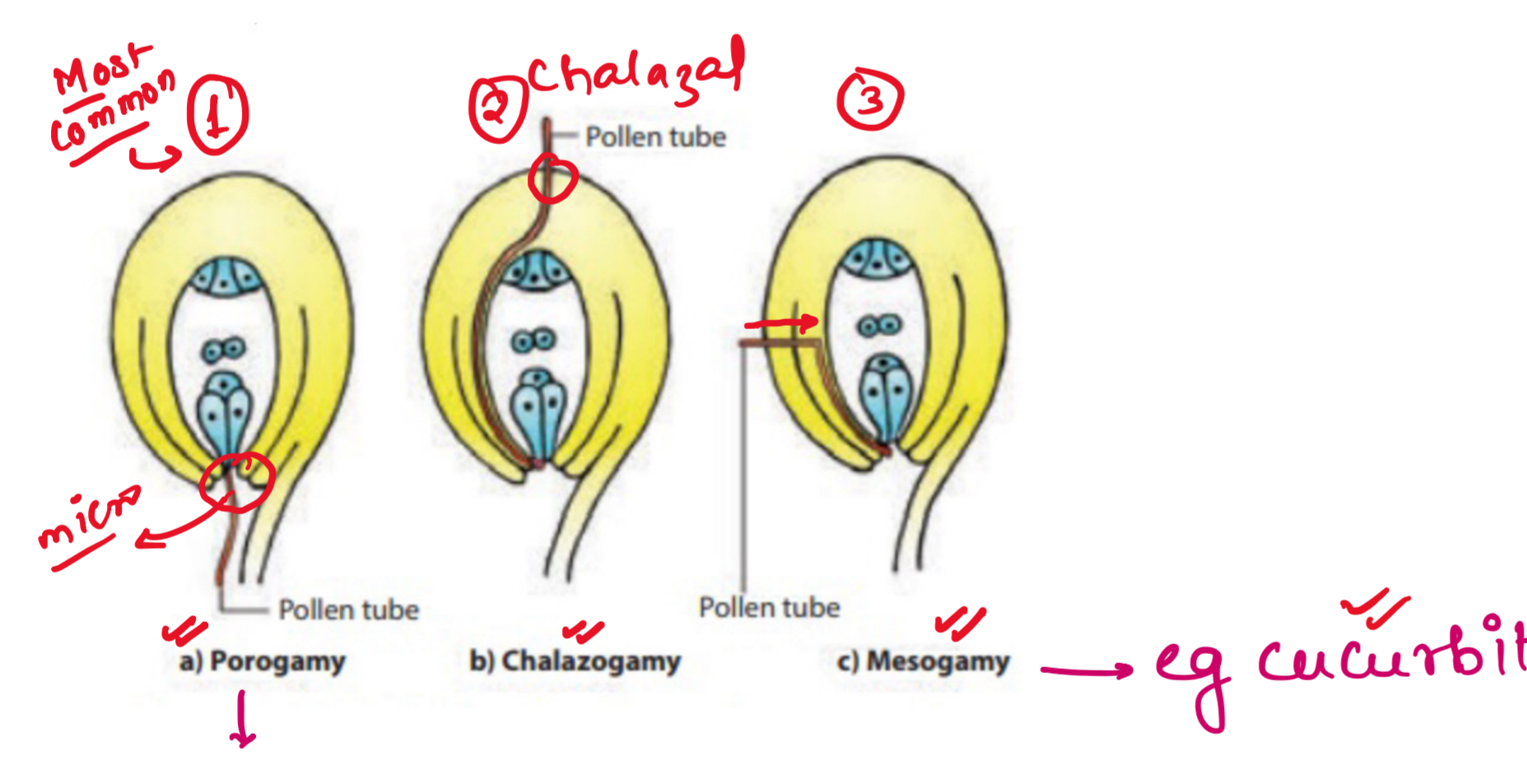
Where as in plants which shed pollen in the ③ called condition, pollen tube carry the two male gametes from the beginning.

The contents of the pollen grains shift into pollen tube with the tube nucleus moving from its tip followed by the two male gametes.

Style may be → solid → Has special tissue of pectinised thick walls via transmitting or conducting tissue.
↓
hollow

(Pollen tube drawing its nourishment from living cells)

Mode of entry of pollen tube in the ovule



• most common

Pollen tube, after reaching the ovary, enters the ovule through micropyle (Porogamy) and then enter into one of the synergids through the filiform apparatus → (guide entry of pollen tube inside ovule)

All these events - from pollen deposition on the stigma until pollen tube enters the ovule - are together referred to as pollen-pistil interaction

We can easily study Pollen Germination by dusting some pollen from flower such as Pea, chickpea, Crotalaria, balsam and Vinca on a glass slide containing a drop of sugar solu. (2-10%). After 15-30 min., observe the slide under low power microscope. we like to see pollen tubes coming out of the pollen grains.

In Plant Breeding, a breeder is interested in crossing different species and often genera to combine desirable characters to produce commercially superior varieties.

Artificial Hybridisation is one of the major approaches of crop improvement programme. → quantity (yield) quality

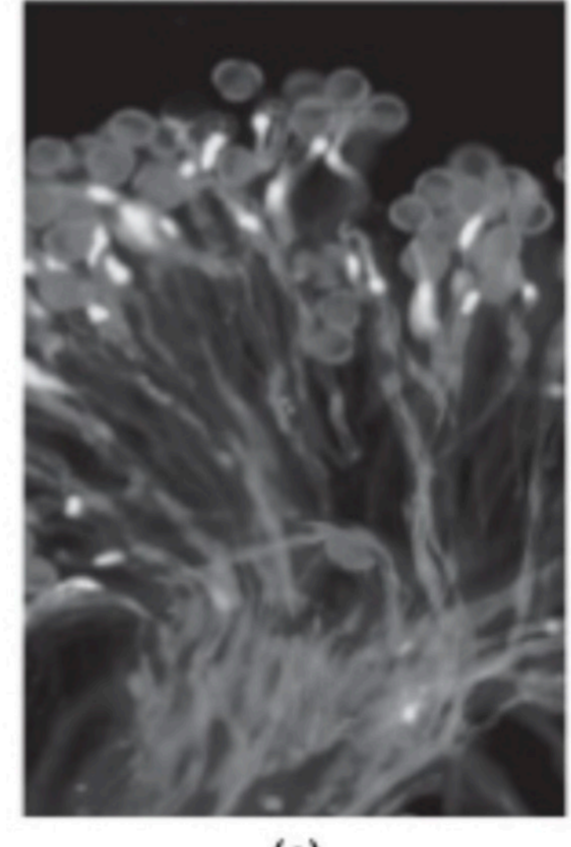
In such crossing experiments **emasculatation and bagging** technique is required

If the female parent bear bisexual flowers, removal of anther from the flower bud before anther dehisces using a pair of forceps, this process is referred as Emasculatation.

Emasculated flowers have to be covered with a bag of suitable size, generally made up of butter paper to prevent contamination of its stigma with unwanted pollen. This process is called "Bagging".

When stigma of bagged flower attains receptivity, mature pollen grains collected from anthers of male parent are dusted on the stigma, and the flowers are rebagged, and the fruits allowed to develop.

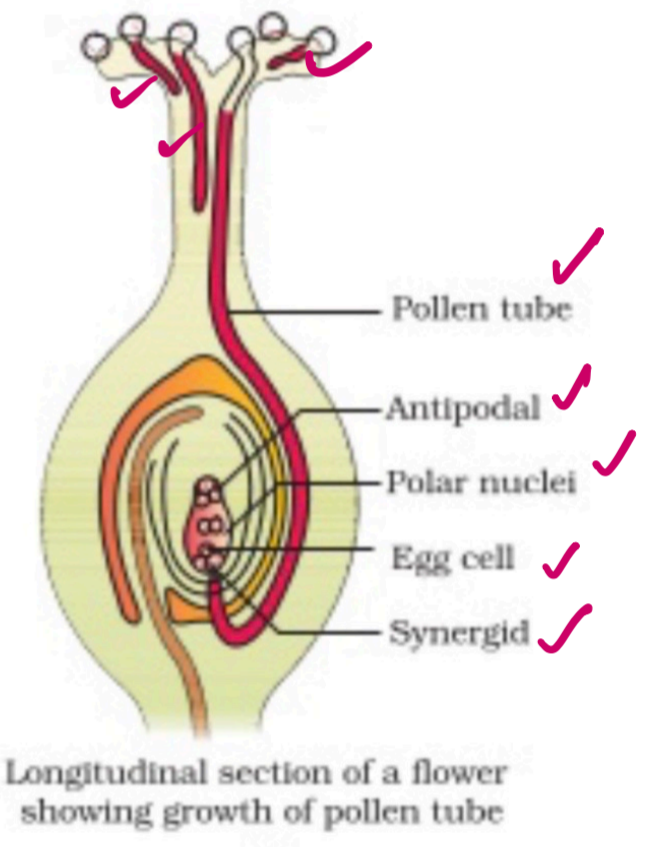
If the female parent produce unisexual flowers, there is no need for emasculatation. The female flower buds are bagged before the flower open. when stigma become receptive, pollination is carried out using desired pollen and the flower rebagged.



(a) Pollen grains germinating on stigma



(b) Pollen tube growing through style



(c) enlarged view of an egg apparatus showing entry of pollen tube into a synergid.