EXPERIMENT

AIM

To perform emasculation, bagging and tagging for controlled pollination.

THEORY

The plant breeding is a science of changing and improving the heredity of plants and production of new varieties which are far better than the original type. Artificial hybridisation is the phenomenon used by plant breeders for the crop improvement programmes.

Steps involved in plant breeding programme are:

1. Collection of germplasm.
2. Selection of parents with desired characteristics.
3. Cross hybridisation among selected parents which involves emasculation, tagging, bagging and lastly controlled pollination.
4. Selection and recombination of superior recombinants.
5. Selection and testing of new superior recombinants.
6. Testing, release and commercialisation of new cultivar.

There are three methods which are involved in the process of controlled pollination.

Emasculation

In this process, stamens or anthers are removed from a bisexual flower before they ripe, without affecting female reproductive system, to avoid self-pollination.

Note This step of emasculation is only needed when the flowers under study are bisexual. If the female parent produces unisexual flowers, then this step is not needed.

Bagging

The emasculated flower is immediately enclosed in a bag made of butter paper or polythene to avoid pollination by unwanted pollen. This process is called bagging. In case of unisexual flowers, they are bagged before the flowers open.

Tagging

The tag is fixed to the emasculated flower mentioning the name of the parent plant, date of emasculation, controlled pollination and the name of the plant breeder.

REQUIREMENTS

Ornamental plants/wild plants bearing large bisexual flowers, magnifying lens, tweezers, small sharp scissors, brush, alcohol, paper bags, rubber bands, paper clips and tags.

PROCEDURE

The steps given below are sequentially followed to perform the experiment of controlled pollination.

Emasculation

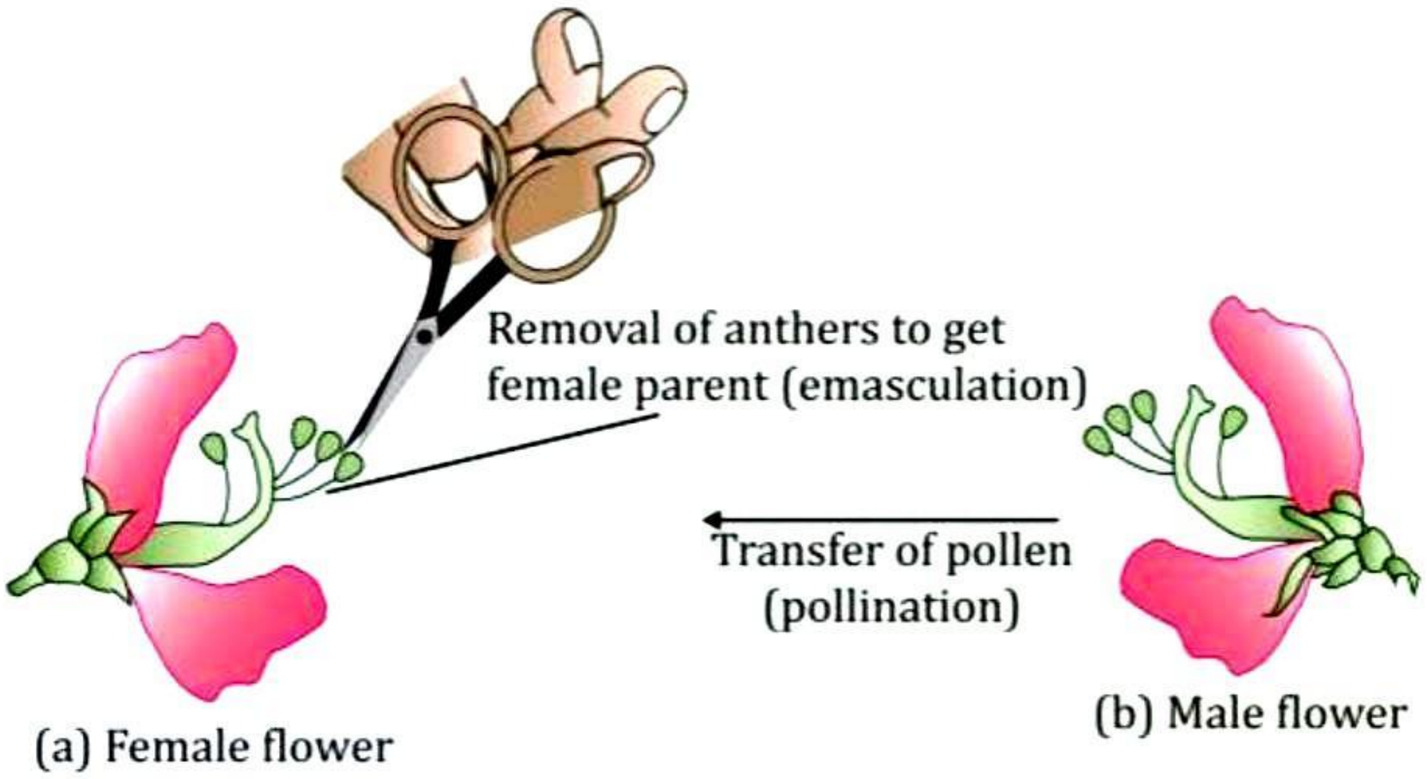
It is the process of removal of anther before its dehiscence (anthesis). There are two methods of emasculation.

Scissors/Forceps Method of Emasculation

(i) This method is adopted for the plants having large sized flowers, e.g. cotton. pea, etc.

(ii) Emasculation is done with the help of pocket lens, forceps, needle, scissors, scalpel camel hair brush as shown in figure below :

(iii) The anthers are cut in the flower before their maturation with the help of sterilised forceps or scissors. This is called female flower now.

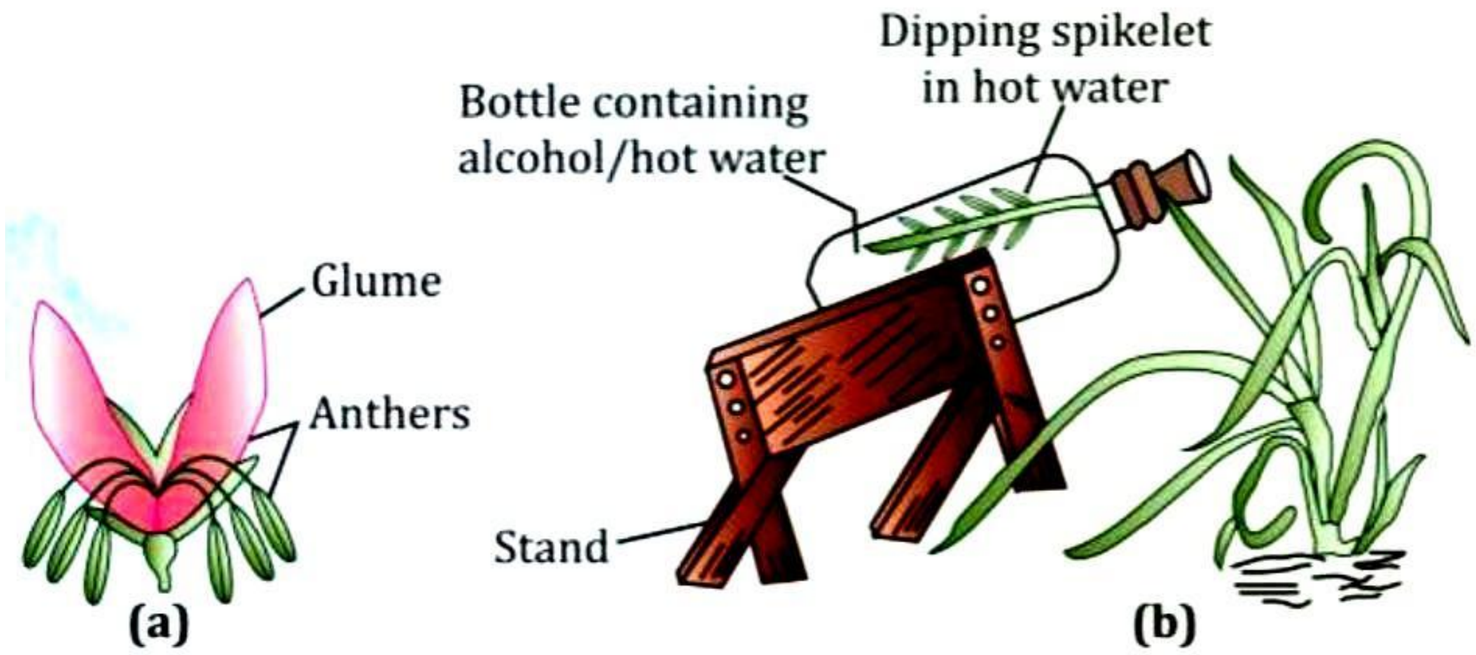


Scissors/Forceps method of emasculation

Alcohol/Hot Water Method of Emasculation

(i) This method is adopted for plants/crops with small sized flowers like paddy, sorghum, etc.

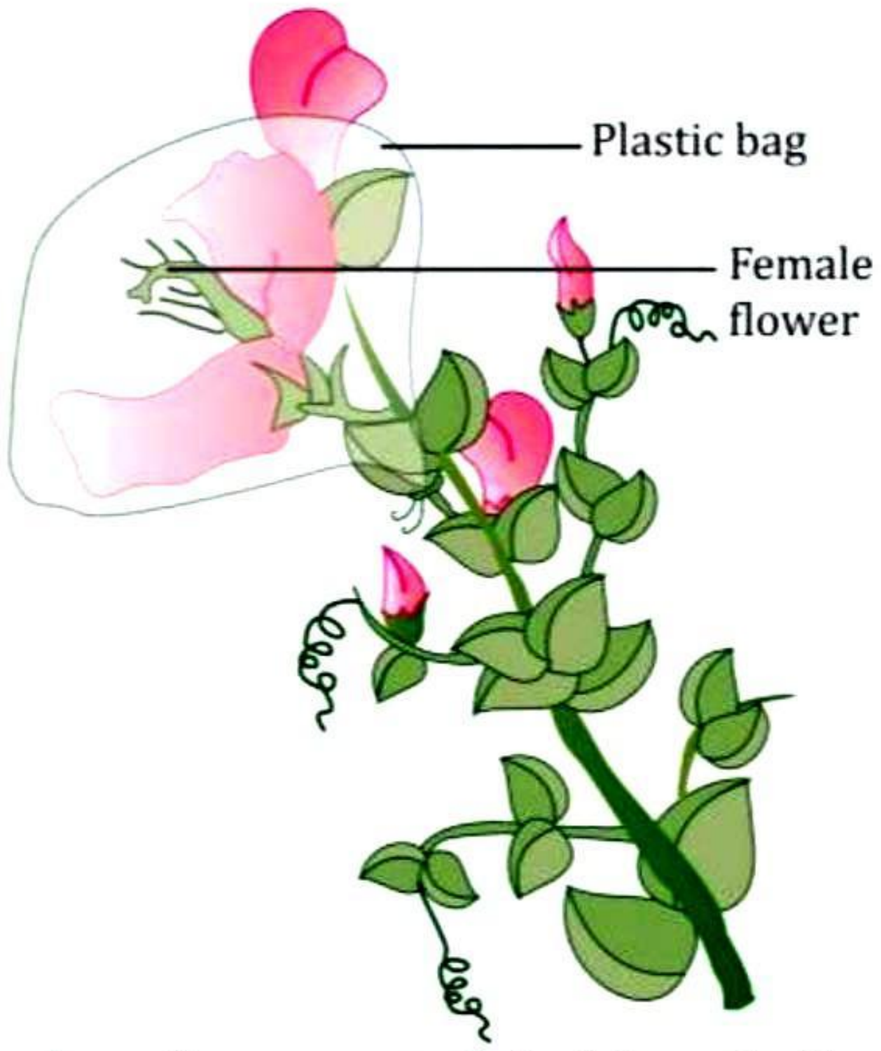
(ii) The penicles of flowers are dipped in hot water/alcohol for 1-10 minutes to kill the anthers.



(a) Single spikelet of paddy (b) Method showing emasculation in experimental paddy plant by hot water/alcohol

Bagging

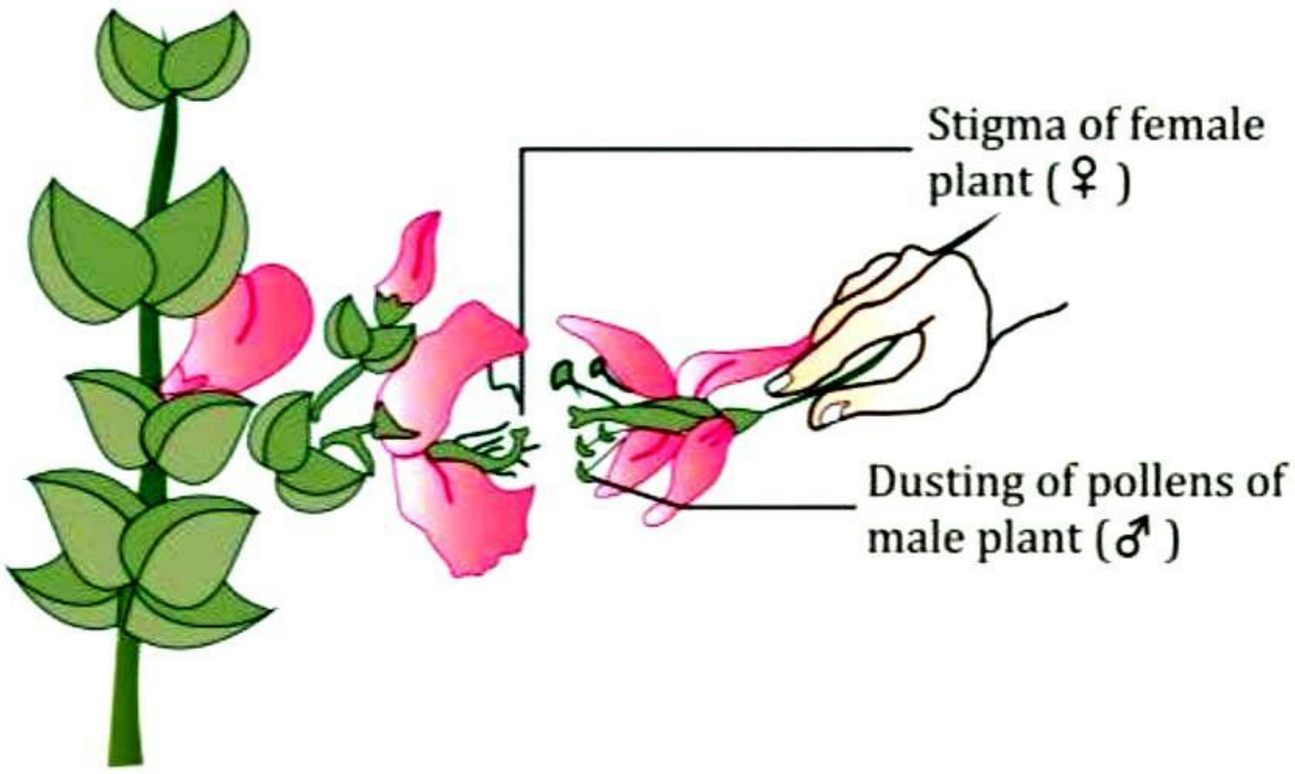
Cover the emasculated female flowers with transparent plastic bags (with minute holes in it) to avo the undesired pollen from falling on it.



Bagging of an emasculated female flower

Cross-Pollination

As we get the female flower (having only the stigma after removal of anthers by emasculation) we dust them with the pollens of desired plant (male parent) on the stigma (female parent) with sterile camel brush. This way we ensure controlled cross-pollination.



Cross-pollination is being performed on emasculated female flower

Note: Cover the pollinated flower again with transparent bag immediately after the cross-pollination step.

Tagging and Labelling

After performing cross-pollination, tagging is done on the plant. The tag includes all necessary information about the experiment like plant variety of male and female parent, date of pollination, etc.

Plant showing labelled tag

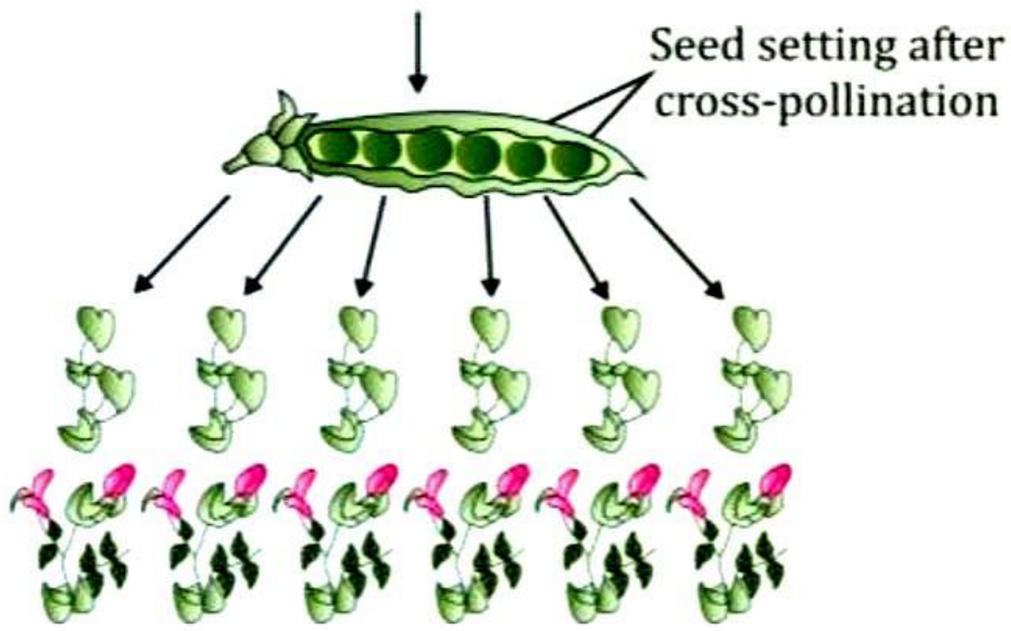
OBSERVATION

After the emasculation, bagging and tagging is done, the plant is kept under undisturbed observation and proper care of experimental plants is taken till seed setting and harvesting. This ensures the success of the experiment.

RESULT

By the process of emasculation and cross pollination under controlled conditions, the female plant will produce seeds of the desired characteristics.

Experimental flower will produce seeps



Seed will show the desired characters in the next generation of the plant

VIVA VOCE

Q1. What is plant breeding?

Ans. It is a science which deals with the development of improved varieties.

Q2. Which is the oldest method of plant improvement?

Ans. Selection of best plant in each generation selects the best genes naturally.

Q3. What is hybridisation?

Ans. It is a process of crossing two different plants having desirable characters to get a superior variety which combines the good characteristics of both the parents.

Q4. Which process is better among selfpollination or cross-pollination and why?

Ans. Cross-pollination is better because it leads to greater variability and recombination of characteristics of two different plants. This helps new organism formed to have better adaptability. The self-pollination gradually leads to inbreeding depression due to the loss of vigour and vitality.

Q5. Why do we need to test the new recombinants before releasing them in the commercial market?

Ans. It is done to select the superior hybrids and ensure that hybrid does not contain any harmful characters of both the parents. The individual hybrids with only desired characters are selected and tested.

Q6. What is the importance of self pollination?

Ans. It is important as it maintains the character of species from one generation to other generation

Q7. Why is emasculation performed before anthesis?

Ans. When anthesis occurs, it releases the pollen grains leading to pollination of the flower. So, before the release of pollen grains emasculation is necessory to get female flower ready for cross-pollination

Q8. What are the advantages of using a bag containing minute pores?

Ans. The minutes pores will allow the gaseous exchange (O_2 and CO_2) needed for the plant but prevent the pollination by not allowing pollens to reach the female flowers.

Q9. Should we discard self pollination totally?

Ans. No, it is a natural process which maintains the unformity in characters in successive generations so we should not totally discard it.

Q10. What are the objectives of plant breeding?

Ans. It aims to develop varieties of crop plant with better yield, resistance in plants against disease and pests, tolerance in the prevailing climatic conditions etc