



DAVANAGERE UNIVERSITY



**SJ.M COLLEGE OF ARTS, SCIENCE AND COMMERCE
CHANDRAVALLI CHITRADURGA**

SUBJECT : BOTANY

GENETICS AND PLANT BREEDING

PROJECT WORK ON :

HYBRIDIZATION AND ITS TECHNIQUES



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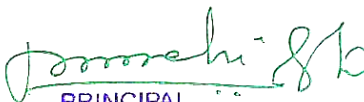
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INTRODUCTION

Chikkamagaluru is a hill station in Karnataka, a state in Southwest India. It is also called as "The Land of coffee" Chikmagalur is famous for its serene environment , lush green forests and tall mountains. It is also famous for the coffee and is often referred to as the coffee land of Karnataka...

To the north is Baba Budaugiri, a mountain range in the western ghats, with 3 large Caves said to be holy..Trails through forest and grasslands Lead up to Mullayanagiri peak. The Cascading Hebbe falls lie in an area of Coffee plantations. The forested Bhadra wildlife Sanctuary northwest of chikkamagaluru is home to elephants tigers and leopards. Kemmanagundi (Red poil Pit) is hill station in Tarikere taluk of Chikkamagaluru district in state of Karnataka. Indian it is at the Elevation Of 1434m above Sea level. with it peak at 1863m..

It is also known as 'Sri krishnarajendra Hill station' Hybridisation is method of producing new Varieties of plants or animals by crossing two individuals of different genotypes. It can be intraspecific if cross is done between two individuals of same speies or it may be interspecific if cross is done between two individuals of different species.

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HYBRIDIZATION

Hybridization

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Definition: The phenomenon of mixing up of atomic orbitals of similar energies and formation of equivalent number of entirely new orbitals of identical shape and energy is known as "hybridization" and the new orbitals so formed is called as "hybrid orbitals".

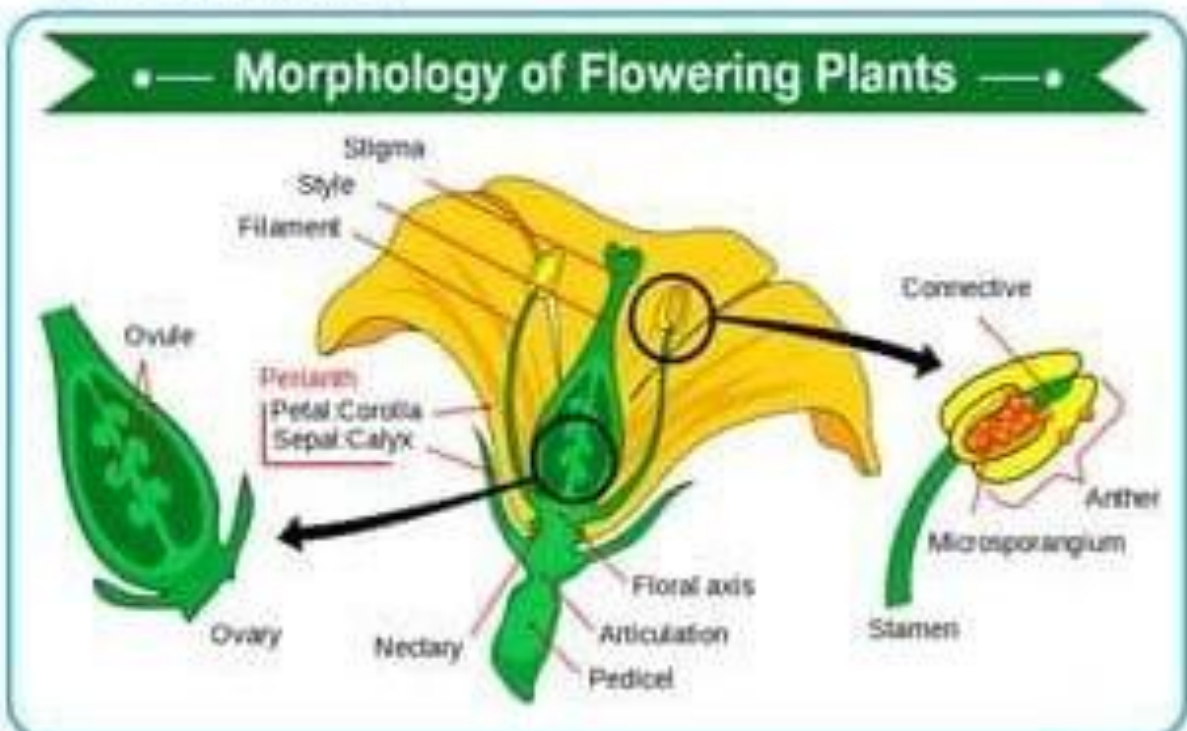
Important points for understanding the hybridization:

- (i) The number of hybrid orbitals generated is equal to the number of pure atomic orbitals that participate in hybridization process.
- (ii) Hybridization concept is not applicable to isolated atoms. It is used to explain the bonding scheme in a molecule.
- (iii) Covalent bonds in polyatomic molecules are formed by the

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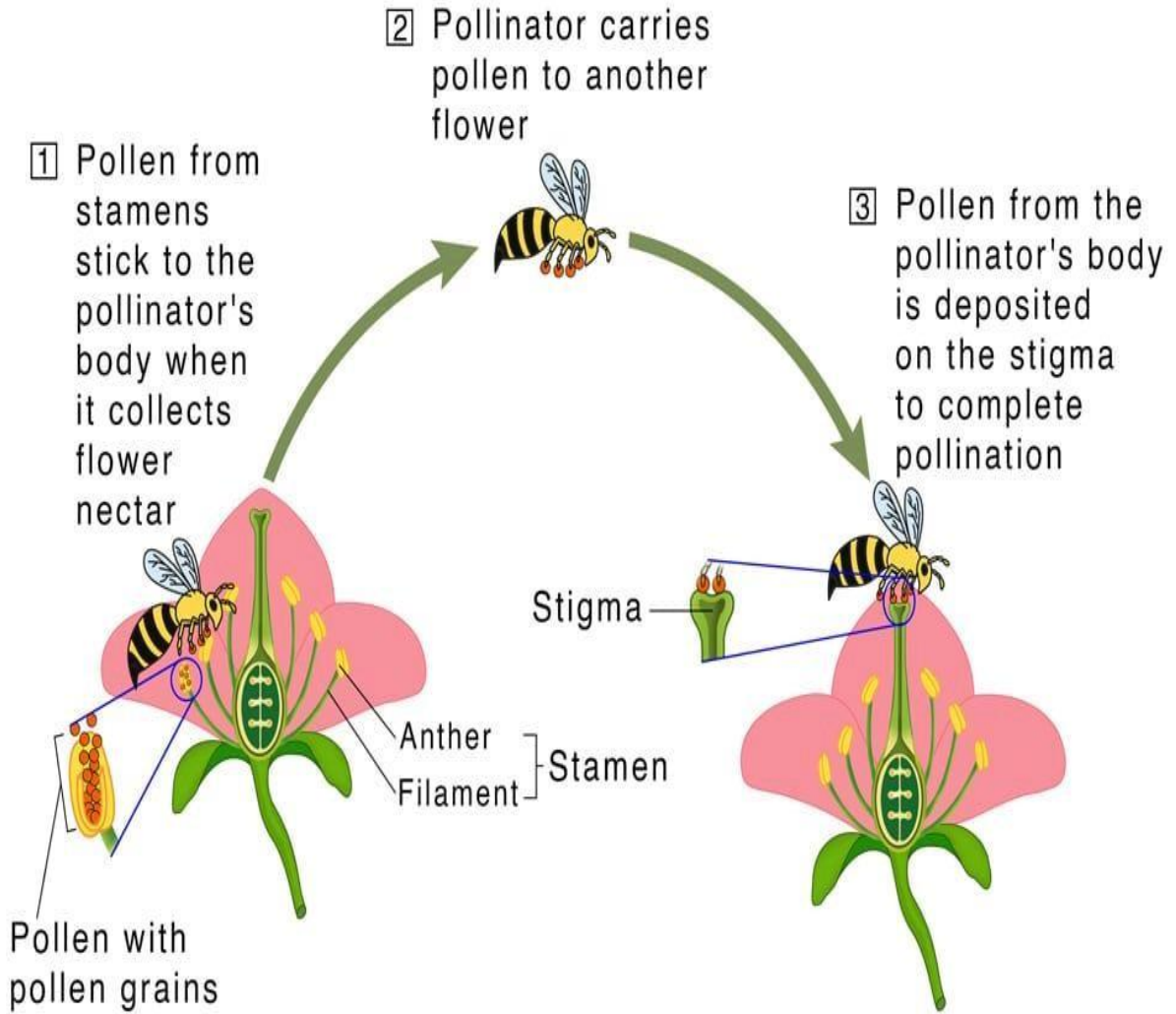
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- The flower is the part of the plant that brings about reproduction by sexual means.
- The androecium and gynoecium produce the male and female gametes respectively, which on fusion, form the zygote.
- The fusion of the male and female gametes is termed as fertilization. In order to bring about fertilization, the most important step is to bring the two gametes together. This is brought about by a process called pollination.
- There are two kinds of pollination : self-pollination and cross-pollination.



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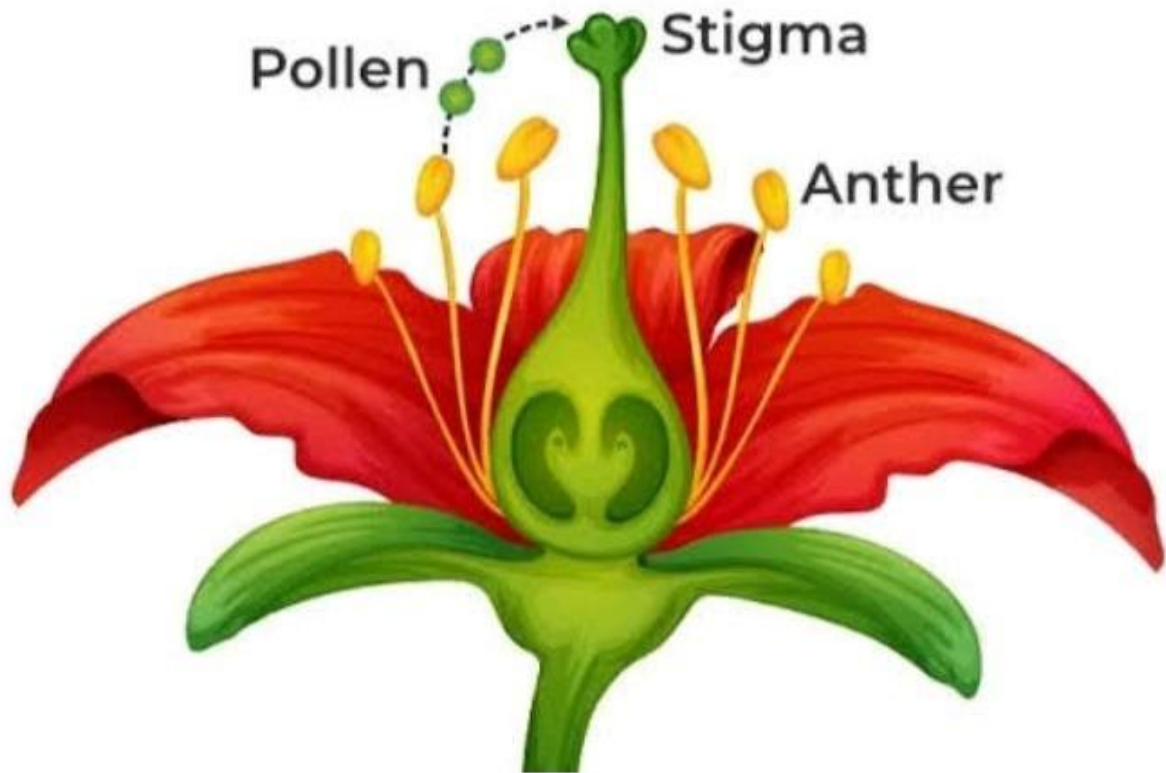
Pollination



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Self Pollination



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Self-Pollination

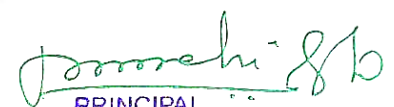
Self-pollination, or more exactly almost full self-pollination, is the principle mating system found in grain crops and in many vegetables. The majority of the 50–60 main grain crops of the world are predominantly self-pollinated. Only a few (such as maize, rye, pearl millet, buckwheat, or scarlet runner bean) are cross-pollinated. Now that the wild progenitors of the majority of the grain crops are already satisfactorily identified, we know that the wild ancestors of the self-pollinated crops are also self-pollinated. In other words, self-pollination in grain crops did not evolve under domestication. It is rather a “preadaptation” of the wild ancestor, which considerably enhances its chance to perform successfully in cultivation. One major advantage of self- over cross-pollination is the fact that self-pollination isolates the crop reproductively from its wild progenitor. It enables the farmer to

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grow a desired genotype in the same area in which the wild relatives abound without endangering the identity of the cultivar by genetic swamping. A second advantage of self-pollination lies in the genetic structure maintained within the crop. Self-pollination results in splitting the crop's gene-pool into independent homozygous lines. Variation is thus structured in the form of numerous true breeding cultivars. Because they are automatically “fixed” by the pollination system, they can be easily maintained by the farmer, even if they are planted together. In contrast, the preservation of varietal identity in cross-pollinated plants is much more problematic. It requires repeated selection towards the desired norms, constant care to avoid the mixing of types and the prevention of contamination from undesirable plants. It is therefore not surprising that early





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tion

1. Pollen from stamens sticks to a bee as it visits a flower to collect food.



3. Pollen or to a pistil on the ot



2. The bee travels to another plant of the same type.



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cross-pollination

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Cross-pollination, type of pollination in which sperm-laden pollen grains are transferred from the cones or flowers of one plant to egg-bearing cones or flowers of another. Cross-pollination is found in both angiosperms (flowering plants) and gymnosperms (cone-bearing plants) and facilitates cross-fertilization and outbreeding. This movement of pollen may occur by wind, as in conifers, or via symbiotic relationships with various animals (e.g., bees and certain birds and bats) that carry pollen from plant to plant while feeding on nectar.

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pollination, or selfing, although foolproof in a stable environment, thus is an evolutionary cul-de-sac. There also is a more direct, visible difference between selfing and outbreeding: in those species where both methods work, cross-pollination usually produces more, and better quality, seeds. A dramatic demonstration of this effect is found with hybrid corn (maize), a superior product that results from cross-breeding of several especially bred lines. About half of the more important cultivated plants are naturally cross-pollinated.

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When compared with self-pollination (the transfer of pollen within a flower or between flowers on the same plant), cross-pollination clearly has certain evolutionary advantages. The seeds formed by outbreeding may combine the hereditary traits of both parents, and the resulting offspring generally are more varied than would be the case after self-pollination. In a changing environment, the genetic variability within a cross-pollinated population may enable some individuals to be adapted to their new situation, ensuring survival of the species, whereas the individuals resulting from self-pollination might

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Vegetative reproduction, any form of asexual [reproduction](#) occurring in [plants](#) in which a new [plant](#) grows from a fragment of the parent plant or grows from a specialized reproductive structure (such as a [stolon](#), [rhizome](#), [tuber](#), [corm](#), or [bulb](#)). In many plants, vegetative reproduction is a completely natural process; in others it is an artificial one. For a general discussion of plant reproduction, see [plant reproductive system](#). For an overview of the cultivation of plants for food and ornament, see [horticulture](#).

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Bulbs

Flowers have an underground stem to which the leaves are attached, which is known as a bulb. These leaves have the capability of storing food in their cells. The bulb's centre contains an apical bud, which develops into leaves and flowers as the bulb grows. Shoots are formed as a result of the development of lateral buds.

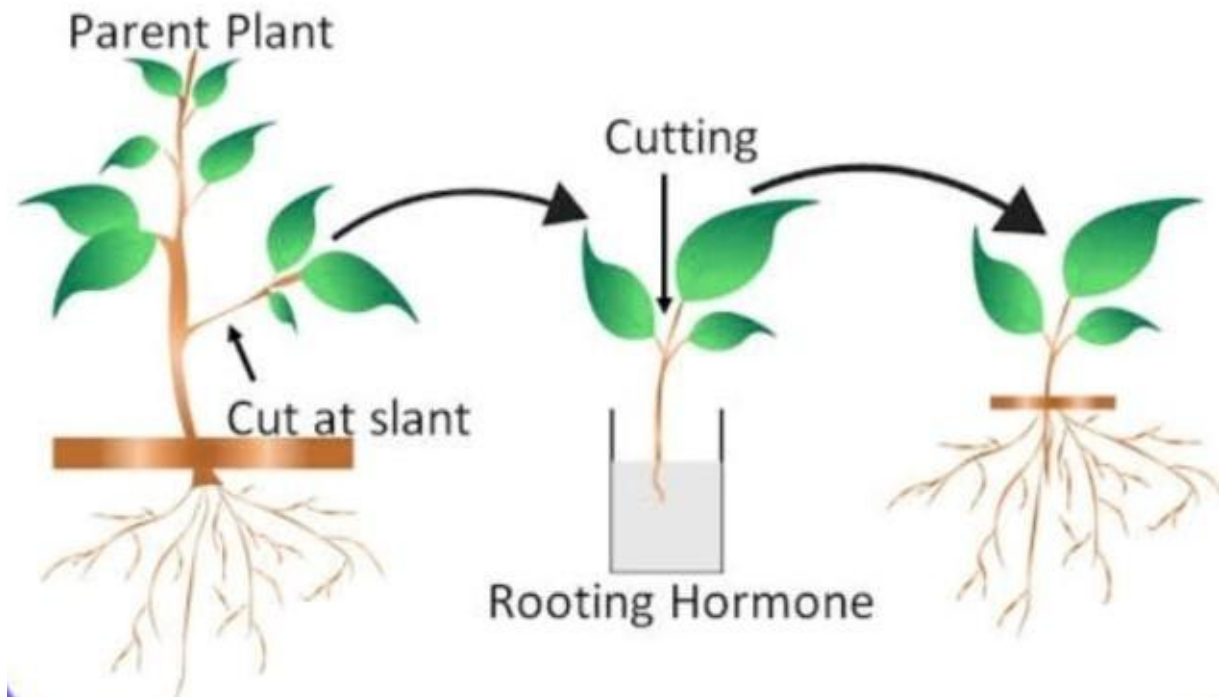
Also see: Asexual Reproduction in Plants for more information.

Artificial Vegetative Propagation (AVP) is a technique for propagating plants in artificial environments.

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CUTTING METHOD OF VEGETATIVE PROPAGATION



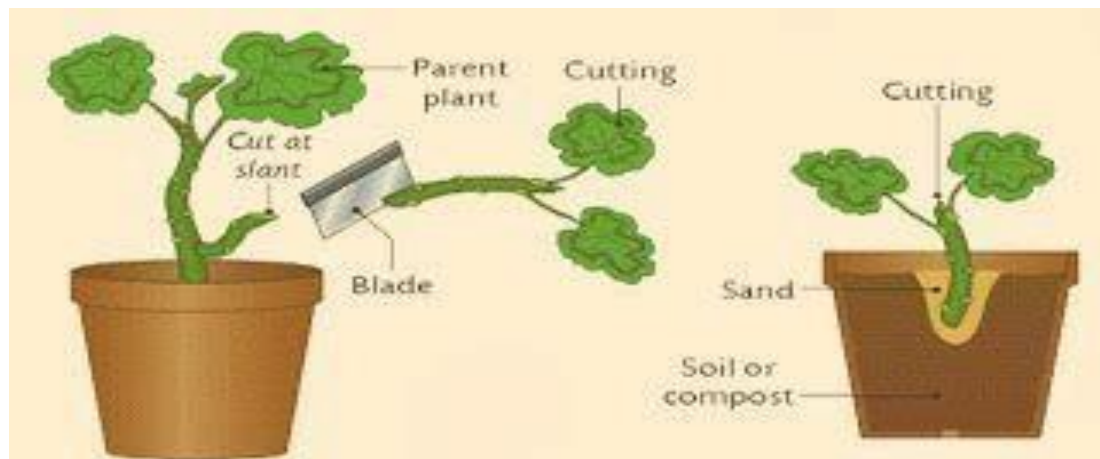
Cutting

An individual plant part, such as a stem or leaf, is cut and planted in the soil.

Hormones are sometimes applied to these cuttings in order to stimulate root development. The adventitious roots that develop from the cutting become the building blocks of the new plant.

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What is Grafting?

Grafting is the process of combining two different plants to create a single one

It requires lots of skill and practice, but has been successfully achieved by providing a clean cut on the two plants and taping the ends together until they heal

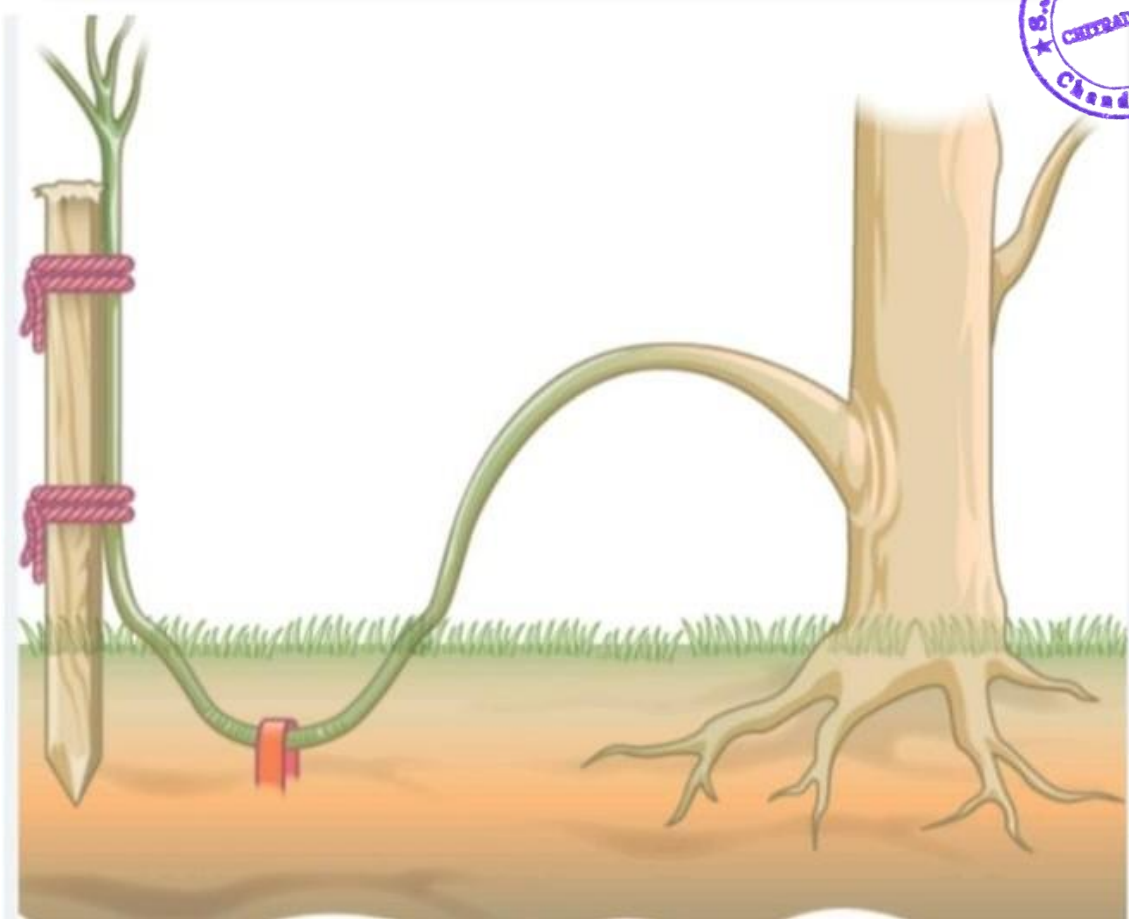
The purpose is to combine one plant's qualities of flowering or fruiting with the roots of another that offers vigour and resilience

Most plants need to be grafted within their own genus - such as potatoes and tomatoes - but it is sometimes possible to graft those of a differing makeup

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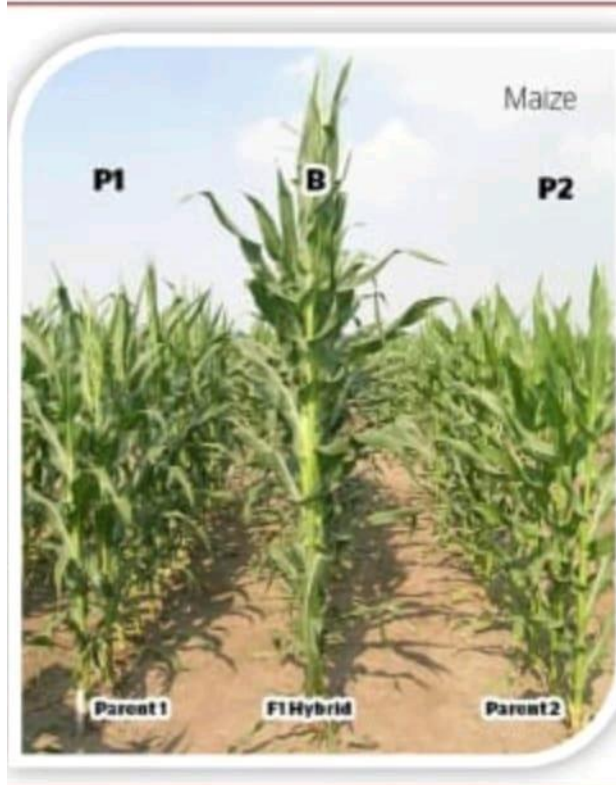
Layering

- **Definition:** a propagation method by which stems are rooted while still attached to the parent plant
- **Uses**
 - propagation of “trailing” species (e.g., blackberries, raspberries)
 - difficult-to-root species (e.g., filberts, Muscadine grapes, apple, and pear rootstocks)
 - producing larger-sized plant specimens in a short time period (dieffenbachia, crotons)

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Plant hybridization



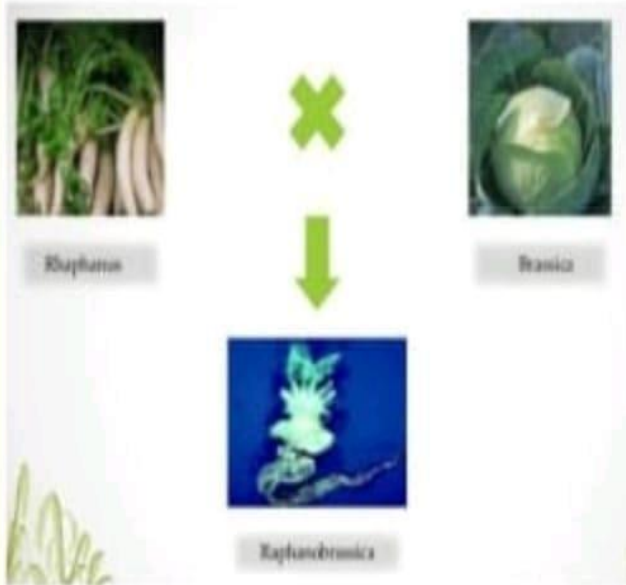
- The mating or crossing of two plants or lines of dissimilar genotype is called hybridization.
- In plant hybridization, one of the plants is taken as the female plant and the other as the male plant.
- Pollen grains from the male parent are made to pollinate the stigma of the flowers of the female parent.
- **The seeds obtained from such a cross are called F_1 hybrid seeds** and the progeny raised from it is called F_1 (First Filial) generation.

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Distant hybridization



- Hybridization between the members of different species or hybridization beyond species level is called distant hybridization. Thus, it may be interspecific (intra-generic) or inter-generic. When conventional methods of hybridization fails, para-sexual methods are used in such cases.

- Para-sexual hybridization is the technique of fusing somatic

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Types of hybridization

Based on the genetic difference between parents, hybridization can be classified into:

1. **Inter-varietal Hybridization**
2. **Distant Hybridization**

Inter-varietal hybridization

The cross between the members of the same species (intra-specific) is called inter-varietal hybridization. In this type of hybridization, different cross patterns can be used.

Simple Cross: In this case, two parents are used to produce an F_1 hybrid. It is also called single cross.

Parent A \times Parent B \longrightarrow F_1 hybrid

Complex Crosses: In complex crosses, more than two parents are involved. Such crosses can be called convergent crosses since they bring genes from different sources together. eg,

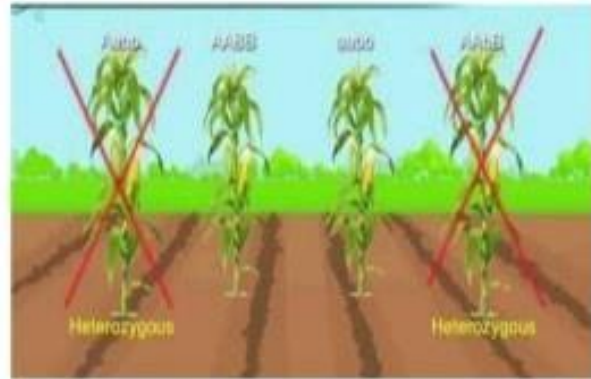
Three way cross $F_1(A \times B) \times C$
 Double cross $F_1(A \times B) \times F_1(C \times D) \longrightarrow$



Jayaram

Evaluation of parents

- In case of parents which are new to the region they must be evaluated for their adaptability.
- Further to ensure homozygosity, they must be evaluated.



Emasculation

- Emasculation is the removal of immature anthers from a bisexual flower.
- Depending upon the crop species, the method of emasculation differs.
- Normal practice is hand emasculation.



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Bagging

- The emasculated inflorescences of female plants are covered using butter paper bags or cloth bags.
- However, in the case of cross-pollinated crops, male plants may also be bagged if desired, so as to avoid pollen mixture.
- The bags are removed 2-3 days after pollination.



Tagging

- Emasculated flowers are tagged properly after bagging.
- Circular or rectangular tags may be used.
- Details of the cross, date of emasculatation, date of pollination



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Conclusion

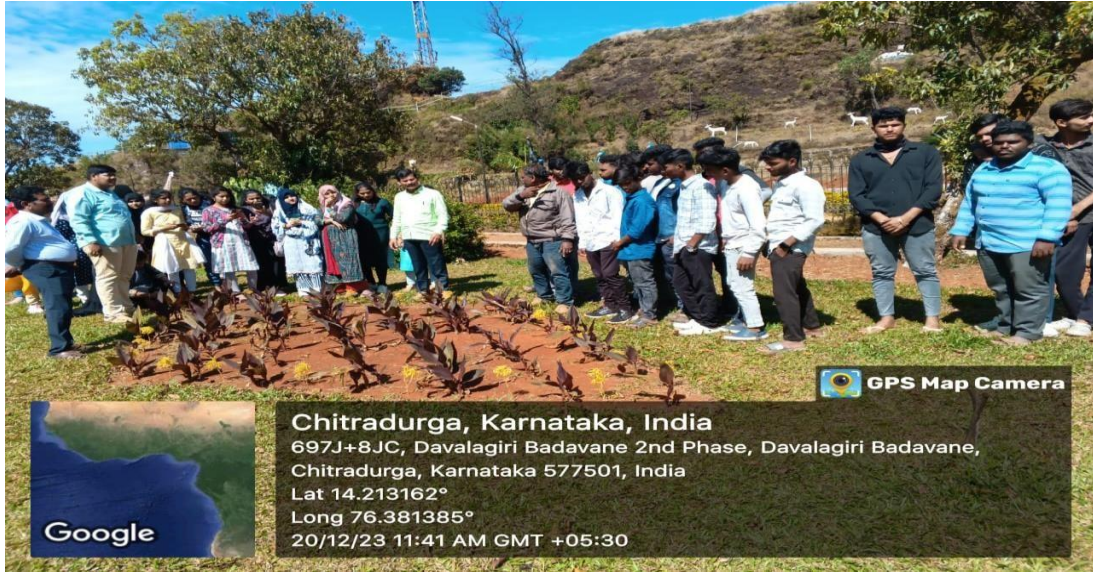
Wide hybridization causes broadening the genetic base and bringing the characters like high protein content, early maturity, high number of primary and secondary branches, multiple stress resistance to the cultivated chickpea species. Crossability barriers during hybridization frustrate breeders efforts in successful hybridization between *Cicer* species. These barriers can be overcome through novel technologies. Among *Cicer* species *C. reticulatum* and *C. echinospermum* are compatible with all other *Cicer* species as a female parent so they can be utilized as bridge species. Crossing between species of same genera have contributed immensely to crop improvement. Hence wide hybridization is crucial for transferring useful genes from alien species to cultivated species.

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