

### **Meaning**

- Haploid plants are characterized by possessing only a single set of chromosomes (gametophytic number of chromosomes i.e.  $n$ ) in the sporophyte.
- This is in contrast to diploids which contain two sets ( $2n$ ) of chromosomes.
- Haploid plants are of great significance for the production of homozygous lines (homozygous plants) and for the improvement of plants in plant breeding programmes.

### **In vitro techniques for haploid production:**

#### **Androgenesis-**

The male gametophyte (microspore or immature pollen) produces haploid plant. There are two approaches in androgenesis- Anther and Pollen culture

#### **Anther culture**

- The selected flower buds of young plants are surface-sterilized and anthers removed along with their filaments. The anthers are excised under aseptic conditions, and crushed in 1% acetocarmine to test the stage of pollen development.
- Each anther is gently separated (from the filament) and the intact anthers are inoculated on a nutrient medium. Injured anthers should not be used in cultures as they result in callusing of anther wall tissue.
- The anther cultures are maintained in alternating periods of light (12-18 hr.) and darkness (6-12 hrs.) at  $28^{\circ}\text{C}$ . As the anthers proliferate, they produce callus which later forms an embryo and then a haploid plant

#### **Pollen (microspore) culture**

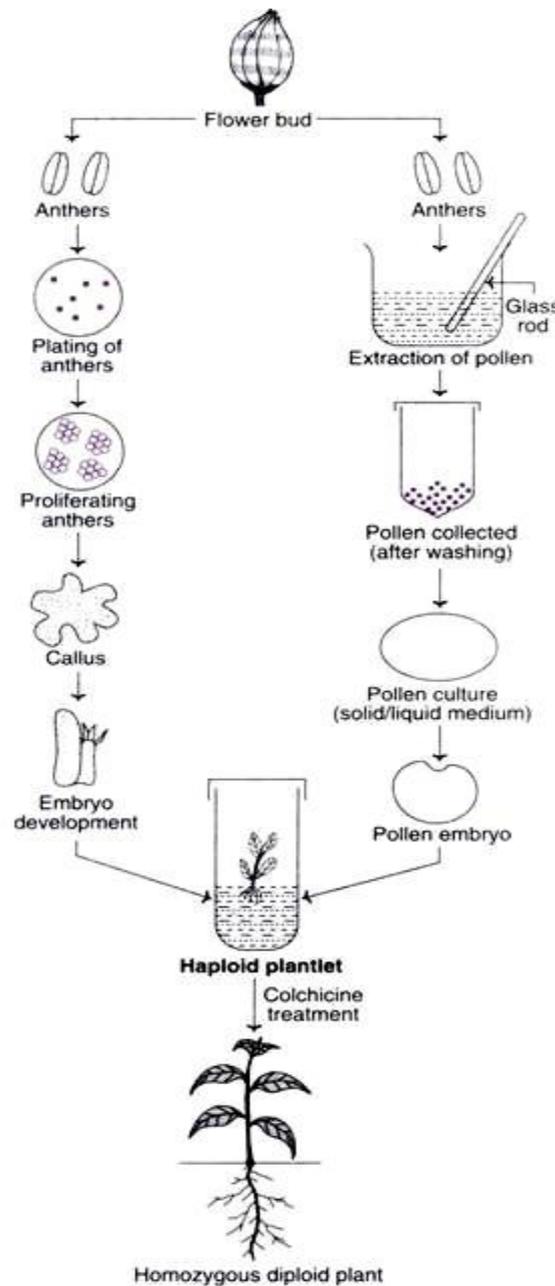
- Haploid plants can be produced from immature pollen or microspores (male gametophytic cells).
- The pollen can be extracted by pressing and squeezing the anthers with a glass rod against the sides of a beaker. The pollen suspension is filtered to remove anther tissue debris.
- Viable and large pollen (smaller pollen do not regenerate) are concentrated by filtration, washed and collected.
- These pollen are cultured on a solid or liquid medium. The callus/embryo formed is transferred to a suitable medium to finally produce a haploid plant

#### **Advantage of anther culture:**

- Anther culture is easy, quick and practicable. Anther walls act as conditioning factors and promote culture growth.

#### **Disadvantage anther culture**

- Major limitation is that the plants not only originate from pollen but also from other parts of anther. This results in the population of plants at different ploidy levels (diploids, aneuploids).



**Fig. 45.1 :** Diagrammatic representation of anther and pollen cultures for the production of haploid and diploid plants.

### Advantage of pollen culture

- Undesirable effects of anther wall and associated tissues can be avoided.
- Androgenesis, starting from a single cell, can be better regulated.
- Isolated microspores (pollen) are ideal for various genetic manipulations
- The yield of haploid plants is relatively higher.