

Genetic improvement of plants 2026- Typical correction

1. Choose the correct answer(s)

1. Crossing over is an example of (2 p)
 - b. imperfect linkage
 - c. incomplete linkage
2. The presence of extranuclear inheritance is confirmed if (1 p)
 - a. The reciprocal crossings ♂ x ♀ and ♀ x ♂ were not equivalent
3. Among the conditions of the Hardy-Weinberg equilibrium (2 p)
 - a. The frequency of genotypes is the same in males and females;
 - c. There is no contribution of new genetic material, through migration
4. Soilless culture is (2 p)
 - a. The growing of plants in a nutrient solution (without soil).
 - b. The synonym of hydroponics
5. Vegetative reproduction (2 p)
 - b. Doesn't need any formation of gametes
 - c. Perpetuates the species without any genetic modification
6. Dioecious plant species have (1 p)
 - a. male and female organs separate on two plants

2. Methods for obtaining new pure lines of self-pollinating plants (1 p x 4)

- The *direct* pedigree method: the selection of lines and then families of lines immediately follows hybridization.
- the *delayed* pedigree method (bulk method): selection is only practiced after a few generations of inbreeding following hybridization, which results in the rapid expression of recessive traits, and therefore their appearance
- the *single seed descent* (SSD) method: this method is used for the selection of plants with a short life cycle, producing several generations per year and few seeds per pod, such as vegetable legumes. For 6 to 7 generations, one seed is taken from each plant and resown. In this way, at least one example of each plant from the initial population is kept, without eliminating any.
- The *haploidization* method: pure lines are obtained directly by haploidy followed by chromosome doubling. Selection can therefore be applied directly to completely homozygous lines.

3. The usefulness of cytoplasmic male sterility (1 p)

It facilitates the creation of hybrid varieties in monoecious plants

4. Improvement of vegetatively propagated plants (1 p)

The creation of new clones requires going through sexual reproduction.

5. Differences between

- *Narrow-sense heritability* $h^2 = V_A/V_P$ (0.5 p)

Broad-sense heritability $h_{bs}^2 = V_G/V_P$ (0.5 p)

- *Inbreeding*: This refers to the decrease in vigor due to inbreeding (0.5 p)

Heterosis: This is a phenomenon that occurs in cases of intraspecific or interspecific hybridization. Heterosis was introduced to describe the superiority of hybrids compared to the best of the two parental populations (0.5 p)

- *Qualitative trait*: Not measurable (0.5 p), monogenic (0.5 p)

Quantitative trait: Measurable (0.5 p), polygenic (0.5 p)