Quadrant II – Transcript and Related Materials

Programme : **Bachelor of Science (Third Year)**

Subject : **Botany**

Course Code : **BOC108**

Course Title : **Cytogenetics and Plant Breeding**

Unit II : **Mendelian genetics and its extension**

Module Name : **Complementary Gene Interaction**

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Complementary Gene Interaction (9:7)

Mendel and other workers assumed that characters are governed by single genes, but later it was discovered that many characters are governed by two or more genes. Such genes affect the development of concerned character.

The phenomenon of two or more genes affecting the expression of each other in various ways in the development of a single character of an organism is known as **Gene Interaction**.

Certain characters are produced by the interaction between two or more genes. These genes are complementary to one another, i.e., if any of the two gene is present alone it remains unexpressed, but are expressed only when they are combined together. Such interaction is referred to as **Complementary gene interaction**. The genes are present on different loci on the homologous chromosomes or on other chromosomes.

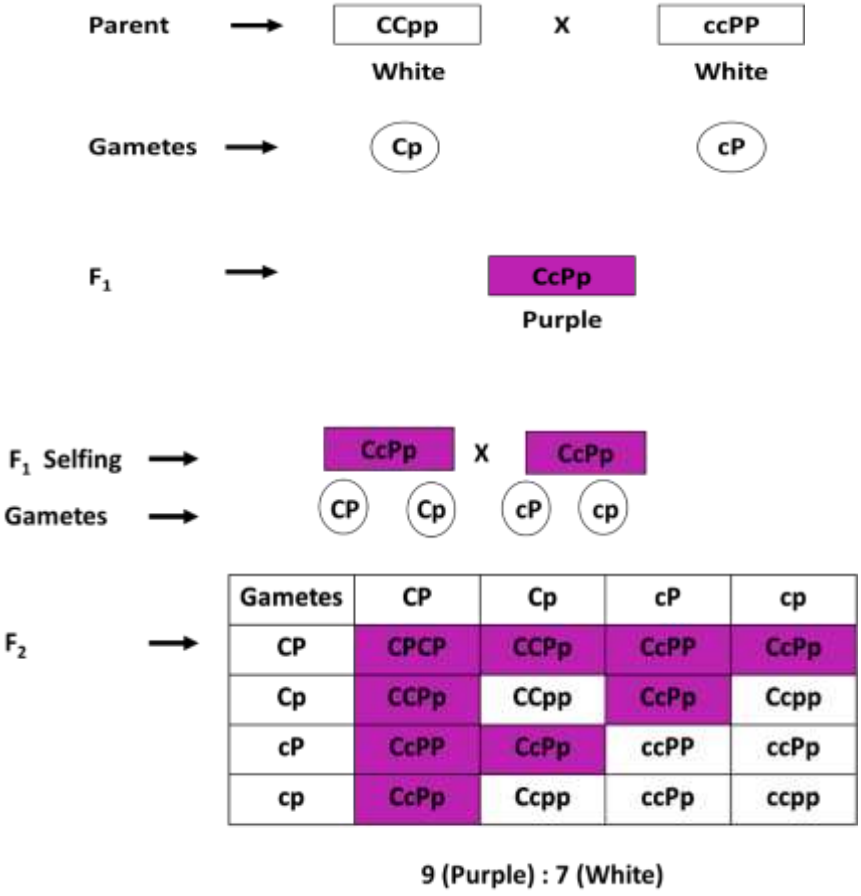
Example 1 : Flower Colour in *Lathyrus odoratus* (Sweet pea)

Sweet pea produces white and purple flowers. The mechanism of flower production is determined by the enzymes controlled by genes which when analysed showed the complementary gene mechanism phenomenon.

A given enzyme (genetically controlled as to absence or presence in a given individual) acts upon chromogen (a colourless base whose absence or presence is also genetically controlled) to produce the purple colour flowers. The

dominant allele/s (CC or Cc) of gene C are responsible for the presence of chromogen, while the homozygous recessive alleles (cc) of this gene are responsible for the absence of chromogen. Likewise, the dominant alleles of gene P in homozygous (PP) or heterozygous (Pp) condition caused the production of an enzyme which is necessary for colour production from chromogen, while homozygous recessive (pp) condition does not produce any such enzyme.

When a pureline variety of white flowered sweet pea was crossed with another pureline variety of white flowered sweet pea, in F_1 purple flowered plants were produced. The F_1 plants when self pollinated or crossed among themselves, produced the F_2 generation with the phenotypic ratio of 9 coloured and 7 white flowered plants.



The appearance of 9:7 ratio instead of 9:3:3:1 ratio from the cross of two white flowered sweet pea plants (CCpp X ccPP) can be illustrated in the above example.

Example 2 : Grain colour in Sorghum

There are two white grained races which, when crossed, produced F1 hybrids with brown grains. When brown grained F1 plants were self pollinated, they produced brown grained and white grained plants in the ratio 9 : 7.