SAVITRIBAI PHULE PUNE UNIVERSITY , PUNE

T.Y.B.Sc. Botany

(Sem-III)

SUBJECT

Genetics and Evolution(Paper-III)

PowerPoint Presentation

Topic-Interaction of gene

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Non-epistatic genetic interaction

1) COMPLEMENTRY GENE (9:7)

Certain character are the results of interaction between two or more pair of basic gene inherited from different parent. These gens if alone, remain unexpressed, and become effective only when they are combined in the same zygote through suitable crossing such gene are called the complementary gene. Because one completes the action of the other.

The interaction of complementary gene modifies the dihybrid ratio to 9:7 in the F_2 generation. e.g. Bateson crossed two varieties of a white sweet pea. All the plants of the F_1 generations possessed purple flower. When the F_1 individuals were self fertilized, they produce 9 purple and 7 white in F_2 generations.

Bateson explained these results by showing that it is really dihybrid cross in which two pair of complementary gene are involved and are inherited from opposite parent.

Bateson assumed that the purple color of the flower is due to two factor, a color factor 'C' and purple factor 'P'. Each of the whit parent lack one or the other gene and is of genotype CCpp or ccPP.

When such parents are crossed F_1 hybrid receives both the gene and are of genotype CcPp. Hence the flowers in the F_1 are purple. The F_2 ratio of 9:7 is actually modifications of dihybrid ratio is 9:3:3:1

Parent → Sweet Pea White Flower CCpp X Sweet Pea White Flower ccPP

Gametes → Cp cP

F1 Generation → CcPp

Purple flower

Gametes → CP Cp cP cp

Checker Board

♀ \ ♂	CP	Cp	cP	cp
CP	CCPP Purple	CCPp Purple	CcPP Purple	CcPp Purple
Cp	CCPp Purple	CCpp White	CcPp Purple	Ccpp White
cP	CcPP Purple	CcPp Purple	ccPP White	ccPp White
cp	CcPp Purple	Ccpp White	ccPp White	ccpp White

9 : 7

9 Purple

7 White

Non-epistatic genetic interaction

2) Duplicate Genes (15:1)

When two or more gene have the same effect o the given trait, they are referred as duplicate gene. The best example of interactions of duplicate genes has been reported by shull in 1914 in *Capsella bursa* and *Capsella pastoris* plant. There are two different varieties of this species, one variety bears triangular capsule fruit, while other bear ovoid shaped capsule. Both varieties breed true.

When they are crossed, the F_1 hybrid plant shows triangular fruit that means they indicating that the triangular capsule are dominance over the ovoid shaped ones.

Let us represents the genes responsible for triangular shape by T_1 and T_2. Since both genes contribute to the same effect that is triangular shape. The presence if even one dominant gene will make the fruit triangular. When only recessive genes are present in homozygous condition ($t_1t_1t_2t_2$) it form ovoid shaped fruit plant.

Thus dominant gene T_1 and T_2 have an identical effect on the fruit shape and are consequently termed as duplicate genes. The self pollination of F_1 triangular capsular fruit plant produce F_2 generation with triangular and ovoid capsular fruit plant in the ratio of 15:1.

Parent → Triangular X Ovoid

$T_1T_1T_2T_2$ $t_1t_1t_2t_2$

Gametes → T_1T_2 t_1t_2

F_1 Generation → $T_1t_1T_2t_2$

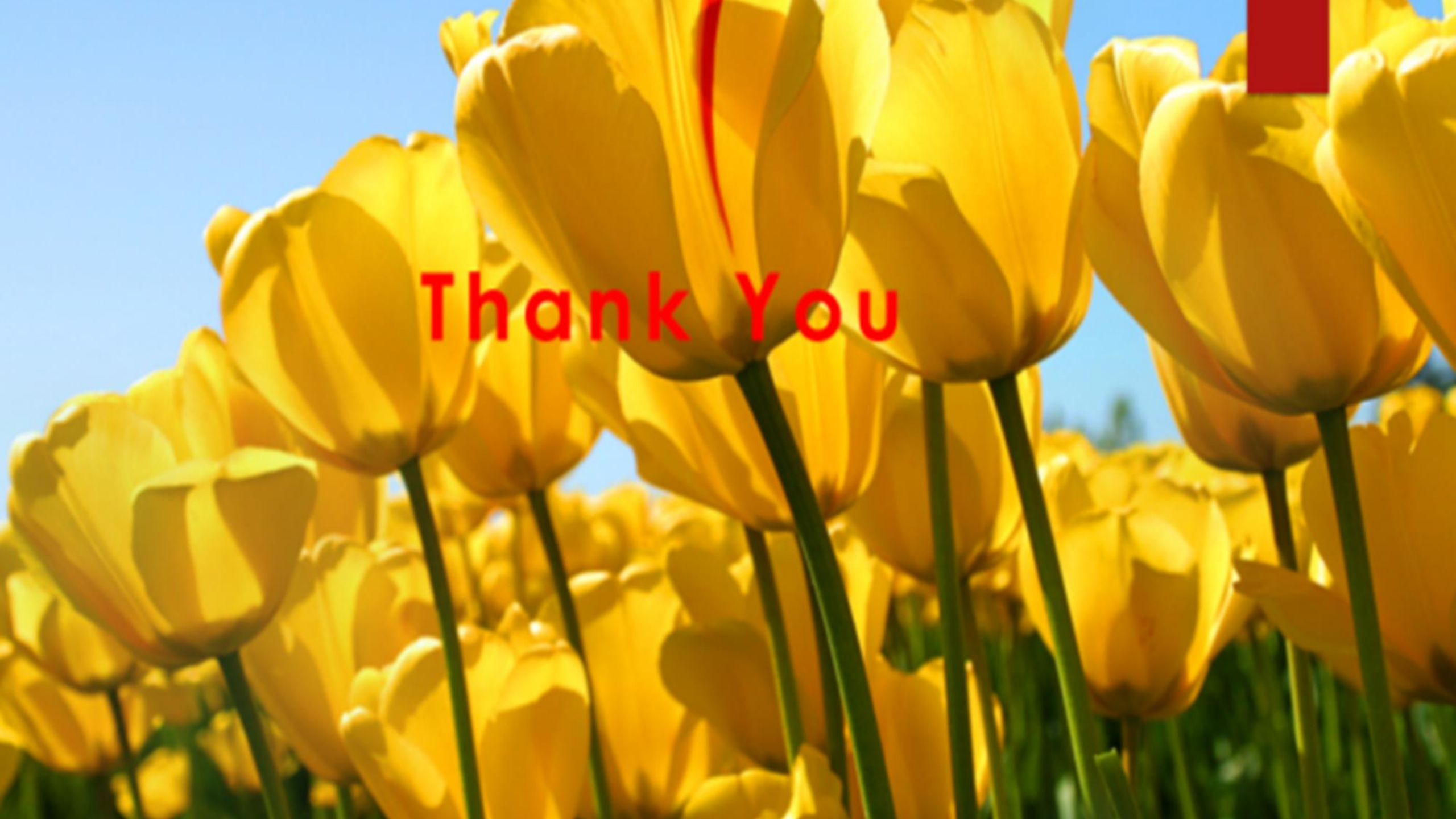
Triangular Fruit

F_1 Gametes → T_1T_2 , T_1t_2 , t_1T_2 , t_1t_2

Checker Board

♀ \ ♂	T_1T_2	T_1t_2	t_1T_2	t_1t_2
T_1T_2	$T_1T_1T_2T_2$	$T_1T_1T_2t_2$	$T_1t_1T_2T_2$	$T_1t_1T_2t_2$
T_1t_2	$T_1T_1T_2t_2$	$T_1T_1t_2t_2$	$T_1t_1T_2t_2$	$T_1t_1t_2t_2$
t_1T_2	$T_1t_1T_2T_2$	$T_1t_1T_2t_2$	$t_1t_1T_2T_2$	$t_1t_1T_2t_2$
T_1t_2	$T_1t_1T_2t_2$	$T_1t_1t_2t_2$	$t_1t_1T_2t_2$	$t_1t_1t_2t_2$

15:1 , 15 Triangular Fruit and 1 ovoid Fruit.


Thank You