Pedagogical Cluster- Journal of Pedagogical Developments
PCJPD: Volume 2 Issue 5, May 2024, online: ISSN 2956-896X

PEDAGOGICAL CLUSTER
JOURNAL OF PEDAGOGICAL DEVELOPMENTS

Website: https://euroasianjournals.org/index.php/pc/index

Analysis Of The Topic Of Complementary Effects Of Genes By Solving Genetic Issues

Oygul Rasulova
Teacher of Chirchik State Pedagogical University
E-mail: o.rasulova@cspi.uz

ABSTRACT: This article provides information on the complementary effect of non-allelic genes. Due to the complementary effect of genes, phenotypic separation is observed in the ratios 9:3:3:1, 9:3:4, 9:6:1, 9:7. The transmission of characters in the offspring under the complementary effect of genes is clarified by solving and analyzing genetic issues.
Keywords: *gene, complementary effect of genes, genetic issue, genotypic ratio, phenotypic ratio.*

Introduction

One of the indispensable stages of studying genetics is solving and analyzing problems related to genetics. These issues contribute to the uniqueness, appeal, and control of the science of genetics [5]. Understanding the topic by solving problems in the study of genetics leads to a deeper understanding of the essence of genetic laws, creative thinking and the development of natural-scientific literacy [4].

Literature Analysis And Methodology

Genetics is a difficult subject for majority of biology teachers and students world-wide. It is recognized that majority of students and even teachers of biology do not fully understand the basic concepts of genetics [3,6]. Analysis of genetic issues is important in solving this problem. This article analyzes the topic of complementary effects of genes by solving genetic issues.

The complementary effect of genes is one of the types of interaction of nonallelic genes. Complementary genes are involved in this inheritance. In the complementary inheritance of genes, F_1 hybrids develop a new trait rather than the parental trait [1]. Due to the complementary effect of genes, phenotypic separation is observed in the ratios 9:3:3:1, 9:3:4, 9:6:1, 9:7. [2].

Pedagogical Cluster- Journal of Pedagogical Developments
PCJPD: Volume 2 Issue 5, May 2024, online: ISSN 2956-896X
Euro Asian Journals
PEDAGOGICAL CLUSTER
JOURNAL OF PEDAGOGICAL DEVELOPMENTS
Website: https://euroasianjournals.org/index.php/pc/index

When teaching genetics to schoolchildren, explaining the topic by solving problems helps to deepen understanding of the essence of genetic law, creative thinking and increase natural-scientific literacy [6].

1 genetic issue: In chickens, the rose crown shape is due to the A gene, the pea crown one is due to the B gene, the walnut crown one is due to the complementary effect of the A and B genes, and the simple one is due to the recessive homozygous state of these genes (aabb). When chickens with a pea crown were crossed with roosters with a rose crown, only chicks with a walnut crown were obtained in the offspring. Find the ratio of phenotypic segregation in the chicks of the parental genotype and F_2.

Genetic issue solving and analysis:

fenotype	**genotype**
simple crown	aabb
rose crown	A_bb
pea crown	aaB_
walnut crown	A_B_

P	fenotype:	pea crown		rose crown
	genotype:	♀ aaBB	x	♂ AAbb
G		aB		Ab
F_1	fenotype:		walnut crown	
	genotype:		AaBb	

F_2

phenotypic radical	genotypes	genotypic ratio	phenotypes	phenotypic ratio
A_B_	AABB	$2^0=1$	walnut crown	9
	AABb	$2^1=2$		
	AaBB	$2^1=2$		
	AaBb	$2^2=4$		
A_bb	AAbb	$2^0=1$	rose crown	3
	Aabb	$2^1=2$		
aaB_	aaBB	$2^0=1$	pea crown	3
	aaBb	$2^1=2$		
aabb	aabb	$2^0=1$	simple crown	1

Answer: parental genotype ♀ aaBB, ♂ AAbb; phenotypic ratio (F_2) 9:3:3:1

2 genetic issue: Two enzymes are involved in the synthesis of chlorophyll pigment (P) in the barley plant. Their absence leads to a violation of pigment synthesis. The synthesis of each enzyme is represented by dominant (A and B) genes located on different autosomes. The absence of the gene responsible for

Euro Asian Journals
PEDAGOGICAL CLUSTER
JOURNAL OF PEDAGOGICAL DEVELOPMENTS
Website: https://euroasianjournals.org/index.php/pc/index

the synthesis of the first enzyme causes the plants to be white, and the absence of the gene responsible for the synthesis of the second enzyme causes the plants to be yellow. Absence of these genes gives the plant a white color, and their presence gives it a green color. When diheterozygous barleys are intercrossed, determine the phenotypic ratio in the offspring.

Genetic issue solving and analysis:

fenotype	**genotype**					
white P	Aabb	**P**	fenotype:	green P		green P
yellow P	A_bb		genotype:	♀ AaBb	x	♂ AaBb
white P	aaB_	**G**		AB, Ab, aB, ab		AB, Ab, aB, ab
green P	A_B_					

F_1

phenotypic radical	genotypes	genotypic ratio	phenotypes	phenotypic ratio
A_B_	AABB	$2^0=1$	green P	9
	AABb	$2^1=2$		
	AaBB	$2^1=2$		
	AaBb	$2^2=4$		
A_bb	AAbb	$2^0=1$	yellow P	3
	Aabb	$2^1=2$		
aaB_	aaBB	$2^0=1$	white P	4
	aaBb	$2^1=2$		
aabb	aabb	$2^0=1$		

Answer: phenotypic ratio (F_1) 9:3:4

3 genetic issue: When round pumpkins (RP) were crossed, flanged pumpkins (FP) were obtained in the offspring. 56.25% of the progeny obtained by cross-breeding the flanged pumpkins obtained in F_1 were flanged pumpkins, 6.25% were long pumpkins (LP). Explain the inheritance of the following traits and find the phenotypic ratio in F_2.

Genetic issue solving and analysis:

P round pumpkin ♀ x round pumpkin ♂

F_1 ⟶ flanged pumpkin

When organisms with the same phenotype are crossed, a new phenotype is formed in F_1. We noted above that we see such a situation only under the complementary effect of non-allelic genes. Accordingly, the genotypes of the round-fruited pumpkin plants obtained for breeding will be different. Our production of such a product is based on the fact that all the plants obtained in the first generation had only flanged fruits. These dominant genes are independently compatible with the flanged character.

	round pumpkin		round pumpkin
P	♀ AAbb	x	♂ aaBB
G	Ab		aB
F_1		flanged pumpkin AaBb	

P	flanged pumpkin	x	flanged pumpkin
	♀ AaBb		♂ AaBb
G	AB, Ab, aB, ab		AB, Ab, aB, ab

F_2

♀ / ♂	**AB**	**Ab**	**aB**	**Ab**
AB	FP AABB	FP AABb	FP AaBB	FP AaBb
Ab	FP AABb	RP AAbb	FP AaBb	RP Aabb
aB	FP AaBB	FP AaBb	RP aaBB	RP aaBb
ab	FP AaBb	RP Aabb	RP aaBb	LP aabb

Answer: Complementary effect of genes; phenotypic ratio (F_2) 9:6:1

4 genetic issue: When white-grain plants belonging to two varieties of maize were crossed, the plants obtained in F1 were red-grain. When F1 plants were backcrossed with white-grain cultivar plants, 50% of the plants obtained in the next generation (F_b) were red-grain and 50% white-grain. When F_1 plants were self-crossed, 9/16 of the F_2 plants had red grain and 7/16 had white grain. Determine the parental genotype of F_1 hybrids.

Genetic issue solving and analysis:

P	white grain ♀	x	white grain ♂
F_1	⟶	red grain	

When organisms with the same phenotype are crossed, a new phenotype is formed in F_1. We can see such a situation only in the complementary effect of non-allelic genes. Accordingly, the genotype of the white grain plants taken for breeding had complementary genes and these plants were homozygous for these genes. This conclusion is based on the fact that all the plants obtained in the first generation had only red grains. These dominant genes independently ensure the color of the grain.

P	white grain ♀ AAbb	x	white grain ♂ aaBB
G	Ab		aB
F_1		red grain AaBb	

P	red grain ♀ AaBb	x	red grain ♂ AaBb
G	AB, Ab, aB, ab		AB, Ab, aB, ab

F_2

♂ \ ♀	AB	Ab	aB	Ab
AB	red grain AABB	red grain AABb	red grain AaBB	red grain AaBb
Ab	red grain AABb	white-grain AAbb	red grain AaBb	white-grain Aabb
aB	red grain AaBB	red grain AaBb	white grain aaBB	white grain aaBb

ab	red grain AaBb	white-grain Aabb	white grain aaBb	white grain aabb

Answer: Parental genotype is ♀aaBB x ♂AAbb or ♀AAbb x ♂aaBB

Solving genetic issues related to the complementary effects of genes leads to an increase in creative thinking and a deeper analysis of genetic laws.

Conclusion

Studying the laws of genetics by solving genetic problems leads to a deeper understanding of these laws and creative thinking. Formulating, solving and analyzing the solution of problems related to the complementary effect of nonallelic genes serves to analyze and synthesize this law.

REFERENCES:

1. A.T. G'ofurov., S.S. Fayzullaev.Genetika va evolutsion ta'limot (dasrlik 1-qism). – Toshkent 2012 yil. – 91-92 betlar
2. D.A.Musayev, Sh.Turabekov, A.T.Saidkarimov, A.S.Almatov, A.K.Raximov. Genetika va seleksiya asoslari (darslik). – Toshkent "Voris nashriyot" 2012 yil. – 50-56 betlar
3. Nurmetov, K., & Rasulova, O. (2023). Development of Competence of Teachers of School Biology Regarding the Use of the Distance Learning Platform. *Diversity Research: Journal of Analysis and Trends*, *1*(3), 80-84.
4. P. K. Gupta. Teaching genetics in India: Problems and possible solutions. *Indian J. Genet.*, 79(1) Suppl. 326-339 (2019)
5. Кириленкова В.Н., Кишинская О.Ю. Постороение личного образовательного маршрута при изучении темы «Генетика» // Биология в школе, 2007, №8, с. 49-56.
6. Расулова, О. О., Маткаримова, С. Ҳ., & Рахимов, А. К. (2024). МАКТАБ ЎҚУВЧИЛАРИДА ГЕНЕТИКА МАСАЛАЛАРИНИ ЕЧИШ ОРҚАЛИ ТАБИИЙ ИЛМИЙ САВОДХОНЛИГИНИ РИВОЖЛАНТИРИШ. Academic research in educational sciences, 5(1), 45-48.