

GENETIC ANALYSIS OF THE HEAD DIAMETER IN ORNAMENTAL
SUNFLOWERS

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SUMMARY

Head diameter is a very important character for the ornamental sunflowers.

Diallel crosses of five inbred lines of ornamental sunflowers were evaluated for the mode of inheritance, gene effect, heritability and combining ability in the F_1 and the F_2 generation for the head diameter.

Head diameter in the F_1 and the F_2 generation was inherited superdominantly or dominantly dependent on the combination.

The results of combining ability showed that in the inheritance of the head diameter, genes with non-additive effects were included.

INTRODUCTION Sunflower (*Helianthus annuus* L.) is a species which includes a lot of ornamental forms with great variations of floral colour and morphology. Head diameter is a very important character for the ornamental sunflowers.

In this study, we analysed ornamental sunflowers for mode of inheritance, gene effect and combining ability in F_1 and F_2 generation for head diameter.

MATERIAL AND METHODS Diallel crosses were made between five inbred lines originated from "Giessen population" (176, 396, 173, 5 and 184) which differed in head diameter flower colour, number of ray flowers, height etc.

The mode of inheritance for head diameter was assessed by the test of significance of the mean values of the generations against the parents average (Borojević, 1965).

The broad - sense heritability estimation was made according to Mather (1949).

The analysis of combining ability was done according to Griffing (1956), method 2, model I.

RESULTS Heterosis for the inheritance of head diameter occurred in all combinations in F_1 generation and in F_2 generation, except the combination 5 x 184 where dominance of the parent with larger head diameter occurred (Table 1.).

Table 1. Mean values, variability, inheritance and heritability for head diameter (cm) in ornamental sunflowers

Parents and hybrids			X ± sx	S	V	h ² (%)
176	P		15.7 ±0.46	1.54	9.8	-
176 x 396	F ₁		21.4 ^h ±0.56	2.09	9.8	-
176 x 396	F ₂		19.0 ^h ±0.38	3.35	17.6	66.7
176 x 173	F ₁		24.4 ^h ±0.59	2.77	11.4	-
176 x 173	F ₂		20.0 ^h ±0.30	2.99	15.0	34.8
176 x 5	F ₁		22.2 ^h ±0.33	2.14	9.7	-
176 x 5	F ₂		19.6 ^h ±0.27	2.53	12.9	15.9
176 x 184	F ₁		21.9 ^h ±0.35	1.68	7.7	-
176 x 184	F ₂		20.0 ^h ±0.43	3.49	17.5	78.5
396	P		15.0 ±0.75	2.12	14.1	-
396 x 173	F ₁		21.4 ^h ±0.48	2.96	13.6	-
396 x 173	F ₂		19.1 ^h ±0.29	3.70	19.3	50.5
396 x 5	F ₁		20.2 ^h ±0.44	2.90	14.4	-
396 x 5	F ₂		19.0 ^h ±0.31	3.77	19.9	48.2
396 x 184	F ₁		23.4 ^h ±1.07	3.38	14.4	-
396 x 184	F ₂		19.3 ^h ±0.40	3.12	16.2	36.4
173	P		17.2 ±0.63	2.73	15.9	-
173 x 5	F ₁		21.6 ^h ±0.49	3.16	14.6	-
173 x 5	F ₂		21.8 ^h ±0.49	4.13	18.9	48.0
173 x 184	F ₁		21.3 ^h ±0.43	2.90	13.6	-
173 x 184	F ₂		18.5 ^h ±0.32	3.95	21.3	60.5
5	P		17.0 ±0.91	3.03	17.8	-
5 x 184	F ₁		21.5 ^h ±0.58	2.02	9.4	-
5 x 184	F ₂		17.4 ^d ±0.34	2.76	15.9	30.3
184	P		16.4 ±0.73	1.63	9.9	-

LSD 0.05 : 0.39 (F₁) 0.50 (F₂)
 LSD 0.01 : 0.53 (F₁) 0.68 (F₂)

The heritability for head diameter ranged from 15.9 to 79.5 % (Table 1.).

The variance of general (GCA) and specific (SCA) combining ability for head diameter were highly significant in F_1 and F_2 generation (Table 2.).

Since the ratio off the variances GCA/SCA was smaller then

Table 2. ANOVA for combining ability for head diameter
in ornamental sunflowers

Source of var.	DF	F_1		F_2		F-t	
		MS	F_e	MS	F_e	0.05	0.01
GCA	4	0.89	48.32**	1.26	41.75**	2.72	4.08
SCA	10	11.80	641.32**	4.20	139.42**	2.19	3.04
E	28	0.02		0.03			
GCA/SCA		0.08		0.30			

unity, it may be concluded that the non - additive gene action was more important for the inheritance of head diameter (Table 2.). The best combiner for the head diameter was inbred line 173 (Table 3.).

The SCA was significant in all combinations in F_1 generation and in eight combinations in F_2 generation (Table 4.).

Table 3. GCA values for head diameter in ornamental sunflowers

P a r e n t s	F ₁		F ₂	
	GCA values	Rank	GCA values	Rank
1. 176	0.12	2	0.01	3
2. 396	-0.54	5	-0.52	5
3. 173	0.44**	1	0.55**	1
4. 5	-0.09	4	0.25*	2
5. 184	0.07	3	-0.29	4

SE	0.05		0.06	
LSD	0.05	0.15	0.19	
	0.01	0.20	0.26	

DISCUSSION AND CONCLUSION Diallel crosses of five inbred lines of ornamental sunflowers were evaluated for the mode of inheritance, gene effect, heritability and combining ability in the F₁ and F₂ generation for the head diameter. Heterosis was exhibited in all F₁ combinations and in F₂ combinations except in one where dominance of the parent with larger head diameter occurred. According to the analysis of combining abilities the head diameter in ornamental sunflowers is characterised by additive and non - additive gene action with overdominance of the non - additive gene action. This is in agreement with the results of Kovačik and Škaloud (1972) and Setty et al. (1977).

Table 4. SCA values for head diameter in ornamental sunflowers

Hybrids	SCA values	
	F ₁	F ₂
176 x 396	1.76**	1.21**
176 x 173	3.84**	1.12**
176 x 5	2.12**	1.01**
176 x 184	1.34**	1.92**
396 x 173	1.47**	0.76**
396 x 5	0.77**	0.89**
396 x 184	3.86**	1.74**
173 x 5	1.28**	2.67**
173 x 184	0.79**	-0.07
5 x 184	1.51**	-0.89
SE	0.09	0.12
LSD _{0.05}	0.33	0.43
0.01	0.45	0.57

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