STUDIES ON PLANT HEIGHT IN AN ASSORTMENT OF VARIETIES OF SINAPIS ALBA

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Abstract: *The increased interest cultivation of mustard (Sinapis alba) in our country, as evidenced by the significant growth areas and in recent years has led us to address a number of scientific investigations and practical importance. When establishing research objectives were taken into account, on the one hand by the fact that in our country, research on this species are exclusively related to culture technology, on the other hand, the fact that this species is globally little studied in genetically.The main objective of our research was the establishing the general and specific combinatory ability in order to choose the best genitors and to forecast the most valuable hybrid combinations on the ground of the analysis of the first generation.We studied plant size, which compared with the parental forms based on the analysis of the first generation hybrids achieved most values close to their average.The incomplete dominance was associated with the small size of the plants in the F_1 generation of hybrids.From the point of view of the proportion of dominant or recessive alleles (i.e. positive or negative), parental forms ranged into distinct groups. These differences were due to the action of the environmental factors that made different gene groups detain the main role in the control of the studied features. Thus, we could see that dominance is associated with negative alleles and recessiveness with positive alleles for plant size.*

Keywords: *mustard/Sinapis alba, general and specific combinatory ability, hybrids*

INTRODUCTION

Production capacity is a complex quantitative character which contributes to achieving a high number of elements in turn determined by many genes with small effects. The creation of varieties, the breeder must obtain and use information about heredity characters for all components in order to steer toward a hybrid generation to a genetic constitution capable of improving production.

Heritability quantitative mustard studies conducted determined genetic variability and nature of the action of genes that influence the production and the main components of production.

For the process breding present special importance knowing how hereditary transmission of traits and characters, because only on this basis can achieve positive results in a shorter time.

Compared with other herbs, mustard has been less studied genetic aspect. Therefore, heredity is little known to many characters, which requires further study. In most cases, genetic information were obtained from the breeding works.

With regard to plant mustard hybridologics analysis performed by SIMONEV (1995) indicated the responsibility of dominant genes for the tree in a cultivated forms.

MATERIAL AND METHODS

The biological material used in this study is the first generation hybrids (F1) and the two parental lines (P1 and P2, respectively) in each hybrid.

Experienced biological material was represented by a collection consists of 9 varieties of mustard with different genetic origin, namely: Sunshine, Carla, Carnella, Condor, Erica, Ascot, Aba, Gisilba and Amog.

Genitors with F1 hybrids were studied in a comparative culture placed in three repetitions The varieties used as genital crossing diallele with F1 hybrids were further studied in a comparative culture on three repetitions in plots of 10 m2 after block method.

Biometric determinations were made on 10 plants in each repetition.

The statistical processing consisted of a simple analysis of variance for each individually character (CEAPOIU, 1968)

By analyzing the genetic variance (JONES, 1965) was conducted genetic variance decomposition of its components has allowed the refinement of information obtained through simple analysis of variance.

Graphical analysis of variance and covariance is based on variance-covariance (Vr, Wr) process developed by Jinks and HAYMAN (1953) AND HAYMAN (1954).

RESULTS AND DISCUSSIONS

In table 1 we can observe most hybrids have achieved values of this lower nature or close to the average of the parental forms. The highest heterosis values of index they have made hybrids Amog x Aba (0.88), Aba x Carla (0.50) and Carla Amog x (6.2), the combinations that there were big differences between parental forms in terms of this character. The lowest values of heterosis, index correlated with a reduced waist of plants amid close values between parental forms, have recorded at hybrids: Ascot x Carnela (-83,50); Sunshine x Erica (-8.50) and Erica x Sunshine -(5,93).

Table 1

Heterosis index for plant height hybrids F1

Genitors	Sunshine	Carla	Carnela	Condor	Erica	Ascot	Aba	Gisilba	Amog
Sunshine	-	0,24	-2,74	-2,66	-8,50	-1,64	-1,00	-3,31	-0,51
Carla	-0,15	-	-0,12	-0,05	-0,01	-0,50	-0,77	0,04	-0,07
Carnela	0,05	-0,15	-	-0,07	0,08	-4,50	-0,63	0,22	-0,25
Condor	-3,50	-0,04	-0,39	-	-0,05	-1,34	-0,31	0,50	-0,04
Erica	-5,93	-0,17	-0,01	-0,73	-	-1,88	-1,59	0,89	-0,19
Ascot	-0,26	-0,26	-83,50	-0,33	-0,58	-	-0,28	-0,22	-0,15
Aba	-1,20	0,50	-0,50	0,71	-0,29	-0,62	-	-0,46	-0,40
Gisilba	-0,31	-0,06	-0,42	0,83	-0,37	-0,31	0,34	-	0,11
Amog	-0,12	0,37	-0,08	-0,18	-0,31	-0,11	0,88	-0,16	-

Table 2

Differences between reciprocal hybrids due to maternal effects for plant height F1 hybrids

Genitors	Sunshine	Carla	Carnela	Condor	Erica	Ascot	Aba	Gisilba	Amog
Sunshine	-	15,20	-46,40	7,20	-10,80	-23,20	4,20	-31,20	-10,80
Carla		-	1,40	-0,20	5,60	-13,40	-23,60	-0,80	-4,60
Carnela			-	8,00	1,80	15,80	-4,80	17,20	-7,20
Condor				-	3,00	-25,80	-11,80	-0,60	2,80
Erica					-	-27,40	-20,80	7,80	2,80
Ascot						-	12,60	2,40	-1,60
Aba							-	-7,80	-10,20
Gisilba								-	4,80
Amog									-

The biggest differences among hybrids due to maternal Acme effects were observed in the combinations: Sunshine x Carnela (46.40 cm); Sunshine x Gisilba (31.20 cm) and Erica x Ascot (27.40 cm). Also, the observed values were significant maternal effects in most combinations, which denotes the position in the forms of parental hybridization is important for the transmission of genes that influence the size of the plants. The lowest values of maternal effects were recorded by the combinations: Carla Condor x (0.20); Condor x Gisilba (0.60 cm) and Carla x Gisilba (0.80 cm).

Table 3

The significance of differences between F1 hybrids and parental forms for plant height

No.	Genitors		Total hybrids	Maternal hydrids	Paternal hybrids
		$\bar{x} \pm s_x$	$\bar{x} \pm s_x$	$\bar{x} \pm s_x$	$\bar{x} \pm s_x$
1	Gisilba	128,67+0,60	129,14+5,79	132,75+6,18	125,53+5,48
		diferența / t	0,47 / 0,08	3,92 / 0,63	-3,14 / 0,57
2	Sunshine	139,20+3,12	116,49+5,22	110,50+3,58	122,48+5,94
		diferența / t	-22,71 / 3,93^{00}	-28,7 / 6,59^{000}	-16,72 / 2,60^{0}
3	Carla	111,00+1,94	113,55+2,88	110,38+3,20	116,73+2,16
		diferența / t	2,55 / 0,78	-0,62 / 0,17	5,73 / 2,16
4	Carnela	155,80+4,31	132,31+5,28	137,05+5,55	127,58+4,75
		diferența / t	-23,49 / 3,74^{00}	-18,75 / 2,88^{0}	-28,22 / 4,82^{000}
5	Condor	130,60+4,65	123,71+3,86	120,75+3,85	126,68+3,83
		diferența / t	-6,89 / 1,29	-9,85 / 1,85	-3,92 / 0,74
6	Erica	135,00+2,21	122,60+5,10	120,28+5,50	124,93+4,90
		diferența / t	-12,40 / 2,30^{0}	-14,72 / 2,55^{0}	-10,07 / 1,93
7	Ascot	156,00+5,19	128,93+6,69	131,85+3,25	126,00+9,10
		diferența / t	-26,07 / 3,32^{00}	-24,15 / 4,61^{000}	-30,00 / 3,00^{0}
8	Aba	119,00+3,07	115,09+3,17	115,48+2,00	114,70+4,18
		diferența / t	-3,91 / 0,98	-3,52 / 1,21	-4,30 / 0,89
9	Amog	111,00+3,70	118,63+2,45	120,13+2,37	117,13+2,57
		diferența / t	7,63 / 2,13	9,13 / 2,59*	6,13 / 1,67

In general, compared with parental forms F1 hybrids grew at a smaller size plant. The biggest negative differences were statistically assured observed in hybrids of varieties: Sunshine, Carnela, Gisilba. Significantly higher values of waist towards the parent shape plants were recorded in particular maternal hybrids you Amog variety.

The experimental results obtained regarding to the size of the plants for the F1 hybrids were processed after the variance analysis method developed by HAYMAN (1954a), (hibridărilor dialele). What testing was done against the sum of the variances of the interaction or the variance of the error.

Table 4

Analysis of variance for plant height F1 hybrids

Cause variability	SP	GL	PM	Proba F
Repetitions	777,73	4	194,43	4,25**
a	36666,25	8	4583,28	100,22**
b	21914,45	36	608,73	13,31**
$\mathbf{b_1}$	3093,69	1	3093,69	67,65**
$\mathbf{b_2}$	4382,08	8	547,76	11,98**
$\mathbf{b_3}$	14438,68	27	534,77	11,69**
c	8431,27	8	1053,91	23,05**
d	11835,93	28	422,71	9,24**
Eroare	14634,12	320	45,73	
Total	94259,90	404		

In table 4. It is observed that the greatest contribution to the variability of plant height was additive variance (a) that is distinct. Dominance variance (b) presents a distinctly significant value having a lesser contribution in the variability of this character than additive variance. From the analysis of the various subcomponents of the dominance variance in terms of their significance and value, you can make clarifications regarding dominance and how she acts in the genetic determinism of the character in question. Thus, it appears that dominance variance subcomponentul b1, which indicates the average deviation of the hybrids from parental values, i.e. the effects of directional dominance, presents a distinctly significant value compared to the error. Because in most cases the average F1 hybrids of this character is below average, meaning his parents ' dominance with b1 indicates a waist smaller plants.

Subcomponent variance of b2 through its values indicate a significant asymmetry of the distribution of those alleles positive and negative influence not only on plants at the parental forms. Subcomponentul b3 presents significant values what attests to the existence of differences between the values direct and hybrids due to their current dominance. Component c values indicate the average maternal effects each parental forms, namely their contribution to the achievement of the hybrid. The significance of this component to the effect that parental forms have a considerable influence on hybrids, according to their position in the hybridization. Through its component d indicates that significant differences between hybrids.

Genetic variance analysis of information relating to the general characterization of the studied genotypes genetic potential and in terms of the type of gene action, as well as individual characterisation, from this point of view each genitor. In order to determine some aspects of genetic determinism of the characters studied, experimental data have been processed and interpreted on the basis of genetic model developed by HYMAN (1954).

Table 5

Mean values (Yr) variance (Vr), covariance (Wr) and proportion of the parents dominant alleles used in the production of F1 hybrids for plant height

No.	Genitors	Yield of parentes Yr	Variance Vr	Covariance Wr	Proportion of dominant alleles
1	Sunshine	139,20	125,15	88,96	0,683
2	Carla	100,40	44,32	83,31	0,818
3	Carnela	155,80	176,79	200,92	0,429
4	Condor	130,60	82,77	66,82	0,784
5	Erica	135,00	163,18	110,40	0,591
6	Ascot	156,00	217,69	236,11	0,311
7	Aba	119,00	42,59	28,80	0,905
8	Gisilba	128,80	72,20	120,71	0,716
9	Amog	111,00	35,79	111,01	0,788

From the study of regression graph (fig. 1) to the size of the plant hybrids F1 it is observed that most parents are returning to group near the line of regression, which indicates that the genetic determinism of this character to the parents involved and gene with additive effect. Also at Ascot and Amog varieties, this is found under the influence of some gene interactions nealelice.

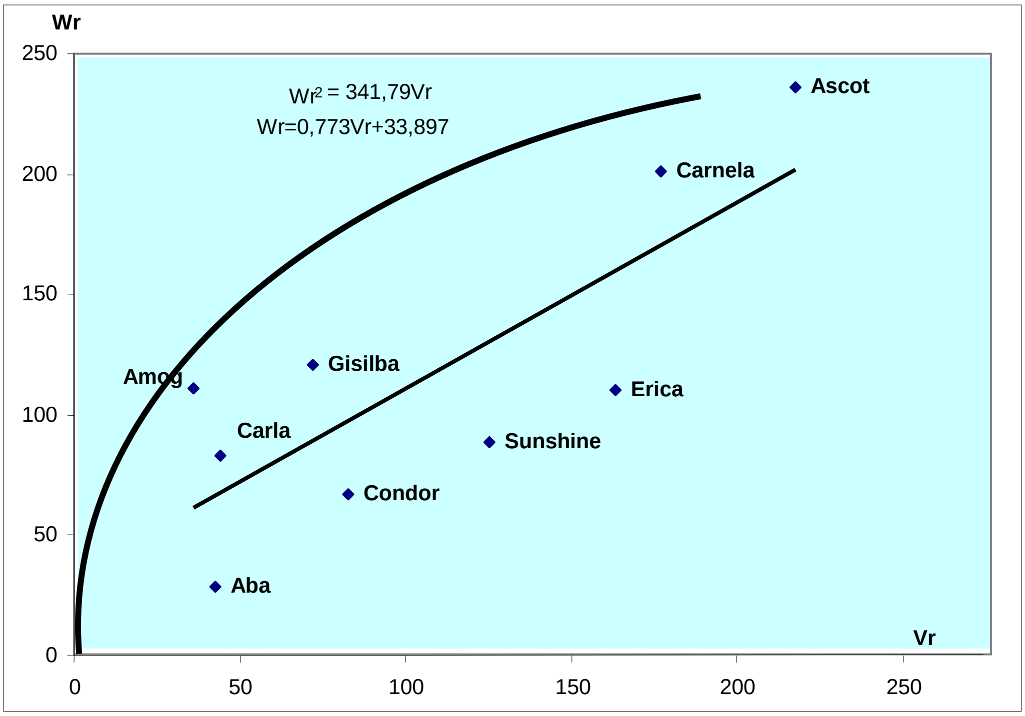

Fig. 1 Graph of the regression Wr / Vr for plant size in F_1 hybrids

Graph of the regression Wr / Vr for plant size in F_1 hybrids distance between right-wing regression and parable, and position the right parental genotypes regression shows that both effects of additivity and dominance have an important role in genetic determinism of this character in accordance with the analysis of the genetic variance. Right axis intersects regression covarianţelor above the origin, indicating the presence of a dominanţe. Of the varieties and study the Ascot stat. Carnela presents the highest proportion of recessive alleles, while Aba, Carla, Ascot and Condor have the highest proportion of dominant alleles. The relative position of genotypes in relation to dominance indicator-recesivitate (Wr Vr) was determined using the method developed by Johnson and Aksel (1959). The distribution of the parental lines on the basis of standardized residuals yr (plant height to parental forms and Wr Vr), indicating a high proportion of recessive alleles at Ascot varieties (69%), Carnela (58%), Erica (41%), i.e. the dominant allele in a considerable proportion in the Aba varieties (90%), Carla (82%), Amog (79%), Condor (78%).

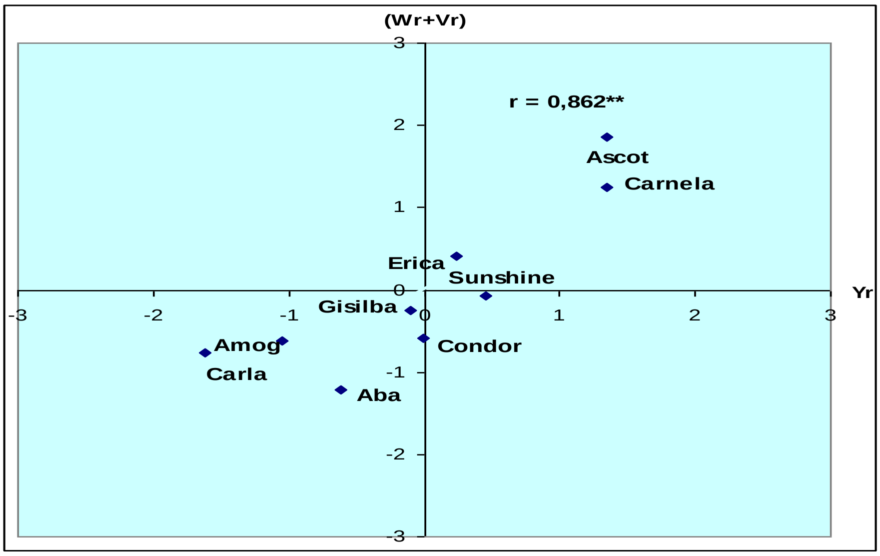

Fig. 2 Graph of standard deviation (Wr Vr) and yr for plant height at F1 hybrids

Distinctly significant correlation (r=0.862**)between yr and (Wr Vr) indicates that in general the dominant alleles studied reduce plant size, while recessive alleles causes an increase of this nature.

Genetic model developed by Hayman allow the addition besides graphically analyzed and a different approach based on genetic variance components and calculation of ratios between them, the content of which is also based theory interpretable diallel hybridization.

Table 6

Components of genetic variance and the value of their relationship F1 hybrids for plant height

No.	**Components of variance** / report	Estimate values
1.	D- additive effects of genes	341,79***
2.	H_1- effects of dominance of genes	303,29***
3.	H_2 – dominance effects of genes corrected	225,42***
4.	F- covariance effects of additive and dominance	218,21***
5.	h^2 square deviations parents	241,02***
6.	E- variance due to environmental	9,14
7.	$(H_1/D)^{1/2}$ – the average level of dominance	0,942
8.	kD/(kD+kR) – the proportion of dominant genes	0,669
9.	$\overline{F_1} - \overline{P}$ - average direction of dominance	-8,79
10.	$D-H_1$ – average direction gene effects	38,50
11.	$H_2 / 4H_1$ – average frequency of positive and negative alleles	0,186
12.	h^2 / H_2 – the number of groups of genes or effective factors	1,20
13.	Hb – Broad heritability	0,945
14.	Hn – Narrow heritability	0,606

$DL_{5\%}$ = 15,08 $DL_{1\%}$ = 19,81 $DL_{0,1\%}$ = 25,40

In table 6 it is noted that a very important and meaningful role in the genetic determinism of plants you have waist additive effects (D), which are present in a smaller extent and effects of dominance (H1). It also highlights a higher frequency of dominant alleles (F) and an asymmetry of the positive and negative effects thereof due to dominance (H2). Relationship between the components of variance give broader relations with regard to heredity must be studied, but the character viewed with much circumspection (Crumpacker and Allard, 1962). Values relationships (H1/D) 1/2 and kD (kD kR) suggest the presence of incomplete determinism of this character, i.e. a proportion (67%) of the dominant allele. Average direction of determined on the basis of the difference indicates if the waist of a plant parental dominance with low waist (negative values).

From the H2/4H1 which estimates the proportion of those alleles dominant with the positive and negative effects the parental forms, indicate if there is a studied different proportions of positive and negative alleles from parents. The number of actual factors or groups of genes that control plant size was estimated using h2/H2 ratio. Mather and Jinks (1971) shows that the notion of "effective factor" means the smallest hereditary unit that can be detected through biometric genetics methods and rarely is a single gene. In most cases the actual factor is represented by a United Group of genes that have similar effects and extra small.

In table 6. It follows that F1 hybrids plant size is controlled only by one factor or group of genes. This assessment may be underestimated due to the high values of his H2, unrelated genes distribution and the presence of dominance effects different in meaning and magnitude (Jinks, 1955; Foster et al., 1961). High levels of eritabilității both broad (94.5%) and narrow (60.6%) for this character indicate that considerable variability from one side of the waist of the plants is due to the effects of the additive and dominance gene.

CONCLUSION

Genetic analysis of F1 hybrid generations allowed highlighting the following conclusions regarding waist mustard plant heredity:

1. Incomplete dominance has been associated with reduced plant in F1
2. At genitors studied was found a higher percentage of dominant alleles (60-70%) involved in genetic determinism of the characters studied, due to the unbalanced distribution of positive and negative alleles;
3. Allele dominant or recessive that it possesses positive and negative respectively, parental forms were framed in distinct groups. These differences were due to the action of environmental factors that have determined that different groups of genes hold the lead role in controlling the manifestation of the characters studied. It has thus been observed that dominance is associated with negative alleles and alleles positive for recesivitatea with plant size.
4. Erica and Ascot varieties for plant height have a high proportion of recessive alleles with positive effect, while Carla and Gisilba varieties accumulate alleles that reduce the value of this character;
5. Differences between hybrids is not due only to maternal effects but also other reasons such as environmental conditions influence attested to the significance of the differences and repetitions;
6. In terms of the size of the plant the largest values of additive effects involved in the determinism of this nature have been recorded in the varieties Gisilba, Carnela and while Carla and Aba varieties exhibit a high transmission capacity of a size of the plant reduced to descendants;

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