THE GENETIC CAPITALIZATION OF SOME MAIZE INBRED LINES EXTRACTED FROM DIFFERENT GERMPLASM SOURCES

VALORIFICAREA GENETICĂ A UNOR LINII CONSANGVINIZATE DE PORUMB EXTRASE DIN DIFERITE SURSE DE GERMOPLASMĂ

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Abstract: *The present paper proposes a comparison between the value of different sources of germplasm used to create inbred lines and parental forms of some maize hybrids. The studied material represents the result of the breeding process of creating inbred lines at ICDA Fundulea, as well as the testing process in the conditions of SCDA Simnic of inbred lines and maize hybrids of foreign firms that operates in Romania with their own genetic material. The results show the progress achieved worldwide and in our country concerning the breeding methods of the hybrid maize in comparison with the situation between 1960 and 1970.*

Rezumat: *Lucrarea prezentă îşi propune să facă o comparaţie a valorii diferitelor surse de germoplasmă, utilizate la crearea de linii consangvinizate, ca forme parentale ale unor hibrizi de porumb. Materialul studiat reprezintă rezultatul lucrărilor de ameliorare ale unor linii consangvinizate de porumb, efectuate la ICDA Fundulea, în ultimii ani, precum şi rezultatul testării în condiţiile SCDA Simnic a unor linii consangvinizate şi hibrizi de porumb de la firme străine, de prestigiu, care operează în România cu materialul genetic propriu. Rezultatele arată progresul realizat pe plan mondial, precum şi în ţara noastră în ceea ce priveşte metodele de hibridare a porumbului în comparaţie cu situaţia din anii 1960-1970.*

Keywords: *maize, hybrids, cross-pollination, inbred lines*
Cuvinte cheie: *porumb, hibrizi, polenizare încrucişată, linii consangvinizate*

INTRODUCTION

The maize hybrids development has led to a real revolution all over the world. The yields have increased significantly as well as the resistance to most pests and draught. Romania has also developed such technology for their different climatic conditions. The introduction of foreign hybrids, especially from the US, has determined new challenges concerning their adaptability to our conditions. This is the reason why we need to research the comparison concerning the adaptability between these germplasm sources.

MATERIAL AND METHOD

Six inbred lines and three local hybrids were studied during 2005 and 2006. These were extracted from:

a) Local sources (ICDA Fundulea)
b) European sources (KWS)
c) American sources (Pioneer)

In total, there were experimented 18 inbred lines and 9 maize hybrids within the plant-breeding laboratory of SCDA Simnic.

The genetic material that was used in the present paper is ciphered in order to respect the confidentiality.

The following comparative trials were set up in the field:

1. for the inbred lines: 18+2 variants x 3 replications

2. for hybrids: 9+1 variants x 3 replications.

The observations from the experimental field have envisaged the main phonological phases: mildew and helminthosporiosis resistance, the yield and the main productivity elements both for the inbred lines and for hybrids.

The experimental results on the production capacity of the parental forms have been interpreted by variance analysis in order to determine the significance of the results by DL value.

Using the data for each hybrid as well as from the inbred line, the heterosis value was calculated this way estimating the specific capacity of combination of the studied inbred lines.

RESULTS

For the inbred lines as parental forms for hybrids, the yielding capacity is important in order to get enough seed quantities especially when the using of the hybrid seed maize is generalized (Ilicevici S., Radu A., 1994.). With the maize hybrids, the production capacity is the essential character that justifies the using of the hybrid seed. The second table shows the yields for the inbred lines extracted from the three germplasm sources. The inbred lines that were used as parental form for the Olt hybrid were used as control. The inbred lines of the local sources have a good production capacity. Of the three inbred lines that were used as maternal partner (F5, F7, F9), two of them overpass the control with significant outputs.

The inbred lines that have as source the European hybrids that are result of modern homozigotism method have given close yields to the control, except for K5, which records a significant yield output of 8.6%.

Of the inbred lines extracted from the American sources, two mother inbred lines (P1 and P5) and two father lines (P2 and P6) can be emphasised by significant outputs.

If we compare the three germplasm sources, we observe that in our conditions the European source is inferior to the local and American forms in what the yield is concerned.

Table 1

The grain yield of the inbred lines extracted from three sources (local, European and American), the average of the 2005 and 2006 years, density = 60,000 plants

	The variant	q/ha	% mt1	S	%mt2	S
	1lcF5	45.2	102.7			
	2lcF6	42.1			111.0	Xx
	3lcF7	46.7	106.1	X		
	4lcF8	41.3			108.9	X
	5lcF9	49.0	11.4	Xx		
	6lcF10	41.6			109.7	Xx
	7lcK1	45.6	103.6			
	8lcK2	40.0			105.5	
	9lcK3	45.4	103.2			
	10lcK4	36.1			95.2	
	11lcK5	47.8	108.6	X		
	12lcK6	39.6			104.5	
	13lcP1	48.0	109.1	X		
	14lcP2	42.3			111.6	Xx
	15lcP3	45.5	103.4			
	16lcP4	38.0			100.2	
	17lcP5	47.0	106.8	x		
	18lcP6	43.6			115.0	xx
Ctrl. 1	19 Olt	44.0	100.0			
Ctrl. 2	20 Olt	37.9			100.0	

DL 5% = 6.2 %; DL 1% = 9.7%

Table 2

The grain yield q/ha of the hybrids obtained from the inbred lines and the value of the heterosis in the conditions of Simnic Research Station, plant density = 50,000 plants/hectare

The formula	The hybrid	q/ha	%ctrl	S	q/ha lc 0	Heterosis value	
						q/ha	%
lcF5 x lc F6	1. HSF 4	83.6	99.3		45.2	38.4	45.9
Lc F7 x lc F8	2. HSF 5	79.5	94.3		46.7	32.8	41.2
Lc F9 x lc F10	3. HSF 6	85.5	101.4		49.0	36.5	42.7
lcK1 x lc K2	4. HSK1	90.9	107.8	x	45.6	45.3	49.8
lcK3 x lc K4	5. HSK2	80.0	94.9		45.4	34.6	43.2
lcK5 x lcK6	6. HSK3	77.3	91.6	0	47.8	29.5	38.1
lcP1 x lcP2	7. HSP1	87.2	103.4		48.0	39.2	44.9
lcP3 x lcP4	8. HSP2	90.7	107.6	x	45.5	45.2	49.8
lcP5 x lcP6	9. HSP3	80.6	95.6		47.0	33.6	41.7
Ctrl.	10 Olt	84.3	100.0		44.0	40.3	47.8
The average value of the heterosis							
For local germination = $\frac{45.9+41.2+42.7}{3}=43.2\%$							
For europea germination = $\frac{49.8+43.2+38.1}{3}=43.7\%$							
For American germination = $\frac{44.9+49.8+41.7}{3}=45.5\%$							

An overall appreciation of the recorded experimented hybrids emphasizes a superiority of the foreigner hybrids in comparison with the local ones that is generated by the specific capacity of combination of the parental lines over the local ones. This superiority is shown by three hybrids for the European sources as well as for the American one.

The value of the heterosis emphasizes the specific combination capacity with all inbred lines. If 25 or 30 years ago we took into account a 30% value of the heterosis in comparison with the parental forms, nowadays these values are around 40% up to 49%. This aspect shows the progress that was recorded in obtaining the inbred lines all over the world and in our country.

If we analyze the heterosis value for all nine combinations, the highest value is obtained for K1 x K2 and P3 x P4. The higher relative value has the Olt hybrid used as control.

The average yields of 2005 and 2006 have been compared with the Olt hybrid as control. From the data in table three, one can observe that the three hybrids from local germplasm sources have given similar yields to the control. With the European source hybrids, the HSK 1 is significantly superior and the HSK 3 is significantly inferior to the control. Of the three hybrids obtained from American sources, the HSP 2 is significantly superior to the control; the other two hybrids give similar yields to the control, Olt.

CONCLUSIONS

1. All inbred lines of the three-germplasm sources prove a good yielding capacity that permits the obtaining of enough seeds for hybridation plots.

2. The specific capacity of combination of the 20 inbred lines emphasized in the yield of the 10 hybrids proves the progress in obtaining inbred lines and the hybrid maize.

3. Of the three germplasm sources, the American one has a slight superiority concerning the average value of the heterosis in comparison with the local or European ones.

4. We can affirm that until 2000-2004, the genetic value of some inbred lines that were used in the breeding of the hybrid maize is likely.

LITERATURE

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