COMPARATIVE RESEARCHES ON THE BEHAVIOUR OF RECORDED AND RECOMMENDED HYBRIDS OVER THE A, B AND C HYBRIDS REGARDING THE BENDING RESISTANCE AND DROUGHT IN SIMNIC – CRAIOVA ZONE

CERCETĂRI COMPARATIVE PRIVIND COMPORTAREA HIBRIZILOR ÎNREGISTRAȚI ŞI RECOMANDAȚI FAȚĂ DE HIBRIZII A, B SI C ÎN CEEA CE PRIVEŞTE REZISTENTA LA FRÂNGERE ŞI SECETĂ ÎN ZONA SINIC - CRAIOVA

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Abstract: *The bending resistance and the drought resistance are key features for the modern corn hybrids. If the corn plant bend down it cannot be harvested by the mechanical harvester any longer. In what the drought resistance is concerned, it can be said that if a hybrid can produce in such conditions, the farmer's welfare is ensured. Romanian corn hybrids were tested in a comparative trial at the Agricultural Research Station of Simnic in comparison with foreign ones. Our results show relative superiority of one or another according to the character genes that are involved. We can summarize that care must be paid in order to obtain such features within the breeding process.*

Rezumat: *Rezistența la frângere şi la secetă sunt caractere foarte importante pentru hibrizii moderni de porumb. Dacă planta de porumb se frânge, ea nu mai poate fi recoltată mecanic de către combină. In ce priveşte rezistența la secetă, se poate spune că, dacă un hibrid poate produce recoltă în aceste condiții, bunăstarea fermierului este asigurată. Hibrizii româneşti de porumb au fost testați în condițiile Stațiunii Agricole Şimnic, în comparație cu cei străini. Rezultatele noastre nu arată o superioritate evidentă a unora sau altora în ceea ce priveşte aceste însuşiri. Drept concluzie putem spune că trebuie mare atenție la fixarea acestor însuşiri în cadrul procesului de ameliorare*

Keywords: *corn, hybrids, cross pollination, inbred lines, bending and drought resistance*
Cuvinte cheie: *porumb, hibrizi, polenizare încrucişată, linii consangvinizate, rezistență la frângere şi secetă*

INTRODUCTION

Drought resistance is a very important feature for nowadays corn hybrids due to the increasing shortage of irrigation water as well as for decreasing rainfall due to the glasshouse effect. Romania use to have around 3 million hectare of agreed surface for irrigation but the economical and social storm after the 1990 events has reduced it to few thousands hectares. In plus the irrigation water became expensive due to the higher electricity cost. In such conditions, the drought resistance is a welcome feature. The drought resistance genes can be added to the plant genome through genetic engineering procedures but this practice has many opponents in Europe, especially. Conventional breeding processes must be undertaken in order to get desirable features into the corn hybrids genome.

The bending resistance is very useful when mechanical harvesting is performed. Taking into account that in modern and efficient farms such a way of harvesting prevails, we can say that bending resistance is paramount in such conditions.

MATERIAL AND METHOD

The studied material is represented by simple corn hybrids resulted from the cross pollination of the three inbred lines on each inbred group, type A lines, B and C that have produced 6 hybrids for every type lines using the mathematical model n (n-1), in our case, 3 (3-1)=3 x 2 = 6 hybrids. The formulas for each hybrid are written in the table 3 where we have 18 hybrids in total and two control hybrids, the simple Hybrid Olt and a KWS hybrid that belong to the germen company that operates in our zone.

The group A hybrids are obtained from the inbred lines that were extracted from Pm3 local populations that underwent three mass selection cycles.

The group B hybrids are obtained from the inbred lines that were extracted from Pm3 local populations that underwent three mass selection cycles followed by a selection cycle after the behaviour of C1 lines that were appreciated as "per se".

The group C hybrids are obtained from the inbred lines that were extracted from divergent populations that underwent two recurrent, reciprocal selection cycles.

The 20 hybrids that were tried within the 2005 – 2006 period have been statistically researched in special trials with 20 treatments and 3 replications. The results were statistically interpreted and there was calculated the DL for two steps of significance.

The rainfall regime in 2004-2005 year is characterized by excedent rains in all vegetation months of the corn. The multiannual average of April, May, June, July, August and September that sum 305 l/sm are spectacularly overpassed. The above moths sum 825 l/sm and the excedent of 520 l/sm is close to the average rainfall of the zone.

Because in the previous papers published by SCDA Simnic there were shown the two methods of corn breeding process of the inbred lines A and B with the respective hybrids, in the following passage we will present, in brief, the working method for the obtaining of the inbred lines and of the C hybrids that unfolds at SCDA Simnic within the Plant Breeding laboratory in 1990+2004 period. (Urechean Viorica, 2001, Ilicevici S., 2004).

Table 1

The working scheme for obtaining the inbred lines of the C hybrids at SCDA Simnic

200 plants are self pollinated from P1 200 plants are self pollinated from P2	Year I
Inbred lines C1P1 are tested „per se" Inbred lines C2P2 are tested „per se"	Year II
There are obtained hybrids from reciprocal crossings of lC1P1 x lC1P2 inbred lines and lC1P2 x lC1P1	Year IIII
The two replication hzbrids are tested There are kept the inbred lines that have good combination capacity.	Year IV
The kept inbred lines undergo a new SRR cycle.	

RESULTS AND DISCUSSION

The data that were obtained in 2005 and 2006 show the superiority of the initial material that underwent two SRR cycles as regard the drought and bending resistance. As the second table shows the average of the C hybrids that were used as control significantly overpass the average of the hybrids that were used as control, by significant outputs in the two experimenting years. There must by emphasized the bending resistance stay low at the type A hybrids while for the type C ones these values are very good. The upward data must be completed by results obtained in dry years in order to observe if the drought resistance, a paramount feature is kept in hybrids.

The 2006/2007 year climatic conditions did not permit the capitalization of all experiments that envisage the corn crop from the Simnic zone. The winter drought, followed by the spring drought that was amplified by hot summer weather, has conducted to the compromising of all field experiments and cash crops. The limits of the genetic material that was extracted from the local corn populations that undergo breeding programs that include the repeated mass selection or the recurrent selection of the C1 inbred lines that are appreciated per se are shown when the climatic conditions permit the obtaining of normal yields. This aspect that was first shown by Ilicevici S. in 1994 and by Viorica Urechean in 2001 in their researches that were carried out at SCDA Simnic do confirm that the results that were obtained by us.

Table 2

The average of the yields and the bending resistance of the Type A, B and C in comparison with the recorded hybrids for the zone in the conditions of SCDA Simnic (%)

Specification		1990 unfavorable		1991 favorable		2005 very favorable		2006 average	
		Yield	Bending resist.	Yield	Bending resist.	Yield	Bending resist.	Yield	Bending resist.
Average of FAO Hybrids (FAO 450 – 500) recorded in the last 10 years	q/ha	19,7	-	81,9	-	107,0	-	60,2	-
		100,0	2	100.0	2	100.0	2	100.0	2
Average of the Type A hybrids(Pm3)		120.0^{xx}	7	75.0^{00}	8	88.0^{00}	7	90.2^{00}	8
Average of the B type hybrids(Pm3 +C1)		122.0^{xx}	3	102.0	3	100.0	4	106.4^{x}	3
Average of the type C hybrids (PSRR)		-	-	-	-	109.0^{xx}	2	110.0^{xx}	2
	DL 5%	11,2%	x	9.0%	-	5.3%	-	5.0%	-
	DL 1%	16,3%	x	15,4%	-	7.1%	-	6.7%	-

We present older data published by Ilicevici S. in 1994, along with recent data obtained in this trial. In 1990, that was extremely dry, the average of the hybrids that were used as control is of only 19.7 q/ha. In comparison with this, the type A and B hybrids get outputs of 20% to 22%. There must be noticed the low bending resistance of type A hybrids this being the major cause when we work with local germplasm.

In 1991, a favourable year as rainfall the control yield is 81.9 q/ha. In these conditions are emphasized the limits of the local populations as regard the productivity. Whether in the dry year the type A hybrids distinctively overpass the control, in the rainy year they get only 75% from the control yield. Nevertheless, type B hybrids that in the dry year overpass the control, in the rainy year get likely yields with the control hybrids. The bending marks show a low behaviour of the type A hybrids and a good one of the type B hybrids.

CONCLUSIONS

As conclusion, the local germplasm that underwent three mass selection cycles show a good resistance to drought yet a limited capacity in rainy years accompanied by a low bending

resistance of the stalks in both cases. When inbred lines from the local populations are used and underwent to three mass selection cycles followed by a selection cycle of the lines C1 appreciated per se (Pm3+C1), the resulting hybrids prove drought resistance, a good production capacity and an acceptable bending resistance.

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