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BREEDING AND GENETIC PROPERTIES OF THE MAIZE VARIETY UZBEKSKA BELA

Lazar KOJIC[1] and Dillyara AJGOZINA[2]

[1]Maize Research Institute, Zemun Polje, Belgrade, Serbia

[2]SPK "Budan", Almatinska 51, p. Balatay, Kazakhstan

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The Uzbekska bela (Uz.b.) maize variety was crossed to nine inbred lines and genetic difference between this variety and observed maize inbreeds lines was determined. The Uz.b. variety is a heterotic pair interesting for deriving maize hybrids with inbreds of BSSS and Lancaster origin, as well as, with some Yugoslav maize populations (Konjski zub, Domaci tvrdunac).

The inbred lines originating from Zambia showed somewhat lower yielding and heterosis percentage in relation to other observed inbred lines in hybrid combinations with the variety Uz.b.

Key words: grain yield, heterosis, heterotic pair.

Corresponding author: Kojic Lazar, Maize Research Institute, Slobodana Bajica 1, 11185 Belgrade-Zemun,Serbia

INTRODUCTION

The success of newly initiated maize breeding programmes greatly depends on evaluation, development and improvement of the initial material (HALLAUER, 1988; MORENO-GONZALES, 1988; DRINIC et al., 1992; IVANOVIC et al. 1995; DHILLON et al., 1997; KOJIC and AJGOZINA, 2000).

Therefore when formulating the programme on the development of maize hybrids of high genetic yielding potential and grain quality, whose implementation began in Kazakhstan in 1993, the set goal was to evaluate the initial breeding material and depending on its breeding and genetic potential to include it into the programme of the development of new inbred lines of high combining abilities.

MATERIALS AND METHODS

The Uzbekska bela (Uz.b.) maize variety was used in the experiment and was crossed to nine inbred lines. Three inbred lines originated from the States (FR 809 and B73 of the BSSS group and Mo17 of the Lancaster origin), two inbreds were from Yugoslavia (P3/72-22, derived from crosses of the local populations Konjski zub x Domaci tvrdunac, L 17/17, derived from the synthetic population Syn 6/9(l) Co of the Lancaster origin) and four inbred lines originated from Zambia (L7, N 3, L 9-2 and L 12-7).

The hybrid combination B73 x Mo17 was used as a check in this study.

The three-replicate trial was set up according to the randomized block design in the vicinity of Alma-Ata, Kazakhstan in 1995 and 1996. The obtained results were processed by the analysis of variance and the superior (Uz.b.)-parent heterosis was evaluated.

Beside hybrid combinations developed by continuous self-pollination, six inbred lines were derived from Uz.b., crossed to Mo17 and then observed in trials during 2003 and 2004.

RESULTS AND DISCUSSION

The average grain yield of the variety Uz.b. was 8,045 kg ha^{-1} (Table 1). It was lower by 35.9% than the yield of B73 x Mo17. The yield obtained in hybrid combinations Uz.b. x P3/72-22, Uz.b. x F 809, Uz.b. x B73 and Uz.b. x Mo17 was at the level of the yield obtained in the hybrid B73 x Mo17 (existing differences were not statistically significant). The superior-parent heterosis evaluated in these hybrid combinations amounted to 151.2%, 148.2%, 146.5% and 146.4% in Uz.b. x P3/72-22, Uz.b. x F809, Uz.b. x B73 and Uz.b. x Mo17, respectively. Although heterosis percentage amounted to 139.2% in the hybrid combination Uz.b. x L17/17, the yield of this combination was lower by 10.7% than the yield of the hybrid B73 x Mo17.

Grain yields registered in hybrid combinations among Uz.b. and inbred lines from Zambia (L7, N3, L9-2 and L12-7) were lower than the grain yield of the hybrid B73 x Mo17, while heterosis percentage varied from 120.4 to 131%. According to the stated it can be concluded that the variety Uz.b. is a heterotic pair interesting for the development of maize hybrids with inbreds of BSSS and

Lancaster groups and some Yugoslav maize populations (Konjski zub, Domaci tvrdunac).

Table 1. Grain yield (kg ha^{-1}), heterosis percentage, grain moisture (%) and lodged and broken plants (%) in 1995 and 1996

Hybrid/ population	Grain yield (kg ha^{-1})			Heterosis %	Grain moisture (%)			Lodged and broken plants (%)		
	1995	1996	X		1995	1996	X	1995	1996	X
Uz.b	8.648**	7.442**	8.045**	100.0	39.5	40.5	40.0	1.0	14.3	7.7
Uz.b x P3/72-22	13.120	11.210*	12.165	151.2	32.8	33.5	33.2	0.0	0.0	0.0
Uz.b x FR809	13.196	10.642**	11.919	148.2	38.5	36.1	37.3	2.8	2.5	2.6
Uz.b x B73	11.198	12.106	11.785	146.5	39.5	35.5	37.5	0.0	0.0	0.0
Uz.b x Mo17	11.959	11.602	11.781	146.4	37.7	34.0	35.9	0.0	0.9	0.4
Uz.b x L17/17	11.622	10.777**	11.199**	139.2	37.0	38.0	37.5	0.0	0.0	0.0
Uz b x L7	10.947	10.129**	10.537**	131.0	42.0	39.5	40.8	11.7	5.5	8.5
Uz.b x N3	11.372	9.552**	10.462**	130.0	41.2	39.5	40.4	13.4	9.9	11.8
Uz.b x L9-2	10.765	9.382**	10.083**	125.5	41.7	40.5	41.1	9.3	1.0	4.9
Uz.bx L12-7	9.168**	10.201**	9.684**	120.4	42.5	38.5	40.5	0.0	2.7	1.4
B73 x Mo17	12.534	12.548	12.541	-	36.0	33.5	34.8	0.0	0.0	0.0

Table 2. Grain yields (kg ha^{-1}) and grain moisture (%) at harvest in 2003 and 2004

Hybrid	Grain yield (kg ha^{-1})			Heterosis %	Grain moisture (%)		
	2003	2004	X		2003	2004	X
L730/9 x Mo17	11.210*	-	-	-	29.0	-	-
L372/9 x Mo17	9.913**	-	-	-	30.7	-	-
L733/9 x Mo17	8.960**	-	-	-	24.6	-	-
L734/9 x Mo17	10.240**	-	-	-	23.7	-	-
L735/9 x Mo17	12.630	17.491	15.061	98.5	28.3	22.0	25.2
L736/9 x Mo17	12.760	17.248	15.004	98.1	28.1	26.3	27.2
B73 x Mo17	13.040*	17.555	15.298	100.0	28.0	23.2	25.6

Two out of six inbreds (L730/9, L732/9, L733/9, L734/9, L735/9, L736/9) derived from the variety Uz.b. were crossed to Mo17 (Table 2) and had a grain yield at the level of B73 x Mo17. Since the variety Uz.b. is of subtropic origin, it is very luxuriant and has a great amount of green mass, hence inbreds derived from this variety should be adequately crossed to result in combinations favorable for silage production.

Beside grain yield other traits were also studied: plant height, ear height, ear length, cob diameter. It should be stressed that Uz.b. has a high stalk (329.7-342.7 cm) and the ear highly formed on the stalk (175.3-180.3 cm), which adversely affects the plant stability (% of lodged and broken plants ranged from 1.0% to14.3%, Table 1). Furthermore, tasseling occurs eight days later and silking occurs 12 days later in Uz.b. than in B73 x Mo17, which means that the growing period of Uz.b. is significantly longer than the growing period of the hybrid B73 x Mo17.

CONCLUSIONS

According to obtained results it can be concluded that there is a genetic difference between the variety Uz.b. and observed maize inbred lines. The variety Uz.b. is a heterotic pair interesting for the development of maize hybrids with inbreds of BSSS and Lancaster groups, as well as, with some Yugoslav maize populations (Konjski zub, Domaci tvrdunac). The inbred lines originating from Zambia showed somewhat lower yielding and heterosis percentage in relation to other observed inbred lines in hybrid combinations with the variety Uz.b.

The variety Uz.b. can be used in the process of the development of new inbred lines with the strict selection of plants for certain properties (plant and ear height, plant stability) and/or of the development of synthetic populations as a source breeding material by using appropriate donors for the improvement of those properties, which are not, according to the set goal of the breeding programme, satisfactory (plant stability, ear height).

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SELEKCIONO-GENETIČKA KARAKTERISTIKA SORTE KUKURUZA UZBEKSKA BELA

Lazar KOJIĆ[1] i Dillyara AJGOZINA[2]

[1]Institut za kukuruz, Zemun Polje, Beograd, Srbija
[2]SPK "Budan", Almatinska 51, p. Balatay, Kazakhstan

I z v o d

Izučavanje, izbor i korišćenje početnog materijala je od prvorazrednog značaja za uspešnu realizaciju programa stvaranja inbred linija i hibrida kukuruza. Za ispitivanja smo izabrali sortu kukuruza Uzbekska bela (Uz.b) i ukrstili je sa 9 inbred linija. Tri inbred linije potiču iz Amerike (FR 809 i B73 tipa BSSS, i Mo17 tipa Lancaster, 2 iz Jugosalvije-P3/72-22 dobijena iz ukrštanja domačih populacija Konjski zub x Domaći tvrdunac, L17/17 dobijena iz sintetičke populacije Syn6/9 (L)Co tipa Lancester i 4 inbred linije iz Zambije-L7, N3, L9-2 i L12-7).

Pored sorte Uz.b. i njenih kombinacija sa navedenim inbred linijama,u ispitivanja smo uključili i hibridnu kombinaicju B73 x Mo17, kako bi mogli da upoređujemo svojstva sorte Uz.b i njene hibridne kombinaicje sa ovim poznatim hibridom.

Uporedno sa ispitivanjem dobijenih hibridnih kombinacija procesom kontinuirane samooplodnje, dobili smo iz Uz.b 6 inbred linija, ukrstili ih sa Mo17 i ispitivali u ogledima 2003-2004. godine.

Na osnovu dobijenih rezultata istraživanja može se zaključiti da postoji genetička razlika između sorte Uz.b i ispitivanih inbred linija kukuruza. Sorta Uz.b predstavlja interesantan heterotični par za dobijanje hibrida kukuruza sa linijama tipa BSSS, Lancester i nekih jugoslovenskih populacija kukuruza (Konjski zub, Domaci tvrdunac). Nešto manju rodnost i procenat heterozisa, u odnosu na ostale ispitivane inbred linije u hibridnim kombinacijama sa sortom Uz.b, pokazale su inbred linije iz Zambije.

Sortu Uz.b možemo koristiti u procesu stvaranja novih inbred linija uz strogi izbor biljaka na određeno svojstvo (visina biljke i klipa, stabilnost biljke) i/ili u stvaranju sintetičkih populacija kao izvornog materijala za selekciju koristeći odgovarajuće donore za poboljšanje ovih svojstava, koja nam prema postavljenom cilju selekcije nisu zadovoljavajuća (stabilnost biljke,visina klipa).

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