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Heterosis behaviour with regards to the height and number of the leaves by tobaccos of burley variety group

Dimitar Dimanov, Youvko Dyulgierski

Tobacco and tobacco products institute – Markovo, Bulgaria

Abstract: We have researched the heterosis behaviour with regards to the height of the plants and the number of the leaves indexes. For this purpose, we have studied the P_1 , P_2 and F_1 populations of ten cross-fertilizations where local and introduced varieties of Burley tobacco participate. The data received shows that the heterosis effect is better pronounced with regards to the number of the leaves. Hybrid 1558 shows highest values of pronounced hypothetic and real heterosis with regards to both indexes. The heterosis effect is positively influenced by the distance of the parents used for hybridization.

Key words: Burley tobacco, heterosis, height of plants, number of plants, introduced varieties.

Introduction

Heterosis is biological occurrence which could be seen by the hybrids of the first generation and finds expression in the increase of the power, vitality and productivity of the hybrids compared to the parental forms (Yankulov 1996). Heterosis effect has been determined by all tobacco types. The research on the heterosis effect by the tobacco is subject to a large number of studies (Gopinath *et al.*, 1967, Matzinger and Wernsman 1968, Vandenberg and Matzinger 1970, Butorac *et al.*, 1999, Gixhari and Canllari 2004, Korubin – Aleksoska 2007, Dyulgierski 2011, Zi Cheng Xu and Jun Zhu 1999).

The heterosis by the large-leaf tobacco in Bulgaria is widely put into practice. There have been created the varieties Virginia 0295, 0297, 0372, 0199, 4241, 0454, 0514, 545, as well as Burley 1351 (Chinchev and Stoyanov 1984, Stoyanov and Apostolova 2000).

The heterosis varieties even today occupy large area by the Virginia tobacco. These are the varieties Virginina 0454 and Virginia 514 which are the main varieties grown in Bulgaria (Chinchev and Stoyanov 1985, 1987).

The purpose of our study is to determine the heterosis behaviour with regards to the important biometric indexes – height of the plants and number of the leaves – and its use in the tobacco selection by the Burley variety group.

Material and methods

The experimental work has been performed in the period 2007 – 2010 on the sample area of TTPI – Markovo. We have put under research ten created by us hybrid combinations in F_1 – Hybrid 1554, Hybrid 1555, Hybrid 1556, Hybrid 1557, Hybrid 1558, Hybrid 1559, Hybrid 1560, Hybrid 1562, Hybrid 1563 and Hybrid 1565. In the cross-fertilizations as parental components participate as selected by us varieties and lines and introduces varieties. For all combinations, we have made measures on: height of the plants and number of the leaves. We have measured 50 plants of each combination.

We have made variation analysis of the received data. With regards to the indexes researched, we have calculated the arithmetic average ($\bar{x}$), error of the arithmetic average (S_x %). We have determined hypothetic and real heterosis as per Omarov (1975).

$$H_{hip} = \frac{F_1 - P_{average}}{P_{average}} \cdot 100$$

$$H_{real} = \frac{F_1 - P_{best}}{P_{best}} \cdot 100$$

Results and discussion

Results got about heterosis behaviour given on tables № 1 and № 2 show that by all researched combinations the values of the hypothetic heterosis exceed these of the real. For the practice, however, more important are these of the real heterosis.

With regards to the height of the plants index, considerable heterosis can be seen by six of the ten hybrid combinations in F_1 . In none of them, however, its values exceed 10%. Highest result can be seen by Hybrid 1558 – almost 9%. In

general, the heterosis behaviour with regards to this index are not strongly pronounced. The heterosis effect is under the positive influence of the distance of the parents used for hybridization.

Tab. 1. Heterosis behaviour with regards to the height of the plants index

	P1	P2	F1	HP hypothetic %	HP real %
Hybrid 1555 (JI 1409 x B1344)	157,2±0,32	155,2±0,57	161,5±0,42	3,4	2,7
Parents / cross- fertilizations	158,4±0,74	157,2±0,32	166,8±0,34	5,7	5,2
Hybrid 1554 (JI410 x Ky 8959)	156,4±0,55	153,4±0,37	167,7±0,44	8,3	7,2
Hybrid 1558 (B 102 x B1317)	161,8±0,84	156,1±0,75	176,2±0,70	11,2	8,9
Hybrid 1559 (JI 1390 x B1344)	157,6±0,55	155,2±0,57	159,3±0,65	1,9	1,1
Hybrid 1560 (B 1000 x JI1322)	153,5±0,12	157,5±0,27	158,1±0,35	1,7	0,4
Hybrid 1562 (B 102 x JI 1349)	161,8±0,84	160,8±0,41	172,5±0,14	7,5	7,3
Hybrid 1563 (B1344 x B 1317)	155,2±0,57	156,1±0,75	158,3±0,18	1,7	1,4
Hybrid 1565 (JI 1410 x B 102)	154,8±0,63	161,8±0,84	174,7±0,71	10,9	8

With regards to the number of the leaves index, considerable heterosis can be seen by five of the ten hybrid combinations in F₁, but the heterosis effect is more pronounced. By four of the cross-fertilizations can be seen heterosis over 10% whereas the latter is mostly pronounced in Hybrid 1558 again – over 17%. Unlike the height of the plants index, with regards to the number of the leaves index it has proved to be a reliable selection method for increase of its indexes. Logically, by the hybrid combinations where a considerable heterosis can be seen with regards to the height of the plants, such presents with regards to the number of the leaves too.

Tab. 2. Heterosis behaviour with regards to the number of the leaves index

Parents / cross-fertilizations	P1	P2	F1	HP hypothetic %	HP real %
Hybrid 1554 (Л11410 x Ky 8959)	26,5±0,18	25,7±0,23	28,8±0,12	10,3	8,6
Hybrid 1555 (Л11409 x Б1344)	27,7±0,16	26,9±0,13	27,9±0,11	2,2	0,7
Hybrid 1556 (Ky 8959x Л11409)	25,7±0,23	27,7±0,16	28,5±0,10	6,7	2,9
Hybrid 1557 (Л11390 x ТН 90)	27,6±0,25	25,1±0,15	30,6±0,27	16,1	10,8
Hybrid 1558 (Б102 x Б1317)	27,1±0,24	25,4±0,28	31,8±0,15	21,1	17,3
Hybrid 1559 (Л11390 x Б1344)	27,6±0,25	26,9±0,13	28,0±0,12	2,8	1,4
Hybrid 1560 (Б1000 x Л11322)	24,7±0,17	26,4±0,31	27,2±0,11	6,5	3
Hybrid 1562 (Б102 x Л11349)	27,1±0,24	27,4±0,14	31,5±0,20	15,6	15
Hybrid 1563 (Б1344 x Б1317)	26,9±0,13	25,4±0,28	27,4±0,30	4,8	1,9
Hybrid 1565 (Л11410 x Б102)	26,5±0,18	27,1±0,24	30,9±0,19	15,3	14

The heterosis effect is positively influenced by the distance of the parents used for hybridization, i.e. it is more pronounced by cross-fertilizations where one of the components comes from local selection line and the other is an introduced variety. For both of the indexes, mostly pronounced is the heterosis where in the cross-fertilization participates Banket 102 variety.

Conclusions

By all researched combinations and with regards to both researched indexes, the values of the hypothetic heterosis are greater than those of the real one.

The heterosis effect is more pronounced with regards to the number of the leaves and has economical importance with regards to this index. Hybrid 1558 shows greatest values of pronounced hypothetic and real heterosis with regards to both indexes.

The heterosis effect is positively influenced by the distance of the parents used for the hybridization.

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HETEROZIS U POGLEDU VISINE I BROJA LISTOVA KOD DUVANA SORTNE GRUPE BURLEY

-originalni naučni rad-

Dimitar Dimanov, Youvko Dyulgerski

Institut za duvan i proizvode od duvana - Markovo, Bugarska

Rezime

Ispitivali smo heterozis u pogledu visine biljaka i broja lisnih indeksa. Za potrebe istraživanja, izvršena je analiza P_1 , P_2 i F_1 populacija deset stranooplodnji kojima su bile obuhvaćene lokalne i introdukovane sorte duvana Burley. Dobijeni podaci pokazuju da je uticaj heteroze izraženiji kod broja listova. Hibrid 1558 pokazuje najviše vrednosti izražene hipotetičkog i stvarnog heterozisa u pogledu oba indeksa. Efekat heterozisa pod pozitivnim je uticajem udaljenosti roditelja korišćenih za hibridizaciju.

Ključne reči: Burley duvan, heterozis, visina biljaka, broj biljaka, introdukovane sorte.