

UDC: 633.71-152.4
ID: 195752460
Original research paper



Acta Agriculturae Serbica, Vol. XVII, 34 (2012) 75-82

Study on Heterosis Behaviour Related to the Leaves Size by the Tobacco of Burley Variety Group

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Abstract: The study has been performed on the heterosis behaviour related to the following indications: length and width of the 7-8 leaf and length and width of 13-14 leaf. For this purpose, the research was focused on the populations of P_1 , P_2 and F_1 of ten cross-fertilizations where local and introduced varieties of Burley tobacco participate. The results show that the heterosis effect could be best seen in the width of the 7-8 leaf and therefore it has an economical importance with regards to this index namely. The heterosis referring to the width of the leaves is more pronounced than their length. Also, with regards to the size of the leaves, the heterosis is better seen in the lower than in the upper pick zone (harvesting stalk position).

Key words: Burley tobacco, heterosis, size of leaves, length of the leaf, width of the leaf, harvesting stalk position

Introduction

The dynamics of the needs and the growing demands of the external market to the tobacco varieties set newer and newer problems upon the tobacco selection. The heterosis method offers very good and effective opportunities for creation of new varieties (Shabanov and Tomov 1989).

Heterosis effect has been determined by all types of tobaccos in the world, including by the oriental tobaccos. The study on the heterosis effect by the tobacco is subject to large number of analyses in Bulgaria and abroad (Tsikov 1982, Stankev 1988, Gelemerov 1990 Korubin-Aleksoska 2007; Dyulgerski 2011, Masheva 2009,

Ramanarao *et al.*, 1993, Kara and Esendae 1995, Prasannasimha Rao 1995, Zi Cheng Xu and Jun Zhu 1999, Butorac 2000, Gixhari and Canllari 2004 etc.)

In our country the heterosis by the large-leaf tobaccos is widely put into practice. The heterosis varieties occupy a larger part of the Virginia tobacco areas. The use of heterosis varieties by the large-leaf tobaccos has some advantages over the direct varieties like for example: faster growing dynamics, resistance to some diseases, earlier ripeness and higher income (Pophristev, 1977; Chincev and Stoyanov, 1985; 1987).

The purpose of our study is to ascertain the heterosis behaviour with regards to the leaves size in the lower and upper pick zone (harvesting stalk positions) of Burley and its use in tobacco selection in this variety group.

Material and methods

The experimental work has been performed between 2007 and 2010 on the sample area of TTPI – Markovo. We have put under research ten created by us hybrid combinations in F₁ – Hybrid 1554, Hybrid 1555, Hybrid 1556, Hybrid 1557, Hybrid 1558, Hybrid 1559, Hybrid 1560, Hybrid 1562, Hybrid 1563 and Hybrid 1565. In the cross-fertilization, as parental components, participate both selected by us and introduced varieties. For all combinations, we have made observations and measuring of: length and width of the 7-8 leaf and length and width of 13-14 leaf. 50 plants of each combination have been measured.

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 hypothetical 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

The results which we got about the heterosis behaviour of the researched hybrid combinations and the sizes of the leaves in the lower and upper pick zone are shown on tab. 1 and tab. 2.

Tab. 1. Heterozis behaviour regarding the length of the 7-8 leaf indication

Parents / cross-fertilizations	P1	P2	F1	HP hypothetic %	HP real %
Hybrid 1554 (JI1410 x Ky 8959)	57,5±0,19	56,7±0,28	61,8±0,13	8,2	7,4
Hybrid 1555 (JI 1409 x B1344)	57,2±0,21	58,0±0,12	62,7±0,14	8,6	8,1
Hybrid 1556 (Ky 8959 x JI 1409)	56,7±0,28	57,2±0,21	61,5±0,20	8	7,5
Hybrid 1557 (JI 1390 x TH 90)	59,1±0,27	56,9±0,25	62,2±0,26	7,2	5,2
Hybrid 1558 (B 102 x B1317)	57,5±0,16	56,8±0,18	61,9±0,18	8,3	7,7
Hybrid 1559 (JI 1390 x B1344)	59,1±0,27	58,0±0,12	65,0±0,17	11	10
Hybrid 1560 (B 1000 x JI 1322)	55,5±0,29	56,8±0,19	58,7±0,14	4,5	3,3
Hybrid 1562 (B 102 x JI 1349)	57,5±0,16	57,8±0,22	60,3±0,18	4,6	4,3
Hybrid 1563 (B1344 x B 1317)	58±0,12	56,8±0,18	63,7±0,23	11	9,8
Hybrid 1565 (JI 1410 x B 102)	58,2±0,19	57,5±0,16	61,1±0,18	5,6	5

With regards to the length of 7-8 leaf, by all researched combinations the values of the real are little bit lower than the values of the hypothetic heterosis, although more important for the practice are the values of the real heterosis. Considerable heterosis has been observed by nine of the ten hybrid combinations in F1. Despite this, in general, the heterosis behaviour with regards to this index is not heavily pronounced. In none of the hybrid combinations its values are higher than 10%. Highest results with almost equal values can be seen by the cross-fertilizations where as parental component for hybridization participate Burley 1344 variety.

With regards to the width of the 7-8 leaf index, considerable heterosis is to be seen by nine of the ten hybrid combinations in F1 again but the heterosis effect is more pronounced. By four of the cross-fertilizations can be seen heterosis over 10% - mostly pronounced it is by Hybrid 1563 – about 16%. The heterosis has proved to be a reliable selection method for increasing of the width of the leaves in the lower pick zone (harvesting stalk position).

By most of the cross-fertilizations, the heterosis effect is positively influenced by the distance of the parents used for hybridization, as well as by the participation of Burley 1344 as parental component in the cross-fertilization.

Tab. 2. Heterozis behaviour regarding the width of the 7-8 leaf indication

Parents / cross-fertilizations	P1	P2	F1	HP hypothetic %	HP real %
Hybrid 1554 (Л1410 x Ky 8959)	30,1±0,16	28,8±0,18	33,3±0,14	13,1	10,6
Hybrid 1555 (Л1409 x Б1344)	30,5±0,15	30,2±0,10	34,7±0,17	14,3	13,8
Hybrid 1556 (Ky 8959x Л1409)	28,8±0,18	30,5±0,12	32,9±0,21	11	7,9
Hybrid 1557 (Л1390 x ТН 90)	28,4±0,22	29,6±0,19	32,4±0,14	11,7	9,5
Hybrid 1558 (Б102 x Б1317)	29,6±0,13	29,2±0,24	31,8±0,20	8,2	7,4
Hybrid 1559 (Л1390 x Б1344)	28,4±0,22	30,2±0,10	34,0±0,13	16	12,6
Hybrid 1560 (Б1000 x Л1322)	30,8±0,23	30,0±0,09	31,3±0,14	3	1,6
Hybrid 1562 (Б102 x Л1349)	29,6±0,13	30,5±0,12	32,9±0,25	9,5	7,9
Hybrid 1563 (Б1344 x Б1317)	30,2±0,10	29,2±0,24	34,9±0,15	13,7	15,6
Hybrid 1565 (Л1410 x Б102)	30,1±0,16	29,6±0,13	32,1±0,12	7,5	6,6

The heterosis behaviour of the researched hybrid combinations of the leaves sizes in the upper pick zone (harvesting stalk position) are shown on tab. 3 and 4.

With regards to the length of 13-14 leaf, by most of the researched variants the values of the real are little lower than the values of the hypothetic heterosis. Considerable heterosis can be seen in only 4 of the ten hybrid combinations in F1. In general, the heterosis behaviour regarding this indication is less pronounced. The highest result of 8.4% can be seen by Hybrid 1555. The heterosis effect can be seen in the cross-fertilizations where as parental component for hybridization participates Burley 1344 variety.

With regards to the width of the 13-14 leaf, by most of the variants the values of the real are lower than the values of the hypothetic heterosis and by two of the cross-fertilizations can be seen a significant difference in the values of the first and the second one – approximately 4 times. Considerable heterosis can be seen by eight of the ten hybrid combinations in F1, but the heterosis effect is more pronounced. Most pronounced is the heterosis again by Hybrid 1555. This hybrid has proved to be the cross-fertilization with mostly pronounced heterosis effect with regards to the size of the leaves in the upper pick zone (harvesting belt).

Tab. 3. Heterozis behaviour regarding the length of the 13-14 leaf indication

Parents / cross-fertilizations	P1	P2	F1	HP hypothetic %	HP real %
Hybrid 1554 (Л1410 x Ky 8959)	61,6±0,17	61,3±0,14	64,8±0,16	5,6	5,2
Hybrid 1555 (Л 1409 x Б1344)	62,4±0,19	62,6±0,18	67,4±0,12	7,8	8,4
Hybrid 1556 (Ky 8959xЛ 1409)	61,3±0,14	62,4±0,19	63,7±0,19	3	2,1
Hybrid 1557 (Л 1390 x ТН 90)	63,6±0,27	60,4±0,23	63,3±0,16	2,1	-0,3
Hybrid 1558 (Б 102 x Б1317)	61,4±0,15	60,8±0,23	64,1±0,24	4,9	4,4
Hybrid 1559 (Л 1390 x Б1344)	63,6±0,27	62,6±0,18	66,9±0,13	6	6,9
Hybrid 1560 (Б 1000 x Л 1322)	59,5±0,19	62,1±0,25	62,6±0,13	3	0,8
Hybrid 1562 (Б 102 x Л 1349)	61,4±0,15	61,7±0,22	63,6±0,12	3,3	3,1
Hybrid 1563 (Б1344 x Б 1317)	62,6±0,18	60,8±0,23	66,4±0,18	7,6	6,1
Hybrid 1565 (Л 1410 x Б 102)	61,6±0,17	61,4±0,15	64,0±0,22	4,1	3,9

Tab. 4. Heterozis behaviour regarding the width of the 13-14 leaf indication

Parents / cross-fertilizations	P1	P2	F1	HP hypothetic %	HP real %
Hybrid 1554 (Л1410 xKy 8959)	31,1±0,14	30,8±0,18	33,5±0,23	8,2	7,7
Hybrid 1555 (Л 1409 x Б1344)	31,5±0,13	32,2±0,10	35,8±0,16	12,4	11,2
Hybrid 1556 (Ky 8959xЛ 1409)	30,8±0,18	31,5±0,13	33,8±0,10	8,5	7,3
Hybrid 1557 (Л 1390 x ТН 90)	33,4±0,19	30,5±0,12	34,0±0,15	6,4	1,8
Hybrid 1558 (Б 102 x Б1317)	30,8±0,11	31,2±0,19	34,3±0,18	10,6	9,9
Hybrid 1559 (Л 1390 x Б1344)	33,4±0,19	32,2±0,10	36,1±0,11	10,7	8,1
Hybrid 1560 (Б 1000 x Л 1322)	30,3±0,20	33,2±0,15	33,7±0,14	6,1	1,5
Hybrid 1562 (Б 102 x Л 1349)	30,8±0,11	31,7±0,18	34,3±0,13	9,8	8,2
Hybrid 1563 (Б1344 x Б 1317)	32,2±0,10	31,2±0,19	35,5±0,21	12	10,2
Hybrid 1565 (Л 1410 x Б 102)	31,1±0,14	30,8±0,11	32,9±0,13	3	5,8

By most of the cross-fertilizations, the heterosis effect is positively influenced by the distance of the parents used for hybridization, as well as by the participation of Burley 1344 as parental component in the cross-fertilization. The heterosis with regards to the width of the 13-14 leaf is more pronounced than the one with regards to the length of the leaves in the same zone (belt) but it is weaker in comparison with the one pronounced with regards to the width of the leaves in the lower pick zone (harvesting belt).

Conclusion

The heterosis effect is most pronounced with regards to the width of the 7-8 leaf and has economical importance in connection with this indication.

Hybrid 1555 shows highest values of pronounced hypothetic and real heterosis with regards to the length of the leaves, as well as to the width of the 13-14 leaf.

The heterosis with regards to the width of the leaves is more pronounced than the one with regards to their length.

With regards to the size of the leaves, the heterosis is more pronounced in the lower than in the upper pick zone (harvesting stalk position).

The heterosis effect can be seen by the cross-fertilizations where as parental component for hybridization participates Burley variety.

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ISPITIVANJE HETEROZISA U POGLEDU VELIČINE LISTA KOD DUVANA SORTNE GRUPE BURLEY

-originalni naučni rad-

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Rezime

Izvršeno je ispitivanje heterozisa na osnovu sledećih indikatora: dužine i širine 7-8. lista i dužine i širine 13-14. lista kod populacije P_1 , P_2 i F_1 deset stranooplodnji kojima su obuhvaćene lokalne i introdukovane sorte duvana Burley. Rezultati pokazuju da je najbolji efekat heterozisa ispoljen u širini 7-8. lista, zbog čega heterozis ima ekonomski značaj kad je reč o ovom indeksu. Heterozis koji se odnosi na širinu lista izraženiji je od heterozisa za dužinu lista. Kad je reč o veličini lista, heterozis je vidljiviji u donjoj zoni branja u odnosu na gornju zonu (žetveni položaj stabljike).

Ključne reči: Burley duvan, heterozis, veličina lista, dužina lista, širina lista, žetveni položaj stabljike