

INHERITANCE OF THE NICOTINE IN BURLEY TOBACCO CROSSES

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ABSTRACT

For the purpose of examination of the degree of dominance, heterosis and heritability of the nicotine in tobacco cross hybrids, the populations P_1 , P_2 , F_1 and F_2 crosses of ten featuring local and introduced varieties of Burley tobacco were studied. As a result of the analysis a positive heterosis of economic value was established in most of the crosses tested. It was most expressed in Hybrid 1457 and Hybrid 1462. The inheritance of the nicotine is incompletely dominant or additive. The direction of inheritance varies both in direction of the parent with the lower and the parent with higher levels of nicotine. In the most of the studied hybrid combinations, a relatively high coefficient of heritability is set. So the selection with good quality of the seven genotypes will be more effective in earlier hybrid generations ($F_2 - F_3$). Low values of heritability coefficient were found in hybrids 1466, 1472 and 1478. Selection of nicotine will be effective in the later hybrid generations ($F_5 - F_6$).

Keywords: Burley tobacco, nicotine, heritability, heterosis

НАСЛЕДУВАЊЕ НА НИКОТИНОТ КАЈ КРСТОСКИ ОД ТИПОТ БЕРЛЕЈ

За проучување на степенот на доминантност, хетерозисот и херитабилноста на никотинот кај тутунски хибриди, испитувани се P_1 , P_2 , F_1 и F_2 крстоските од десет домашни и странски сорти тутун од типот берлеј. Како резултат од анализата, кај поголемиот дел од испитуваните крстоски забележан е позитивен хетерозис со економско значење. Тој е најизразен кај Хибрид 1457 и Хибрид 1462. Начинот на наследување на никотинот е нецелосно доминантен или адитивен. Повеќето на наследување варира и кон родителот со пониска вредност на никотин и кон оној со повисока. Кај најголем дел од хибридните комбинации постои релативно висок коефициент на херитабилност. Затоа, селекцијата од седумте генотипови со висок квалитет ќе биде поефективна во пораните генерации на хибриди ($F_1 - F_3$). Пониски вредности на коефициентот на херитабилност се утврдени кај хибридите 1466, 1472 и 1478. Селекцијата на никотинот ќе биде ефективна во подоцните генерации на хибриди ($F_5 - F_6$).

Клучни зборови: берлејски тутун, никотин, херитабилност, хетерозис

INTRODUCTION

The chemical composition is essential for tobacco quality (Gyuzelev, 1983; Korubin-Aaleksoska, 2001). In Burley tobacco, the most important indicators shaping its use-value are nicotine, total nitrogen, sugars, ashes and ammonia, chlorine and proteins (Drachev, 1996; 2001; Tso, 1988). Of these, undoubtedly the most important role has the nicotine (Manolov, 1979; Stoilova, 2008). The use of genetic analysis on these indicators will help to improve the efficiency of the selection process (Dagnon and Dimanov, 2007).

Studies of some authors suggest that

inheritance of nicotine is the most negative overdominant and intermediate with a negative sign. Overdominantly positive inheritance was observed less frequently (Nicolic et al., 1995). The literature refers to additive inheritance of nicotine (Bing-Guang, et al., 2005). In Bulgaria, there is little data with respect to Burley tobacco for such studies (Dyulgierski, 2011).

The purpose of this work is to establish heterosis events and the nature of inheritance of nicotine in order to pick out prospective forms high in nicotine.

MATERIAL AND METHODS

The experimental work was carried out in the experimental field of ITTI - Markovo village. Populations were investigated to P₁, P₂, F₁ and F₂ crosses of ten local and introduced varieties of Burley tobacco: Hybrid 1435 (L 1334 x Tn 86), Hybrid 1457 (1317 B x B 21); Hybrid 1462 (L 1322 x Ky 907), Hybrid 1463 (B 1344 x L 1330), Hybrid 1465 (L 1390 x Ky 908), Hybrid 1466 (B 1317 x Ky 8959), Hybrid 1471 (B1344 x

B 1317), Hybrid 1472 (B 1344 x Tn 90); Hybrid 1475 (B 1317 x Ky 908) and Hybrid 1478 (B 1317 x Tn 90).

Certainly the content of nicotine: arithmetic mean (\bar{x}), the average error (Sx%), degree of dominance (d/a) by the formula of Mather (1949), heterosis effect in terms of better parental form (HP) in Omarov (1975) coefficient of the trait heritability (H²) by Sobolev (1976).

RESULTS AND DISCUSSION

The data in Table 1 show that there is a positive heterosis effect on the economic value in six of the ten crosses. It was most pronounced in Hybrid 1457 - about 15% and Hybrid 1462 - over 12%. It can be concluded that heterosis, although

in small amounts, has an economic significance in terms of research indicator. The economic heterosis effect is influenced positively by far off parents used for hybridization.

Table 1 Data on the content and inheritance of nicotine

| Parents / Crosses/Indexes | P ₁ | P ₂ | F ₁ | F ₂ | d/a | HP | H ² |
|---|--------------------|--------------------|--------------------|--------------------|-------|-------|----------------|
| | $\bar{x} \pm Sx\%$ | $\bar{x} \pm Sx\%$ | $\bar{x} \pm Sx\%$ | $\bar{x} \pm Sx\%$ | | | |
| Hybrid 1435 (L 1334 x T _H 86) | 2.94±0.34 | 2.06±0.03 | 2.26±0.04 | 2.29±0.17 | 0.55 | 76.9 | 0.31 |
| Hybrid 1457 (B 1317 x B 21) | 2.41±0.10 | 2.13±0.30 | 2.76±0.23 | 2.61±0.18 | 1.75 | 114.5 | 0.54 |
| Hybrid 1462 (L 1322 x Ky 907) | 2.56±0.31 | 2.61±0.21 | 2.93±0.15 | 2.73±0.22 | 0.30 | 112.3 | 0.57 |
| Hybrid 1463 (B 1344 x L 1330) | 3.07±0.07 | 2.27±0.19 | 2.82±0.24 | 2.58±0.13 | -1.1 | 91.9 | 0.43 |
| Hybrid 1465 (L 1390 x Ky 908) | 2.61±0.16 | 3.35±0.16 | 2.37±0.07 | 2.46±0.15 | -0.98 | 70.7 | 0.35 |
| Hybrid 1466 (B 1317 x Ky 8959) | 2.41±0.30 | 2.28±0.29 | 2.59±0.26 | 2.44±0.14 | 1.88 | 107.5 | 0.16 |
| Hybrid 1471A (B 1344 x B 1317) | 3.07±0.07 | 2.41±0.30 | 2.5±0.32 | 2.54±0.11 | -0.73 | 81.4 | 0.43 |
| Hybrid 1472 (B1344 x Tn 90) | 3.07±0.07 | 2.61±0.31 | 3.27±0.09 | 2.77±0.16 | 1.87 | 106.5 | 0.19 |
| Hybrid 1475 (B 1317 x Ky 908) | 2.41±0.30 | 3.35±0.16 | 3.67±0.02 | 3.04±0.19 | 0 | 109.6 | 0.63 |
| Hybrid 1478 (B 1317 x Tn 90) | 2.41±0.30 | 2.61±0.31 | 2.81±0.06 | 2.83±0.11 | 0.20 | 107.7 | 0.12 |

Inheritance of nicotine content is overdominant for Hybrids 1457, 1462, 1466 and 1472, incompletely dominant for Hybrids 1435, 1462, 1465, 1471 and 1478 and additive in Hybrid 1475. When the heterosis effect is observed, of the order of 9.6% it can be seen that it has a considerably high rate of traits heritability (63). The inheritance varies in direction of the parent with higher or lower values, depending on the crossing.

The value of the coefficient of heritability is quite diverse and varies depending on the crossing. High coefficients of heritability -up to 50%, were detected in Hybrid 1457, Hybrid 1462 and especially in Hybrid 1475. In combinations № 1471, 1435, 1465 relatively high coefficients

of heritability of nicotine content (0.43, 0.31, and 0.35) are also found. If the three crosses are removed, the coefficient of heritability is low - less than 20%. Prevailing values of the coefficients of heritability of the tested hybrids showed that the genetic expression of interest in these signs is low.

Most of the surveyed crosses showed relatively high degree of heritability. For this reason, the selection of genotypes with good quality will be more effective in earlier hybrid generations (F₂-F₃). In hybrids 1466, 1472 and 1478 the selection of nicotine will be effective in the later hybrid generations (F₅-F₆).

CONCLUSION

1. In most of the investigated crosses, positive heterosis of economic value was determined. It was pronounced most highly in Hybrid 1457 and Hybrid 1462.

2. The inheritance of nicotine content is overdominant, incompletely dominant or additive. The inheritance varies in direction of the parent with higher or lower nicotine content.

3. A relatively high coefficient of heritability of the nicotine content is set for most hybrid combinations. For this reason, the selection of genotypes with good quality will be more effective in earlier hybrid generations (F_2 – F_3). In Hybrids 1466, 1472 and 1478 nicotine content breeding will be effective in the later hybrid generations (F_5 – F_6).

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