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GENETIC AND PHENOTYPIC CORRELATIONS BETWEEN OIL CONTENT AND MORPHOPOGICAL TRAITS IN HIGH OIL MAIZE POPULATION NSU$_1$

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In this paper we are studied correlations between grain yield and oil content, on one side, and morfological traits of plant and ear, on the other side, in two testcross maize populations. In testcross combination NSU$_1$ × 568/II NS, oil content had pozitive genetic correlation with all studied traits. At the second studied population, NSU$_1$ × B73, oil content had positive correlation only with ear height and ear lenght, while correlation between oil content and plant height and kernel row number were negative. Between other studied traits, at 568/II testcrosses, the strongest relationship was found between plant and ear height, and at B73 testcrosses between plant height and ear lenght. In NSU$_1$ × 568/II NS, oil content had positive phenotypic correlations with all traits, except, with a

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kernel row number. In the second studied population, phenotypic correlations between oil content and all traits (except ear lenght) were negative. The highest value of phenotypic correlation between another studied traits, in NSU_1 × 568/II NS testcross combination, was found between plant and ear height, and in NSU_1 × B73, between plant height and kernel row number.

Key words: maize, morphological traits, oil content, correlations

INTRODUCTION

Grain yield is the most important agronomic traits of maize, and because of that most of maize breeders is highly treated. Besides that, the attention should be paid to the quality of kernel itself, ie. chemical composition, mainly if we take into consideration one of the most important maize use in developed countries, as livestock feed.

The kernels of a modern maize hybrid contain about 4% oil, 9% protein, 73% starch, and 14% other constituents (LAURIE ET AL., 2004). Poultry, swine and dairy cows require livestock with high calorie levels (LAUER, 1995). The calorie content of oil is approximately 2.25 times greater than that of starch (ALEXANDER, 1988). Therefore, one way how to provide high calorie livestock feed is use of high oil maize. High oil maize have not only the increased oil content, but also enhanced protein content, which increased biological value of the kernel (DUMANOVIĆ, 1964; ALEXANDER, 1988; BOĆANSKI ET AL., 1998). Also, maize oil is one of the most quality oil for human consumption. Maize oil has great percent of linoleic acid, which is essential in the human diet because there is no synthetic mechanism for it.

Grain yield has very complex mode of inheritance. Because of that we need to submit unit or mutual influence level different traits on grain yield. The objectives of this paper were to obtain correlative relationships between grain yield and morphological traits of plant and ear, as well as between oil content and morphological traits.

MATERIAL AND METHOD

The genetic material evaluated in the present study was developed by crossing progenies of high oil corn population after 16 cycles of reccurent selection, and two testers, 568/II NS and B73. During 2003 and 2004 testcrosses were evaluated in field experiments at one location (Rimski Sancevi) according to Nested Design (incomplete block design; COCHRAN AND COX, 1957). 96 genotipes were assigned at random to 4 sets. Two replication within set were used and 20 plants per plot were grown. Each plot consisted of one, 5-m long row, spaced 0.75m between plots and 0.24 m between plants. The standard maize growing technique was practiced. Harvest was done by hand.

The data were recorded on 10 randomly taken competitive plants for plant (PH) and ear height (EH), ear lenght (EL), kernel row number (KRN), 100-kernel weight (KW), grain yield per plant (GY) and kernel oil content (KOC). Oil content was determined by NMR (nucler magnetic resonance spectroscope).

Analysis of variance and covariance were done by Nested Design (random model; COCHRAN AND COX, 1957). For comparison of mean values of studied traits we applicated t test. Genetic and phenotypic correlation coefficients were based on ratio of joint variation and sumary of individual variation two traits (HALLAUER AND MIRANDA, 1988), and for testing significance of correlation coefficients we also applicated t test.

RESULTS

In population NSU_1 × 568/II NS, highly mean values are obtained for plant and ear height, ear lenght and 100-kernel weight. At the second studied population of testcrosses, where inbred line B73 was used as tester, higly mean values were noticed for kernel row number and kernel oil content. Grain yield per plant had almost identical mean values in both studied testcross populations (Tab. 1).

Testing significance of difference between mean values of studied traits, between populations which are evaluated, highly significance difference were found for ear height and lenght, kernel row number, 100-kernel weight and kernel oil content. Difference between mean values of plant height and grain yield didn`t show significance.

Tab. 1 Mean values for studied traits

Population	*Trait*						
	PH (cm)	*EH (cm)*	*EL (cm)*	*KRN*	*KW (g)*	*GY (g)*	*KOC (%)*
NSU_1 × 568/II NS	239.01 ± 0.544	111.96 ± 0.490	20.53 ± 0.057	16.35 ± 0.053	35.41 ± 0.180	207.43 ± 1.260	7.14 ± 0.063
NSU_1 × B73	237.37 ± 0.641	107.97 ± 0.495	19.93 ± 0.061	16.73 ± 0.060	33.01 ± 0.214	207.34 ± 1.317	7.59 ± 0.058

Values of genetic and phenotypic coefficients of correlations, for 568/II NS testcrosses, are given in Table 2. Kernel oil content was in positive genetic relationship with all studied traites. Oil content had medium strong genetic correlations with plant height (r_g = 0.390) and 100-kernel weight (r_g = 0.336), and low correlations with ear height (r_g = 0.088), ear lenght (r_g = 0.013) and kernel row number (r_g = 0.192). Between other studied traits the strongest genetic relationship was found for plant and ear height, and it was highly significance (r_g = 0.944**). Highly significance, but medium strong correlation, also was found between ear height and lenght (r_g = 0.482**). For grain yield, value of genetic variance was negative, and because of that we couldn`t calculate correlations between grain yield and another studied traits.

Between oil content and almost all traits (except kernel row number and grain yield) we found positive, low phenotypic correlations. Kernel oil content was in negative, low correlation with kernel row number, and in medium strong correlation with grain yield (Tab. 2). Between grain yield, on one side, and ear lenght (r_p = 0.569) and 100-kernel weight (r_p = 0.454), on the other side, we found medium strong correlations. With other studied traits grain yield had low values of phenotypic coefficient of correlation. The strongest phenotypic correlation was found between plant and ear height, and it was highly significance (r_p = 0.713**).

Tab. 2 Genetic (above diagonal) and phenotypic (below diagonal) correlations in NSU$_1$ × 568/II NS

Osobina	*PH*	*EH*	*EL*	*KRN*	*KW*	*GY*	*KOC*
PH		0.944**	0.293	-0.175	0.151	/	0.390
EH	0.713**		0.482**	-0.178	0.046	/	0.088
EL	0.053	0.082		-0.048	0.338	/	0.013
KRN	-0.038	-0.082	-0.090		-0.567	/	0.192
KW	0.112	0.078	0.325	-0.418		/	0.336
GY	0.048	0.042	0.569	0.225	0.454		
KOC	0.136	0.084	0.059	-0.026	0.171	0.315	

** $p < 0.01$

Values of genetic and phenotypic coefficient of correlations, for testcross combination NSU$_1$ × B73, are given in table 3. Medium strong, positive correlations were found between oil content and ear height (r_g = 0.304) and lenght (r_g = 0.586). With other studied traits oil content was in negative correlations; with plant height in negative low correlation, and with kernel row number in medium strong, negativ correlations (Tab. 3). In this testcross population, the strongest relationship was found between plant height and ear lenght, but it was negative. Because of negative values of genetic variance for grain yield and 100-kernel weight, we couldn`t calculate genetic correlations between this traits and other studied traits.

Between oil content and all traits (except ear height) low, negative phenotypic correlations were found. Grain yield was in low, positive relationship with plant height and kernel row number, and low negative relationship with ear height. With ear lenght (r_p = 0.593) and 100-kernel weight (r_p = 0.464), grain yield was in medium strong, positive correlations. Highly significance values of phenotypic coefficient of correlations were found between plant height, on one side, and kernel row number (r_p = 0.937**) and ear height (r_p = 0.590**), on the other side.

Tab. 3 Genetic (above diagonal) and phenotypic (below diagonal) correlations in NSU_1 × *B73*

Osobina	*PH*	*EH*	*EL*	*KRN*	*KW*	*GY*	*KOC*
PH		0.587	-0.864*	-0.116	/	/	-0.011
EH	0.590**		0.312	-0.401	/	/	0.304
EL	-0.092	0.072		0.157	/	/	0.586
KRN	0.937**	-0.021	-0.099		/	/	-0.599
KW	-0.070	-0.016	0.386	-0.380		/	/
GY	0.049	-0.094	0.593	0.112	0.464		/
KOC	-0.074	0.034	-0.099	-0.135	-0.008	-0.073	

* $p < 0.05$

** $p < 0.01$

DISCUSSION

Mean value of trait which will be breed is one of the important genetic parameters which is submitted at some population genetic potential evaluation. If trait has lower mean value more selection cycles will be necessary for its multiplication (HALLAUER AND MIRANDA, 1988). The changes in population mean value represent indirect selection success (LAMKEY, 1992). At population NSU_1 × 568/II NS, highly significant mean values have been noteced for ear height and lenght and 100-kernel weight, while kernel row number and oil content are traits which had highly significante lower mean values in this population. Significance differences appeared between used testers may be discussed in a way that one of the testers has higher frequencies of desired dominance allels, and therefore masks the influence of undesired allels in the studied population. Therefore 568/II NS is closer to the definition of better tester which was given by HULL (1945) for traits kernel row number and oil content, while B73 for traits of ear height and lenght and 100-kernel weight.

Enabling the determination of genetic population values one of the submitted parametres are correlative relationship between studied traits. Genetic correlations have a great importance in the selection, showing the direction of studied traits changes influencing by the selection (HALLAUER AND MIRANDA, 1988).

The values of genetic correlation coefficients between kernel oil content and other studied traits obtained in this paper are partially similar to the results obtained by variaus authors in preveus researches. EL ROUBY AND PENNY (1967), studing relationship between oil content and morphological traits, found negative, correlative relationships between oil content and plant height and 100-kernel weight. The obtained results for 568/II NS testcrosses are contra to the results of the above mentioned authors, but the resulta obtained in the another studied testcrosses combination (NSU_1 × B73) in accordance to the results of EL ROUBY AND PENNY-a (1967). Also, results which we got in our research are contra to results of DUDLEY ET AL. (1977). They submitted significant negative correlation coefficients, obtained between oil content and 100-kernel weight (r_g = - 0.85*), studying hybrid combination of maize in Illinois plantbreeding program. The results obtained in our paper are manly different to the MIŠEVIĆ AND ALEXANDER (1989) results. They estimated correlation changes grain yield and other agronomic traits, after 24 cycles of phenotypic recurrent selection on kernel oil content. The estimation has been done at progenies *per se* and at testcross combinations with 2 inbred line, B73 and R802A. Both, at progenies *per se* and testcross combinations, negative values of correlation coefficient have mainly been obtained. At progenies *per se* the positive values are obtained between oil content and 100-kernel weight and kernel row number. At testcross populations, between oil content and kernel row number, at both testcross combinations, and between oil content and plant height, at the B73 testcrosses, they also obtained positive values. In our study, at 568/II NS testcrosses, the oil content was in positive correlation relationship will all studied traits, while at B73 testcrosses the positive values appeared between oil content, at one side, and ear height and lenght, at the other side. DUDLEY (2004) i DUDLEY AND LAMBERT (2004) summerising the results of Illinois experiment concluded that if increasing the kernel oil content the starch content is decreased. As the result of it we have the kernel weight decrease. Such a conclusion may be explaine by more selection cycles at Illinois program influencing the significant change of kernel structure. The srongest genetic correlation between other studied morphological traits, as testcross combination NSU_1 × 568/II NS, was found between plant and ear height. The strong correlative connection between these two traits were obtained by HALLAUER and MIRANDA (1988), HUSIĆ (1992), SCHINCKER AND LAMKEY (1993), BOĆANSKI (1995), DRINIĆ (1995), UHR AND GOODMAN (1995A, B), MAITA AND COORS (1996), GUZMAN AND LAMKEY (2000). At B73 terstcrosses the strongest correlative relationship was obtained between plant height and ear lenght, but it was negative. TYAGI ET AL. (1988) obtained the strong, but negative correlation between these two traits, at their research. Our results are also different to the results obtained by HUSIĆ (1992) and DRINIĆ (1995). In their researches they obtained low and medium strong, positive correlation between plant height and ear lenght.

Mutual action of genetic factors and environment ones to relationship of traits is noticed by phenotypic correlation coefficient. Presences of diference between phenotypic and genetic correlation show the modification in agreement height degree between the traits coused by enviromental factors (BEKAVAC, 1996).

In the first studied population (NSU_1 × 568/II NS) oil content was in positive correlative relationships with all studied traits (except the kernel row number). At the second population (NSU_1 × B73) negative correlation with all traits, except with ear height, has been obtained. The results of our research are partially in accordance with EL ROUBY AND PENNY (1967) researches. They obtained low, negative correlative relationships between oil content and plant height and 100-kernel weight, and low positive, phenotypic correlations between oil content and ear height and grain yield. MIŠEVIĆ ET AL. (1985) obtained negative, medium strong correlations between oil content and kernel weight, at two high oil maize populations. Our results are similar to these ones. At B73 testcrosses, we obtained negative correlation of these traits, but it was low, while at 568/II NS testcrosses relationship between oil content and kernel weight was low, but positive. LAMBERT et al. (1997) obtained the low negative correlation between oil content and kernel weight. The values of phenotypic correlation coefficient between the oil content and 100-kernel weight have been obtained at NSU_1 × B73, are similar to the above mentioned authors researches. At 568/II NS testcrosses, between these traits low correlations was also obtained, but negative, being contra to the researches of LAMBERT ET AL. (1997). Studying the genetic ponential of two testcross combination, MITTELMANN et al. (2003) obtained low correlative relationships between oil content and grain yield. Contra to this research, at first studied population (NSU_1 × 568/II NS) we obtained medium strong phenotypic correlation between these two traits. At the second studied population of testcrosses (NSU_1 × B73), low, but negative correlative relationship has been obtained.

For grain yield, the strongest phenotypic correlation coefficient, at both studied populations of testcrosses, has been obtained by ear lenght (r_p = 0.569, za NSU_1 × 568/II NS; r_p = 0.593, za NSU_1 × B73). HUSIĆ (1992) i DRINIĆ (1995) obtained the medium strong correlation between grain yield and ear lenght. Comparing phenotypic correlations between S_1 and two testcross combinations, WALTERS et al. (1991) have obtained the medium strong correlations between grain yield and ear lenght, only at one testcross combination (Mo17 testcrosses), while at S_1 population and the second testcross combination strong relationship, between these two traits has been obtained. TYAGI et al. (1988) i SUJIPRIHATI et al. (2003) have obtained strog relationship of these two traits in their researches. The strongest phenotypic correlation of the other studied traits, at 568/II NS testcrosses, has been obtained between plant and ear height (r_p = 0.713**), being in accordance with the results obtained by SCHNICKER and LAMKEY (1993), MAITA and COORS (1996), GUZMAN and LAMKEY (2000), ALI and SALEH (2003) and SUJIPRIHATI and SAR. (2003), but contra to NIGUSSIE AND SALEH (2005) results, who obtained, in their research, medium strong correlations between these two traits. At the second studied testcross population, the strongest relationship has been obtained between the plant height and kernel row number (r_p = 0.937**), being contra to a great number of researches. A great number of authors have obtained extremely low correlation between these two traits (HUSIĆ, 1992; ALI and SALEH, 2003), while some of the authors obtained the presents of negative correlation between the plant height and kernel row number (TYAGI et al., 1988; SUJIPRIHATI et al., 2003).

CONCLUSION

On the basic of results which we get in this paper, the conclusions are:

For most traits (except plant height and grain yield) we obtained highly significance differencies in mean values between two studied testcross populations. At testcross combination NSU_1 × 568/II NS greater mean values were obtained for ear height and lenght and 100-kernel weight, and in another testcross population for kernel row number and kernel oil content.

At 568/II NS testcrosses, oil content had the highest value of genotypic correlation coefficient with plant height, and at second studied testcross population with kernel row number, but that relationshiop was negative. Between other studied traits, in the first evaluated population (NSU_1 × 568/II NS), the strongest relationship was found between plant height and ear height, and in NSU_1 × B73 testcross combination between plant height and ear lenght.

In NSU_1 × 568/II NS testcross combination, oil content was in positive, phenotypic relationship with almost all studied traits. Only between oil content and kernel row number was found negative relationship. On the other hand, in B73 testcrosses, only between oil content and ear lenght was found positive, phenotypic correlation coefficient. Between other studied traits, in the first population which was evaluated, the strongest relationship was found between plant and ear height, and in testcross population NSU_1 × B73 between ear height and kernel row number.

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REFERENCES

ALEXANDER, D. E. (1988): High oil corn: Breeding and nutritional properties. 43th Annual Corn and Sorghum Research Conference, Dec. 8-9, 97-105.

ALI, E. S., G. B. SALEH (2003): Response of two cycles of phenotypic mass selection and heritability on two tropical sweet corn (*Zea mays* L. *saccharata*) populations. Asian J. Plant Sci., *2(1):*65-70.

BEKAVAC, G. (1996): Genetičke korelacije za prinos zrna i dužinu trajanja lisne površine sintetičkih populacija kukuruza (*Zea mays* L.). Doktorska disertacija, Poljoprivredni fakultet, Novi Sad.

BOĆANSKI, J. (1995): Genetička i fenotipska mađuzavisnost morfoloških osobina i žetvenog indeksa kod BSSS populacija kukuruza (*Zea mays* L.). Doktorska disertacija, Poljoprivredni fakultet, Novi Sad.

BOCANSKI, J., DJ. JOCKOVIC, M. STOJKOVIC, G. BEKAVAC, Z. PETROVIC, N. VASIC (1998): Fourteen cycles of recurrent selection for increased oil content in maize. Procceding on 2nd Balkan Symposium on Field Crop, 299-302.

COCHRAN, W. G., M. G. COX (1957): Experimental designs. John Wiley and Sons, Inc., New York, Chichester, Brisbane, Toronto, Singapore, pp. 611.

DRINIĆ, G. (1995): Genetička varijabilnost kvantitativnih svojstava u F_2 sintetičkoj populaciji kukuruza (*Zea mays* L.). Doktorska disertacija, Poljoprivredni fakultet, Novi Sad.

DUDLEY, J. W. (2004): Long-term selection for biochemical traits. In Encyclopedia of Plant and Crop Science, R. M. Goodman (ed.), Taylor & Francis Group, LLC.

DUDLEY, J. W., R. J. LAMBERT (2004): 100 generations of selection for oil and protein in corn. Plant Breed. Rev., *24*:79-110.

DUMANOVIĆ, J., V. TRIFUNOVIĆ (1964): Nasledni karakter variranja sadržaja ulja u zrnu kukuruza. Savremena poljoprivreda, *7-8*:521-533.

EL ROUBY, M. M., L. H. PENNY (1967): Variation and covariation in a high oil population of corn (*Zea mays* L.) and their implications in selection. Crop Sci., *7*:216-219.

GUZMAN, P. S., K. R. LAMKEY (2000): Effective population size and genetic variability in the BS11 maize population. Crop Sci., *40*:338-346.

HALLAUER, A. R., J. B. MIRANDA (1988): Quantitative genetics in maize breeding. Iowa State Univ. Press. Ames, IA, pp. 468.

HULL, F. G. (1945): Recurrent selection and specific combining ability in corn. J. Am. Soc. Agron., *37*:134-135.

HUSIĆ, I. (1992): Nasleđivanje komponenti prinosa i genetička dobit od selekcije na bazi S_1 i HS potomstva kukuruza. Doktorska disertacija, Poljoprivredni fakultet, Novi Sad.

LAMBERT, R. J., D. E. ALEXANDER, E. L. MOLLRING, B. WIGGENS (1997): Selection for increased oil concentration in maize kernels and associated changes in several kernel traits. Maydica, 42:39-43.

LAMKEY, K. R. (1992): Fifty years of recurrent selection in the Iowa Stiff Stalk Synthetic maize population. Maydica, 37:19-28.

LAUER, J. (1995): High-oil corn: Adventages and risks. Field Crops, *28*:31-33.

LAURIE, C.C., S.D. CHASALOW, J. R. LEDEAUX, R. MC CARROLLA, D. BUSH, B. HANGE, C. LAI, D. CLARK, T. R. ROCHEFORD, J. W. DUDLEY (2004): The genetic architecture of response to long-term artificial selection for oil concetration in the maize kernel. Genetics, *168*:2141-2155.

MAITA, R., J. G. COORS (1996): Twenty cycles of biparental mass selection for prolificacy in the open-polinated maize population Golden Glow. Crop Sci., *36*:1527-1532.

MIŠEVIĆ, D., D. E. ALEXANDER (1989): Twenty-four cycles of phenotipic recurrent selection for percent oil in maize: I. Per se and test-cross perfomance. Crop Sci., *29*:320-324.

MIŠEVIĆ, D., D. E. ALEXANDER, J. DUMANOVIĆ, S. RATKOVIĆ (1985): Recurrent selection for percent oil in corn. Genetika, *17*:97-106.

MITTELMANN, A., J. B. MIRANDA-FILHO, G. J. M. M. LIMA, C. HARA-KLEIN, R. T. TANAKA (2003): Potential of the ESA23B maize population for protein and oil content improvement. Sci. Agric., *60*:319-327.

NIGUSSIE, M., G. SALEH (2005): Response to recurrent selection methods in two sweet corn (*Zea mays* L. s*accharata*) population. Asian J. Plant Sci., *4(6)*:589-596.

SCHNICKER, B. J., K. R. LAMKEY (1993): Interpopulation genetic variance after reciprocal recurrent selection in BSSS and BSCB1 maize populations. Crop Sci., *33*:90-95.

SUJIPRIHATI, S., G. B. SALEH, E. S. ALI (2003): Heritability, perfomance and correlation studies on single cross hybrids of tropical maize. Asian J. Plant Sci., *2(1)*:51-57.

TYAGI, A. P., G. P. POKHARIYAL, O. M. ODONGO (1988): Correlation and path coefficient analysis for yield components and maturity traits in maize (*Zea mays* L.). Maydica, *33*:109-119.

UHR, D. V., M. M. GOODMAN (1995a): Temperate maize inbreds derived from tropical germplasm: I. Testcross yield trails. Crop Sci., *35*:779-784.

UHR, D. V., M. M. GOODMAN (1995b): Temperate maize inbreds derived from tropical germplasm: II. Inbred yield trails. Crop Sci., *35*:785-790.

WALTERS, S. P., W. A. RUSSELL, K. R. LAMKEY (1991): Comparisions of phenotypic correlations amongs S_1 lines, and their testcrosses, from four Iowa Stiff Stalk populations of maize. Maydica, *36*:39-44.

GENETIČKE I FENOTIPSKE KORELACIJE ZA UDEO ULJA U ZRNU I MORFOLOŠKA SVOJSTVA VISOKOULJANE POPULACIJE KUKURUZA NSU_1

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I z v o d

U ovom radu proučavane su korelativne veze između prinosa zrna i sadržaja ulja u zrnu, sa jedne strane i morfoloških osobina biljke i klipa, sa druge strane, u dve populacije test-ukrštenika. U populaciji $NSU_1 \times$ 568/II NS između sadržaja ulja u zrnu i ostalih proučavanih osobina dobijeni su pozitivni genetički korelacioni koeficijenti, a u drugoj proučavanoj populaciji ($NSU_1 \times$ B73), sadržaj ulja u zrnu je bio u pozitivnim vezama samo sa visinom i dužinom klipa, dok je između sadržaja ulja i visine biljke i broja redova zrna na klipu ustanovljena negativna korelativna veza. Između ostalih proučavanih osobina, u prvoj proučavanoj populaciji test-ukrštenika, najjače genetičke korelativne veze ustanovljene su između visine biljke i visine klipa, a u populaciji $NSU_1 \times$ B73 između visine biljke i dužine klipa. U populaciji $NSU_1 \times$ 568/II NS, sadržaj ulja u zrnu se nalazio u pozitivnim, fenotipskim korelativnim vezama, sa svim osobinama, izuzev sa brojem redova zrna na klipu, a u drugoj populaciji test-ukrštenika fenotipske korelacije između sadržaja ulja u zrnu i ostalih osobina, izuzev dužine klipa, bila su negativne. Najjača, pozitivna fenotipska međuzavisnot, između ostalih proučavanih osobina, u populaciji $NSU_1 \times$ 568/II NS ustanovljena je između visine biljke i visine klipa, a u populaciji $NSU_1 \times$ B73 između visine biljke i broja redova zrna na klipu.

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