Effectiveness of selection of parental components used for cross-breeding in winter wheat cultivation (*Tr.aestivum ssp. vulgare*) on the basis of the yield assessment of their offspring

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The aim of the study: The aim of the study was to analyze the impact of the genetic origin of 1966 varieties and winter wheat strains on grain yielding based on the results of field experiments located in 6 to 10 localities from 2004 to 2017.

Materials: The offspring of 1136 objects obtained as a result of single crosses (AxB) and 603 objects obtained as a result of compound crossbreeds (A * B) * C or (A*B)* (C*D) were studied. On this basis, an attempt was made to assess the effectivenes of the selection of parental components: mothers and fathers in obtaining high yield potential in the offspring.

TYPE OF CROSSES	FREQUNCIES	%	MEAN YIELD	MIN	MAX	CV (%)
SINGLE (A * B)	1150	65,3	99,64	64,00	138,00	15,32
COMPLEX (AxB)*C but (AxB)*(CxD).	638	603	96,83	57,00	134,20	15,38
TOTAL	1788	100	98,24	60,50	136,10	15,35

Method: Before the analysis, the yield of the objects was "corrected" by subtracting or adding from the crops of the tested varieties the deviation of the average yields of the reference varieties from the general average. Then, the normal distribution of both results was tested. For this purpose, a multivariate analysis of the ANOVA variance (according to the linear model) was performed, in which several factors affect one explanatory trait. In this analysis, interactions between factors are also allowed.

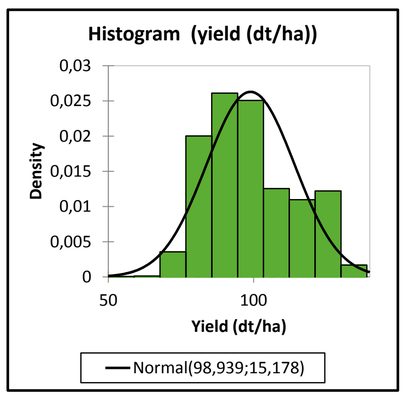
An example of a linear model of variance analysis with two factors and their interaction is as follows:

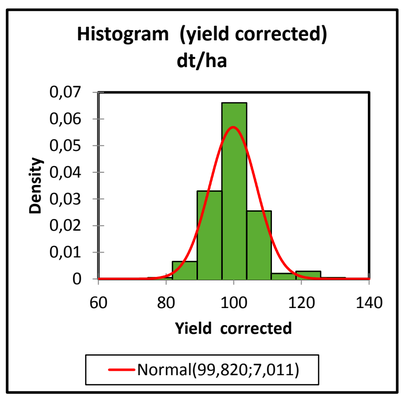
The analyzed independent factors explaining the yields were the year of research, mothers and fathers, on the other hand, the explanatory factor, that is the dependent height of the yield of the bred hybrid. Multivariate analysis of variance according to the linear variance analysis model was carried out using a procedure XLSTAT (2018).

$$x_{ijk} = \mu + \alpha_i + \beta_j + (\alpha\beta)_{ij} + \varepsilon_{ijk}$$

The results of scientific research.

A normal distribution of both the original and the "corrected yields" was found.



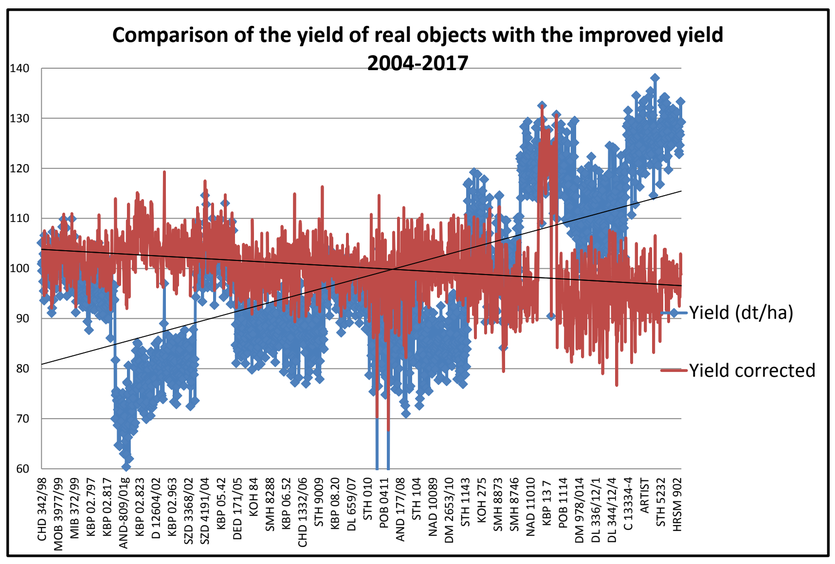


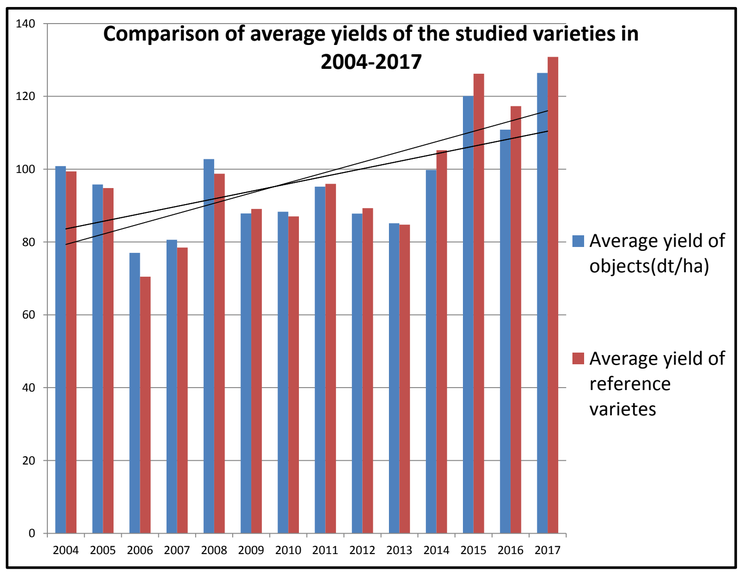
Descriptive statistics for the intervals (yield (dt/ha)):

Lower bound	Upper bound	Frequency	Relative frequency	Density (Data)	Density (Distribution)
50	58,9	1	0,001	0,000	0,004
58,9	67,8	2	0,001	0,000	0,016
67,8	76,7	55	0,032	0,004	0,051
76,7	85,6	310	0,178	0,020	0,118
85,6	94,5	404	0,232	0,026	0,195
94,5	103,4	388	0,223	0,025	0,231
103,4	112,3	194	0,112	0,013	0,195
112,3	121,2	170	0,098	0,011	0,118
121,2	130,1	189	0,109	0,012	0,051
130,1	139	26	0,015	0,002	0,016

Descriptive statistics for the intervals (yield corrected):

Lower bound	Upper bound	Frequency	Relative frequency	Density (Data)	Density (Distribution)
60	67,3	0	0,000	0,000	0,000
67,3	74,6	2	0,001	0,000	0,000
74,6	81,9	6	0,003	0,000	0,005
81,9	89,2	83	0,048	0,007	0,060
89,2	96,5	418	0,240	0,033	0,253
96,5	103,8	839	0,482	0,066	0,397
103,8	111,1	323	0,186	0,025	0,231
111,1	118,4	26	0,015	0,002	0,050
118,4	125,7	36	0,021	0,003	0,004
125,7	133	6	0,003	0,000	0,000





Analysis of variance (Yield corrected):

Source	DF	Sum of squares	Mean squares	F	Pr > F
Model	13	18185854,6	1398911,9	1679,9	**< 0,0001**
Error	1951	1624682,1	832,7		
Corrected Total	1964	19810536,7			

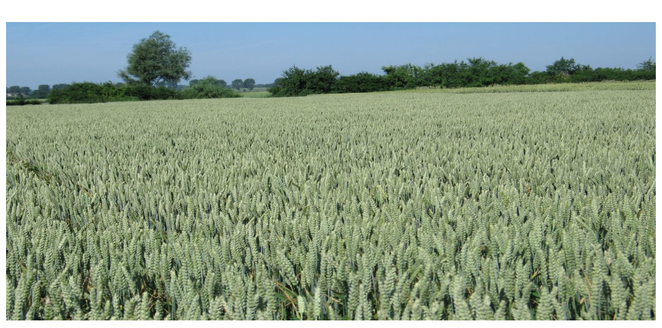
Computed against model Y=0

Type I Sum of Squares analysis (Yield corrected):

Source	DF	Sum of squares	Mean squares	F	Pr > F
YEARS	13	18185854,6	1398911,91	1679,9	**< 0,0001**

It was found that the most-used parental component was the winter wheat variety - Tonacja, both as a mother (32 times) and father (56 times). Her offspring with other varieties yielded high but not record high. The highest yield in the offspring was obtained using the Legenda - 114.9 dt/ha variant of winter wheat used in 10 combinations, and the most fertile father turned out to be the Zyta winter wheat variety - 119.4 dt/ha used in 8 cross-breeding combinations. However, both "the longest components" have not been crossed. The most valuable object of winter wheat in the analyzed material turned out to be the line: STH 5295/1 (119.4 dt/ha) bred in 2014 as a result of selection of plants obtained from the simple A*B cross-breeding combination ie. (MIB295 * ZYTA). The analysis of the ANOVA variance showed a significant effect of the years of research on the yield of the examined objects. There was no significant impact on the yield of selected winter wheat types of the type of crossings used (simple and complex ones).

VARIETY	YEARS	GENETIC ORiGIN	YIELD (dt/ha)	YIELD CORRECTED (dt/ha)
STH 5295/1	2004	MIB 295 * ZYTA	109,9	**119,4**
AND 4011/14	2017	Edgar * Tobak	**138,0**	107,6
AND 4009/14	2017	Edgar * Tobak	134,5	



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