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On the Possibility of Predicting Genotypic Correlations between Productivity Traits of Plants

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Abstract

For quantitative traits (components of plants productivity) the general traditional hypothesis about the mechanisms of genotypic correlations (GC) it is - linkage of genes or pleiotropy -- has been rejected by this paper -- and epigenetic (ecological-genetic) nature of GC has been experimentally proved.

Keywords: Shifts of values and signs of GC, epigenetic nature.

1. Introduction

In conventional hereditary qualities, the speculation of the components of genotypic relationships (GC) is by and large acknowledged – quality's linkage, or pleiotropy. This theory depends on the genocentric worldview of legacy, with its propose - "qualities straightforwardly decide the attributes of usefulness" (TP). Corresponding to GC of TP, this theory doesn't have severe confirmations, besides, it is invalidated by current realities of dependable fluctuation of qualities and even indications of coefficients GC (Rg) in various conditions.

What's more, this speculation is pointless for taking care of the reasonable issues of reproducing innovations – choices from isolate populaces (F2 and resulting ages) of hereditarily important remarkable plants which will profoundly expand yields later on, since the reproducer can't have the foggiest idea about the signs and upsides of Rg ahead of time and can't predict how other usefulness parts will change with in addition to determination for one of them.

From our Theory of Ecological-Genetic Organization of Quantitative Trait (TEGOQT) [1,2,3,4] something else entirely on the idea of the GC follows. It depends on the epigenetic (biological hereditary) worldview of legacy and advancement and contends that if, for instance, reproducing for

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expanded efficiency is done in an environment where the laying of the characteristic "number of grains on a plant" (NGP) - happens against the foundation of a dry spell (tillering stage), and quality "the mass of 1000 grains" (M1000G) - against the foundation of cold (aging stage), then, at that point, when crossing a dry season safe (DR) assortment with cold-safe (CR), a crossover F1 with expanded NGP will be acquired because of the DR frameworks of the mother assortment, and M1000G will increment because of the CR frameworks of the dad (**the fundamental finish of TEGOQT is the required difference in the spectra (sets) of quality's items under the attribute of usefulness when change the restricting variable of the climate**). The subsequent quality - "mass of grains from the plant" - is the result of the NGP for "mass of one grain", while the NGP of the crossover will surpass the NGP of the best parent (on the foundations of "dry spell - cold"), and on different foundations of the lime variables of the climate this won't occur. (4, P. 258). To check the legitimacy of this speculation, we broke down piece of the trial information from the DIAS (diallel crosses) - Cooperative Interdepartmental Program - "Hereditary qualities of Productivity Traits of Spring Wheat in Western Siberia," (the information bank is situated in Institute of Calculative Technologies of Siberian Branch RAS (Novosibirsk, Academgorodok) and contains around 5 million estimations of part attributes of usefulness of spring wheat, in 15 parental assortments and 210 mixtures F1 and 210 F2 made in 8 geological focuses - from the Ural to Transbaikalia and from Tyumen to Ust-Kamenogorsk) [5].

2. New Methods and Convergence Analysis

Of the aggregate sum of exploratory information from the DIAS program bank, a bunch of assortments was chosen for examination, which included DR, yet not CR genotypes (Saratovskaya 29; Kzyl-Bas; Grekum 114; Pyrotrix 28; Omskaya 9), as well as the other way around, CR however not DR (Diamant; Rang; Novosibirskaya 67; Milturum 553; Strela). In a bunch of these assortments, Rg between mean qualities (genotypic upsides) of NGP and M1000G were determined. These characters are essentially moved on schedule by the second they are start improvement in ontogenesis. From 8 geological places, three differentiating by elements of lim-elements of climate were chosen - Ust-Kamenogorsk, Tyumen and Tara.

In these geological focuses the accompanying elements of lim-factors in time of vegetation were noticed and Rg among NGP and M1000G were determined.

Ust-Kamenogorsk. The restricting component - soil dry spell - is held steady back from spring to fall. Our speculation hypothesizes that during the starting improvement of the NGP characteristic (in the tillering stage), DR genotypes will expand this quality, non-dry-safe genotypes will diminish. In pre-winter, when maturing of grains, similar DR frameworks will expand the characteristic M1000G in a DR gathering of assortments and decrease it in a gathering of non-dry assortments. Rg in a consistent dry spell among NGP and M1000G in the whole assortment set ought to be about + 1. Computations on test information showed: Rg = ± 0.25 + 0.10;

Tara. During the time of starting advancement of the NGP quality (tillering stage) - soil dry season, and during the maturing time frame (development of the M1000G character) - agreeable conditions. The quality of NGP as indicated by our speculation ought to recognize solid genotypic fluctuation because of differentiation contrasts in DR frameworks of various assortments in their full set, and the attribute of M1000G in agreeable conditions ought to have extremely low genotypic

changeability. From the point of view of our speculation, it was normal that Rg among NGP and M1000G would be near nothing. Computations on exploratory information showed: Rg = ± 0.25 + 0.10;

Tyumen. During the start of improvement of NGP, as far as possible is soil dry season, and during the aging of grain - lower temperatures. DR assortments should build NGP, non-dry - decrease it. Also against the foundation of cold (in maturing), DR assortments will lessen the characteristic M1000з, and cold-safe will build it. For this situation, our speculation expresses that a high bad Rg ought normal among NGP and M1000G. Computations showed as: Rg = -- 0.91 ± 0.03.

Table 1 properly shows the starting data for the Rg calculation. Each digit is the average value, i.e., the genotypic value of each trait. It is calculated for 80 plants (20 in each of the 4 random blocks (repetitions) in each of the three geographical points (NGP - in pieces, M1000G - in g).

All Student's **t**-criteria for these averages are greater than 5.

Table 1. Experimental data for calculation of Rg between "number of grains per plant" (NGP) and "mass of 1000 grains" (M1000G).

№	Name of points Varieties	Ust-Kamenogorsk		Tara		Tyumen	
		M1000G	NGP	NGP	M1000G	NGP	M1000G
	Drought-resistances						
1	Saratovskaya 29	39	79	85	44	74	30
2	Kzyl-Bas	41	81	81	42	79	34
3	Grekum 114	38	76	77	41	80	29
4	Omskaya 9	39	74	79	40	77	32
5	Pyrotrix 28	39	78	81	45	75	30
	Cold-resistances						
6	Diamant	30	65	65	45	64	45
7	Novosibirskaya 67	29	68	70	44	69	39
8	Rang	31	69	71	40	63	43
9	Strela	30	66	63	41	67	44
10	Milturum 553	28	63	64	42	62	41

3. Conclusions

It very well may be seen that GC (Rg) between the attributes of usefulness don't emerge because of linkage of qualities or pleiotropy, however are the consequence of changing arrangements of quality items under the characteristic of efficiency when the lim-element of the outside climate change.

Examination of the outcomes showed that three fundamental squares of data, specifically - 1) contrasts in the versatile properties of genotypes in the concentrated on set of assortments, 2) dynamic of changing the lim-variables of the climate by the periods of ontogenesis and 3) movements of signs and upsides of Rg - are still up in the air through one another. Assuming we know the versatile properties of assortments (for this it is to the point of knowing the states of geological points where every assortment was made), and the average elements of lim-factors in the review space of these assortments (prior to rearing), then, at that point, forecasts of the sign and worth of Rg are conceivable. Assuming the ordinary elements of lime factors in the reproducing zone and Rg are known, then, at that point, contrasts in versatile properties in the assortment set not really settled. Lastly, through information on the versatile properties of assortments and information on Rg, it is not difficult to decide the elements of lime factors by the periods of ontogenesis. Detection strict unambiguous connection between the three blocks of information and, of course, the possibility of predicting signs and values of Rg - open the prospects for building a strict quantitative theory of breeding in the breeding of self-pollinating plants for yields growth, and make it possible to predict - which productivity component, with plus selection for one of them, will parallel increase, or remain unchanged, or decrease [6.7].

Any breeding process for yield increasing it is necessary to begin from careful study of typical dynamics of lim-factors of environment in breeding zone through phases of ontogenesis.

Parental varieties it is necessary select according to resistance it’s different phases of ontogenesis to different lim-factors which “strike” on the different phases of development.

Understanding the possibilities and knowledge of algorithms for predicting the values and signs of Rg of productivity traits allowed us to designed for the Trans-Ural and Western Siberia a series of varieties unique in yield and quality - Tyumenskaya 29, Ikar, Irgina, Irene, Grenada, Gornouralskaya - already zoned and grown in huge territories and successfully providing food security for the largest geographical regions of the Russian Federation.

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