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Using isogenic analysis to study genotype effect in in vitro cell and tissue culture of wheat.

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Isogenic analysis using NILs that differ in alleles for only one gene is an exact tool, allowing the establishment of straight and pleiotropic effects of concrete genes for various characters. Using this method it is possible to search genes with a strong positive effect for interesting characters.

Isogenic analysis is seldom used to study morphogenetic processes in cell and tissue culture *in vitro*. Practical use of in vitro isogenic analysis is especially useful when the genes are known to have a precise phenotypic effect and economic value, such as genes for short stalk.

For a number of years, we have screened a set of NILs of soft and hard wheat that differ for the short stalk character in *in vitro* anther and somatic tissue culture.

We found that the *Rht*, *s1*, and *Q* genes in the soft wheat Saratovskaja 29 influence morphogenic anther and haploid formation and regeneration in *in vitro* anther culture, the formation of meristematic tissue in somatic calli, and regeneration ability during long-term callus cultivation.

We also compared the influence of the *Rht-B1b* gene on stages of *in vitro* anther and somatic tissues cultivation in three varieties of hard wheat. For all investigated genes, the greatest positive effect was on haploids in anther culture and morphogenesis in somatic calli in a line with the *Rht-B1c* gene. The *Q* gene increases the frequency of haploid formation and plant regenerants in anther culture.

A serious restriction in using isogenic analysis is the creation of the NILs. Nevertheless, studying the effects of genes will help answer the question of the genetic processes proceeding in vitro cell and tissue culture.

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Wheat plant growth in the presence of aluminum ions is an indication of tolerance to aluminum toxicity.

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Aluminum toxicity is one of the most important issues for poor soils. Wheat makes poor growth and productivity if Al ions are present in the soil. We have established that some wheats have a positive reaction Al ions. When the spring wheat cultivar Lada was grown in an aluminum solution (Ca (1 x 10^{-4} M) + Al (1 mg/l)), leaf length was greater than that of the control plants (Ca (1 x 10^{-4} M)) (Fig. 1). This result was unexpected. We later determined that the increase in yield in same variant in vegetation tests. However, not all wheat plants are capable of increased growth and yield in the presence Al ions.

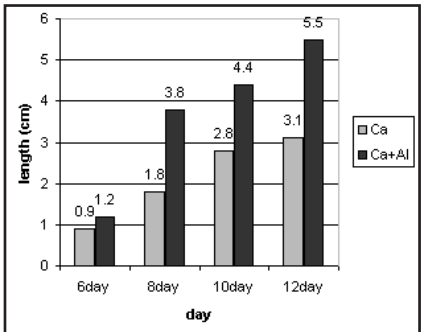

Fig. 1. Leaf length of the spring wheat cultivar Lada grown in an aluminum solution (Ca (1 x 10^{-4} M) + Al (1 mg/l)) and the control plants (Ca (1 x 10^{-4} M))

Materials and Methods. For vegetation tests, the spring wheat cultivars Voronegskaya, Yugo-vostochnaya 2, Kerba, and Omskaya 24 were grown in cells