documentation on the level of leaf, corolla, petal, boll and seed. Completion and processing of these video records is still in processing. In the second year we are planed to sow and evaluate another 121 new genotypes of flax. These genotypes were provided by AGRITEC Šumperk – Temenice Ltd.

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## EVALUATION OF SOME QUANTITATIVE TRAITS OF INTERGENERIC HYBRIDS TRITICUM AESTIVUM L. WITH TRITICUM SPELTA L. IN F1 GENERATION

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***Summary***

With aim to induce genetic variability of *Triticum aestivum* L. by intergeneric hybridization with *Triticum spelta* L. was realized complete dialel crossing of two cultivars of *T. aestivum* "Zdar", "Estica" with *T. spelta* cultivar "Renval". Biological material of parents and hybrids of F1 generation was cultivated in field conditions and analyzed for following quantitative traits: number of productive spikes per plant, length of main stem (mm), number of spikelets per spike, number of grains in main spike and weight of thousand grains (g). Hybrids were evaluated from aspect of real heterosis and hypothetical heterosis. Real effect of heterosis was find out in weight of grain in main spike (18,5 %) and hypothetical effect of heterosis (22,08%) in hybrid combination "Zdar" x "Renval". In weight of thousand grains was find out real heterosis in hybrid combination "Estica" x "Renval" (10,9%) and "Zdar" x "Renval" (6,98%). In both combinations was manifested hypothetical heterosis at the level of 16,76% and 18,88%.

***Keywords***: *Triticum aestivum* L., *Triticum spelta* L., intergeneric hybridization, quantitative traits, real heterosis, hypothetical heterosis

***Introduction***

*Triticum spelta* belongs to the oldest hexaploid forms of wheat. At present is considered relict species. In the history was very common its presence in stands of *Triticum aestivum*. Both species are hexaploid. Diversity of *Triticum spelta* in morphological traits is confirmed by 54 up to now known varieties. There are winter and spring forms with awned and awn-free thin spike. Spike spindle is brittle.

At present is *T. spelta* cultivated mostly in extensive conditions in higher, more rough areas of Austria, Switzerland, Germany, Belgium and in the north of Spain (Astoria region).
Archeological research in the Slovak territory revealed (Hajnalova 1999) at least 18 localities in western, eastern but mostly northern Slovakia from period since neolit till middle age (15 - 16 century). Discoveries of carbonated grains and other spike parts confirmed presence of *T. spelta* in Slovak territory for thousands years. Importance of *T. spelta* as cultivated cereal was not always the same. According archeological research it is supposed, that in the north of Slovakia, where it was the main crop its cultivation was estimated not longer than 700 years and less in other areas.
*T. spelta* due to its modesty, flexibility and good nutritional values is starting to be object of increased interest for direct economical utilization. It has many favorable medicinal properties, which are used in alternative medicine, treatment against allergy, high content of cholesterol, prevention to depression, cancer and rheumatic diseases.
*T. spelta* could be a usable genetic resource in breeding of *T. aestivum*. According other authors is known that some forms mostly wild and landraces contain in the grain 26% of rough protein. In breeding cultivars of *T. spelta* is content lower but significantly higher then in majority cultivars of *T. aestivum*.
Since the last decade were carried out field experiments at the Department of Agricultural systems at the Slovak Agricultural University in Nitra. Their aim was to evaluate possibilities for cultivation of *T. spelta* in specific field and climatic conditions in ecological system of production and to test group of cultivars according qualitative traits and mineral composition of grain (Lacko-Bartošová et al. 1997, Lacko-Bartošová et al. 1999). At the Department of Genetics and Plant breeding in Faculty of Agronomy at the Slovak Agricultural University in Nitra is with minimal financial support solved problem of genetic variability induction of *T. aestivum* by distant hybridization with *T. spelta* for present agroecological cultivation systems.

### *Material and methods*

There was carried out complete dialel crossing of two *T. aestivum* cultivars ("Zdar" and "Estica") and *T. spelta* ("Renval") with aim to induce genetic variability. The cross was made by traditional method in field conditions. Biological material of F1 generation and parental components were cultivated in field at experimental base in Center of biology and plant ecology Faculty of Agronomy in the Slovak Agricultural University in Nitra locality Dolna Malanta. Acquired biological material was analyzed for following traits: number of productive spikes per plant, length of main stem (mm), number of spikelets per spike, number of grains in main spike and weight of thousand grains (g). Analyzed biological material of parental components and their hybrids in F1 generation was evaluated from aspect of calculation:

a) Real heterosis expressed by overcame of F1 generation in percentage for evaluated traits in comparison to better parent.
b) Hypothetical heterosis expressed by overcame of value of F1 generation in percentage to average values of both parents (Petrovic, Bezo 1989).

### *Results and discussion*

Number of productive spikes per plant: In parental components is number of productive spikes per plant from 3 to 4 (“Zdar” and “Renval”) to 5 (“Estica”). The lowest number (2,5) of productive spikes were observed in hybrid combination “Zdar” x “Renval”. In this trait was not discovered real or hypothetical heterosis.
Length of main stem: The values varied in the range from 600 mm (“Estica”) to 1022 mm for *T. spelta* cultivar “Renval”. There was not observed hybrid combination with higher manifestation of trait then higher parent. The lowest was combination (“Estica” x “Estica”) 490 mm. The average values of this trait in hybrid combination were in most cases between values of parental components. There was not discovered real or hypothetical heterosis.
Length of main spike: Average length of main spike varied in studied material in range from 915 mm (“Estica”) to 153,5 mm (*T. spelta* “Renval”). There was not discovered real or hypothetical heterosis.
Number of spikelets per spike: In observed genotypes of parents and their hybrid combinations the highest number of spikelets per spike was find out in cultivar “Estica” (22,8) and the lowest in hybrid combination “Zdar” x “Renval” (18). There was not discovered real or hypothetical heterosis.
Number of grains in main spike: The highest number of grains per spike had cultivar “Estica” (71), the lowest *T. spelta* cultivar “Renval” (49,6). We did not find any combination with higher number of grains than had parents. On the other hand hybrid combination “Estica” x “Zdar” had the lowest number of grains (31). There was not found demonstration of heterosis.
Weight of grains in main spike: The highest weight of grains in main spike of parental components was observed in cultivar “Estica” (3g). The lowest in *T. spelta* “Renval” (2,32 g). In combination “Zdar” x “Renval” was discovered effect of real heterosis at level of 18,5 % and hypothetical heterosis at level 22,08 %.
Weight of thousand grains: In observed genotypes are values of this trait at the range from 39,29 g “Zdar” to 46,42 g *T. spelta* “Renval”. The real heterosis was find out in hybrid combination “Estica” x “Renval” at level of 10,9 % and “Zdar” x “Renval” 6,98 %. Counted hypothetical heterosis in this two hybrid combinations was 16,76 % and 15,88 %.
Extreme climatic conditions in experimental year 1999/2000, mostly spring 2000, significantly influenced values of investigated quantitative traits. In spite of extreme drought the highest weight of thousand grains was find out in *T. spelta*

"Renval". This finding corresponds with data of Vlasak (1995), Lacko-Bartošová, Antala (?...), Lacko-Bartošová et al. (1999). Cultivar "Renval" had in majority of hybrid combinations in F1 generation positive influence on values of experimental traits.

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## POSSIBILITIES OF SYNTHETIC AMPHIPLOID USE FOR ENLARGEMENT OF GENETIC DIVERSITY IN WHEAT

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***Summary***

The world-wide gene pool of common wheat is descended from a very small number of spontaneous interspecific hybrids, which originated as a result of two natural amphiploidisation events. In the more recent event, plant(s) of emmer wheat (*Triticum dicoccoides*), which were cultivated at the time by early Neolithic farmers, were fertilised by weedy diploid goatgrass (*Aegilops tauschii*), producing primitive common wheat. Because of the rarity of this event, today's common wheat (*T. aestivum*) has extremely low levels of polymorphism at enzyme, storage protein, and DNA marker loci, compared with its parent species, especially *Ae. tauschii*. In fact, the bulk of evolutionary evidence suggests that common wheat began its existence as a highly monomorphic species and that its genetic variation was reduced further by domestication. Despite its narrow genetic base, human-guided evolution has produced a profusion of distinct landraces over a period of 5 or more millennia, and modern breeding has maintained steady genetic improvement throughout the current century. Interspecific hybridisation has shown to be a useful tool in the breeding of cultivated species of *Triticeae* tribe. This technique has been mainly used for transferring some interesting characters, such as resistance to biotic and abiotic stresses and other traits of agronomic interest. We present an overall survey of amphiploids created with the utilisation of wheat genomes. Potential uses of synthetic amphiploids to introgress genetic material into *Triticeae* species and amphiploidisation to expand the wheat gene pool are discussed.

***Key words:*** amphiploid, synthetic, wheat, triticale, tritordeum, tritinaldia, agrotana, agrotricum, diversity, gene pool

Wild forms from regions of their natural occurrence are still an undervalued source of the genetic diversity, which will have to be incorporated into the present breeding programmes and used in agriculture. The increasing requirements for the performance of wheat varieties make the breeders use a limited range of approved parental forms (varieties) for hybridisation. The result is an increasing proportion of genetic similarities of the newly formed varieties, which has a negative impact on their longevity. In pure cultures, where the diversity of resistance genes is limited, we see a rapid selection of new virulent pathotypes of fungal diseases, which could soon overcome the resistance of their hosts. This is the reason why the search for new donors of resistance against biotic and abiotic stress factors, which would be potentially effective for a long time, is so urgent. The use of the so-called "non-host resistance", which occurs in some genetically distant wild species, has lately been frequently mentioned.
During the evolution of the *Triticeae* tribe, which includes *Triticum, Hordeum* and *Secale*, i.e. genera most frequently used in agriculture, spontaneous amphiploidy played an important role. Induced amphiploidy allows building up completely different genomes into the common organism. Table 1 presents a survey of amphiploidies.