AGRICULTURAL RESEARCH INSTITUTE FOR THE SOUTH-EAST REGIONS
Department of Genetics, Laboratory of Genetics and Cytology, 7 Toulaikov St., Saratov, 410010, Russian Federation.

One hundred years of breeding spring bread wheats in Saratov.

R.G. Sayfullin and G.A. Beketova and Yu.V. Lobachev and K.S. Magomedova (Saratov State Agrarian University Named After N.I. Vavilov, 1 Teatralnaya Sq., Saratov, Russian Federation).

Scientific selection at Saratov began on 1 March, 1910. During the long history of the spring bread wheat breeding laboratory, 52 cultivars were created and entered into the State Variety Testing Commission, 32 of which were released. Lutestsens 62, Sarrubra, Albidum 43, Saratovskaya 29 and others were created thanks to the joint efforts of a team-oriented staff consisting of laboratory specialists and talented scientists who headed the work, Drs. A.P. Shekhurdin (1911–51), V.N. Maмontova (1952–71), and L.G. Ilyina (1972–86). The first directors of the Saratov Agricultural Experimental Station, A.I. Stebut and academician G.K. Meyster, made great contributions in developing spring soft wheat selections.

Each new cultivar from the spring bread wheat breeding laboratory increases the yield capacity when compared with the standard cultivar, and the increase indicator does not decrease after one year of selection. For more than 50 years, the increasing yield rates in the red-grained wheat cultlivar group is about 12 kg/ha/year, compared with the white-grained cultivars where only recently has the level reached 10 kg/ha/year. Compared to Lutestsens 62, the yield capacity of Saratovskaya 74 and Saratovskaya 68 has increased up to 184% and 192%, respectively, almost double.

In 2010, the prospective new cultivar Saratovskaya 74 was given to the State Variety Testing Commission. Saratovskaya 74 is an albidum-type wheat, a typical Volga steppe ecological group representative. On average during the 4-year period (2006–09), considering fallow land production under grain yields of 2.43 t/ha, Saratovskaya 74 produced 0.95 t/ha more than Saratovskaya 55 (the standard cultivar). With a fore crop, winter wheat yielded 1.45 t/ha, producing 0.32 t/ha more. Saratovskaya 74 is medium ripening in the conditions of the Saratov region, ripening at the same time as Saratovskaya 55, 84–87 days. This new cultivar is practically resistant to red rust, loose smut, and has average resistance to mildew. Vunerability and damage by stem pests of Saratovskaya 74 is at the same as standard cultivar. Flour capacity corresponds to the standards required for the strong wheats, although for this trait Saratovskaya may have an advantage. Although both cultivars have equal of albumin and crude gluten content, Saratovskaya 74 greatly exceeds Saratovskaya 55 in volume bread output. Saratovskaya 74 is suggested for use in the Lower Volga area and the Ural region of the Russian Federation.

The evaluation of spring bread wheat cultivars, NILs, and promising introgression lines in the hard drought vegetation conditions of 2009.

S.N. Sibikeev, A.E. Druzhin, V.A. Krupnov, T.D. Golubeva, and T.V. Kalintseva.

A hard drought was observed in 2009 during the spring bread wheat vegetative period. In the initial vegetation stage, the crop was highly infested with frit flies (*Oscinella fri*t (L.) and *O. pusilla* (Mg.)). Further degeneration of plants after defeat by insects was accompanied by an increasing drought. Lack of precipitation was observed during the entire vegetative period. Evaluation of a set NILs with alien leaf rust-resistance genes and thier combinations and promising introgression lines with gentic material from *T. turgidum* subsps. *durum*, *dicoccum*, and *dicoccoides*, *Ae. speltoides*, *Ae. umbellulata*, *Th. elongatum*, and *Th. intermedium* were evaluated for drought resistance.

Material from *T. turgidum* subsps. *durum* (cultivar Saratovskaya zolotistaya), *dicoccum*, and *dicoccoides*, *Ae. speltoides* (T2D·2S), *Ae. umbellulata* (*Lr9* translocation), and *Th. intermedium* (6Agi(6D) in bread wheat background does not confer resistance, but genetic material from *T. turdigum* subsp. *durum* (cultivar Melyanopus 26), *Th. elongatum* (*Lr19* translocation), and the combinations *T. turdigum* subsp. *dicoccoides* + *T. turdigum* subsp. *durum* (cultivar Ludmila + Saratovskaya zolotistaya) and *Th. elongatum* + *S. cereale* (*Lr19*+*Lr26* translocations) increase resistance to drought. The combinations with translocations *Lr19*+*Lr24* (*Th. elongatum*) and *Lr19*+*Lr25* (*Th. elongatum* + *S. cereale*) significantly decreased resistance to drought. In these lines, except for the direct influence on drought resistance, the other significant influence were from the genes determining tolerance to frit flies and ensuring a fast regeneration of injured plants.

Agronomic performance of multilinear mixes on the basis of spring bread wheat cultivar Dobrynya in 2009.

S.N. Sibikeev, A.E. Druzhin, and I.N. Cherneva.

Previously, we reported on studying multilinear mixes of the spring bread wheat cultivar Dobrynya in the vegetative conditions of 2008, chacterized by moderate precipitations and a moderate leaf rust epidemic (Ann Wheat Newslet 55:174-175). The vegetative period in 2009 was characterized by a hard drought. We were interested in determining the reaction of the multilinear mixes to this very important abiotic stress.

The investigated mixes included four components: Dobrynya, Dobrynya *Lr19+Lr9*, Dobrynya *Lr19+Lr24*, Dobrynyfa *Lr19+Lr25*. All components were tested in equal parts. We also used mixes from the first (prepared in 2009), second (after cultivation in 2008), and third (after cultivation in 2007 and 2008) years. The control mix used all lines and the cultivar Dobrynya. We estimated heading date, plant height, 1,000-kernel weight, grain productivity, grain protein content, gluten content, gluten strength, and SDS evaluation.

For heading date, the multilinear mixes did not differ from components or the cultivar Dobrynya. For plant height, the components did not significantly differ among themselves, except for Dobrynya *Lr19+*, which had a smaller plant height. Multilinear mixes did not significantly differ for plant height from the components average. For 1,000-kernel weight, significant differences were not observed, but among the component lines, Dobrynya *Lr19+Lr24* had the highest. For grain productivity, the mixes did not differ significantly from the component average although the increase in grain productivity of mixes in the third year was 18%. In the second year, mixes had lower grain productivity. For grain protein content, gluten content, gluten strength, and SDS evaluation, the mixes did not significantly differ from the component average. However, among the component lines and mixes, the cultivar Dobrynya had the highest values for all estimated agronomical traits.

Resistance of wheat–Thinopyrum elongatum substitution line L3065 (3Age/3D) to a complex of fungal diseases.

A.E. Druzhin, S.N. Sibikeev, E.D. Badaeva (Institute of General Genetics Gubkina St. 3, Moscow), S.A. Voronina, V.A. Krupnov, T.D. Golubeva, and T.V. Kalintseva.

Thinopyrum elongatum is the donor of many genes for resistance to pathogens and pests, including leaf rust-resistance genes *Lr19*, *Lr24*, and *Lr29*; stem rust-resistance genes *Sr24*, *Sr25*, *Sr26*, and *Sr43*; and *Cmc2*, resistance to the mite *Aceria tosic hilla* (Acari: Eriophyidae). We studied the spring bread wheat line L3065 (Saratovskaya 55/*Th. elongatum* *3/Saratovskaya 29) for resistance to leaf rust, powdery mildew, stem rust, loose smut, and common bunt. Studies have shown that this line is susceptible to leaf rust, powdery mildew, and stem rust similar to the recipient cultivars Saratovskaya 55 and Saratovskaya 29, but is affected significantly less by loose smut and common bunt (Table 1). The line also has race-specific resistance to races of loose smut. The C-banding pattern of this lines showed *Th. elongatum* substitutions with chromosomes 3Age (3D), indicating that chromosome 3Age carries the gene(s) for resistance to loose smut and common bunt.

Table 1. The infection type of spring bread wheat lines and cultivars to leaf rust, powdery mildew, loose smut, and common bunt averaged over 6 years on cultivars and lines to race T18, F*=12.6

Cultivar, line	Leaf rust	Powdery mildew	Stem rust	Race pathotypes					
				Loose smut				Common bunt	
				T18*	I-505	I-164	I-C36	894	Tul5
L3065	3	2	3	21.38 a	8.8	26.3	24.0	0.0	0.0
Saratovskaya 55	3	3	3	66.85 c	63.2	62.5	65.5	25.0	8.6
Saratovskaya 29	3	3	3	52.22 b	36.8	22.7	52.9	38.6	24.5

Laboratory of Cell Breeding, Department of Biotechnology.

Haploid plants production in triticale-wheat hybrids.

O.V. Khomyakova, V.N. Anikina, T.I. Dyatchouk, S.V. Stolyarova, Yu.V. Italianskaya, N.F. Safronova, and L.P. Medvedeva.

Triticale–wheat hybrids developed using modern local wheat and rye cultivar are a valuable, initial breeding stock with introgressions of D-genome genetic material. Plants in the F_3–F_4 of two selfed hybrids were used for haploid plant production using anther culture. An induction medium with sucrose, maltose, and 2 mg/L 2,4-D was used to obtain haploid embryo-like structures. Responding anthers were transferred for callus development on a regeneration medium with 2% sucrose and 1 mg/L IAA. The number of green and albino plants was counted after about 30 days depending on plant development. Well-rooted regenerants were subjected to colchicine treatment.

Our results did not confirm the role of a cold pretreatment of the donor spikes prior to culturing as a trigger for sporophytic microspore development. Altogether, 128 viable green plants and 104 androgenetic albino plants were obtained from 527 embryo-like structures. The frequency of embryogenic anthers (the number of embryogenic anthers/100 anthers) was 8.9–10.5%. The rate of embryo-like structures (the number of embryo-like structures/100 anthers) was 15.5–15.7%. Molecular techniques for DNA, storage protein analysis, and FISH will be used to identify alien chromosome insertions or substitutions in the callus. The DH lines will be multiplied and investigated for resistance to biotic and abiotic stresses.

INSTITUTE OF BIOCHEMISTRY AND PHYSIOLOGY OF PLANTS AND MICROORGANISMS, RUSSIAN ACADEMY OF SCIENCES
13 ENTUSIASTOV AVE., SARATOV 410049, RUSSIAN FEDERATION.

Physiological–morphological changes in wheat seedlings inoculated with Azospirillum bacteria.

N.V. Evseeva, L.Yu. Matora, G.L. Burygin, and S.Yu. Shchyogolev.

The physiological–biochemical bases for the functioning of plant–microbial symbioses is a topical problem in current agrobiology. With the known positive effects of interaction between the macro- and micropartners in symbioses, little attention has been paid to the functioning of root apical meristems, which serve as the formative and regulatory centers in the plant host (Ivanov 2004) and are a major site for the localization of associated bacteria (Bashan and Levanony 1989). We have investigated the mitotic activity of root meristem cells and the morphological parameters of wheat (cv. Saratovskaya 29) seedlings after root inoculation with the associative bacteria *Azospirillum brasilense* Sp7 and Sp245.

Etiolated, 3-day-old wheat seedlings were inoculated for 24 h in suspensions of *A. brasilense* Sp7 and Sp245 and the enterobacterium *Escherichia coli* K12 (cell density, 108 cells/ml). Other seedlings were treated with *A. brasilense* Sp245 prefixed with 2% glutaraldehyde. After inoculation, the seedlings were placed in water. The control was uninoculated plants grown in hydroponic culture. Samples were taken 2 days after inoculation. The functional activity of the root meristem cells was assessed by using two parameters: (1) determining the cell mitotic index and (2) comparative estimates of the content of the proliferative antigen of initials (PAI), a molecular marker for wheat meristem cells (Evseeva et al. 2002). To determine the mitotic index, root apex meristems were fixed in acetic acid–ethanol (1:3), stained with acetohematoxylin, macerated with cytase enzyme, and visualized at 400× magnification. PAI was revealed by enzyme immunoassay by using rabbit monospecific anti-PAI antibodies.

Inoculating wheat seedlings with live *Azospirillum* cells led to an approximately 2-fold increase in the mitotic activity of the root meristem cells and to an almost 1.5-fold increase in the PAI content in these cells. The effect of strain Sp245 did not differ essentially from that of strain Sp7. Shoot length increased by 30–40% and root length increased by 20–30%. The treatment of the seedlings with glutaraldehyde-fixed *A. brasilense* Sp245 did not substantially change the values for mitotic index of the root meristem cells, PAI content, or the morphological parameters. Our data agree with