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ITEMS FROM THE RUSSIAN FEDERATION

AGRICULTURAL RESEARCH INSTITUTE OF THE CENTRAL REGION OF NON-CHENOZEM ZONE
143026, Moscow region, Nemchinovka, Kalinina 1, Russian Federation.

Soft wheat hybrids showing no segregation for resistance to leaf rust.

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The soft winter wheat cultivar Nemchinovskaya 24 has demonstrated absolute resistance to leaf rust since the time of its releaset 20 years ago. In order to understand the genetic basis of the resistance, we crossed Nemchinovskaya 24 with tester lines of spring wheat with genes *Lr9*, *Lr24*, *Lr24 + Sr24*, *Lr27 + Lr31*, *Lr28*, *Lr29*, *Lr38*, and *LrTr*). The susceptible soft spring wheat Khakasskaya was used as a check.

The F_1 hybrids and their parental lines were not susceptible to leaf rust and that the resistance genes of their parental lines appeared to be dominant. The F_2 hybrid progeny of the cross 'Nemchinovskaya 24 / Khakasskaya' segregated according to a trihybrid pattern, 43 resistant plants : 21 susceptible plants (Table 1).

Table 1. Segregation patterns in the F_2 hybrids of crosses with Nemchinovskaya 24 (N24) and lines carrying *Lr* genes for resistance to leaf rust. Critical $\chi^2 = 3.84$.

Cross	Number of resistant plants	Number of susceptible plants	Ratio of resistant to susceptible plants		χ^2
			Observed	Expected	
N24 / Khakasskaya	120	64	42 : 22	43 : 21	0.324
N24 / *Lr9*	127	0	—	—	—
Lr24 / N24	80	6	13.3 : 1	15 : 1	0.078
N24 / *Lr24+Sr24*	157	0	—	—	—
Lr27+Lr31 / N24	122	7	17.4 : 1	15 : 1	0.149
Lr28 / N24	138	9	15.3 : 1	15 : 1	0.004
Lr29 / N24	61	4	15.3 : 1	15 : 1	0.001
N24 / *Lr38*	171	**0**	—	—	—
N24 / *LrTr*	181	**0**	—	—	—

We found the action of one main and two complementary inhibiting genes. F_2 hybrids between stocks with *Lr24, Lr27 + Lr31, Lr28,* and *Lr29* with Nemchinovskaya 24 segregated according to a dihybrid pattern (15 resistant: 1 susceptible). The F_2 progenies from lines with *Lr9*, *Lr24 + Sr24*, *Lr38*, and *LrTr* are interesting because no plants were susceptible to leaf rust. All the plants are

resistant. The experimental evidence indicates that the resistance genes of the parental forms are located on homologous chromosomes, but we have not identified them or determined their allelism. The question that remains unanswered is why the F_2 hybrid population of '*Lr24* / Nemchinovskaya 24' segregated for resistance to leaf rust, whereas the cross 'Nemchinovskaya 24 / *Lr24* + *Sr24*' produced no susceptible plants in the F_2.

Septoria sp. fungi affect all wheats to one extent or another. No fully disease-resistant wheat is known in the world collection. Plants with relative resistance are sensitive to the pathogen at later developmental stages. One example is the Bulgarian winter wheat PI476772 from the Moscow International Science and Technology Center's collection. The line also is resistant to leaf rust and highly resistant to mildew. Hybrid progenies from crossing this line with Nemchinovskaya 24 also are resistant to leaf rust (% infection in both F_1 and F_2 = 0), and *Septoria* develops late on them. According to preliminary data obtained by our laboratory, this Bulgarian wheat has the genotype *Lr10*, *Lr26*, and *Lr46*.

Nemchinovskaya 24 soft winter wheat is resistant to leaf rust. It will be necessary to identify the resistance genes. Using hybrid populations, which are not susceptible to leaf rust and not segregating for resistance, in soft wheat selection for resistance to leaf rust can be effective.

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The evaluation of spring bread wheat cultivars, NILs, and promising lines to leaf, stem, and stripe rusts in 2008.

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In 2008, during the vegetative period of spring bread wheat, leaf, stem, and stripe rusts epidemics were observed and evaluated. The severities of these diseases were different. Leaf rust was estimated as moderate. Atem and stripe rusts were observed as weak. Evaluation of a set NILs carrying *Lr* genes show that the severity of the leaf rust epidemic on susceptible cultivars was 50–55%. Highly resistant lines (IT = 0;1) had the genes *Lr9*, *Lr28*, and *Lr29* and gene combinations *Lr9+Lr19, Lr19+Lr24, Lr19+Lr25, and Lr19+Lr26*. Interestingly, genes *Lr28* and *Lr29* showed an IT = 0;1, but several years ago (2000) these genes had an IT = 3. Hence, within eight years sharp changes in the set of pathotypes has taken place, enablling *Lr28* and *Lr29* to be highly effective.

The evaluation of promising spring bread wheat lines to stem and stripe rusts was made in the southwest part of the Saratov region. An IT = 0 in the NILs and promising lines had the following combinations of *Sr* genes: *Sr24+Sr25* and *Sr25+Sr31*. The majority of spring bread wheat sowings in this zone include the cultivars L503, L505, Belyanka and Dobrynya. The cultivars L503, L505, and Dobrynya had ITs = 0; Belyanka had an IT of 3. Resistance to stripe rust in the L503, L50,5 and Dobrynya controlled by an unindentified *Yr* gene(s). This *Yr* gene(s) was transmited from the above-mentioned cultivars into the promising lines.

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

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The perceived advantages of mixtures over their components in monoculture include larger yields, more stable performance, and improved and more durable resistance to diseases. In 2008, we investigated multilinear mixes on the basis of cultivar Dobrynya. These mixes include four components: Dobrynya, Dobrynya *Lr19+Lr9*, Dobrynya *Lr19+Lr24*, Dobrynya *Lr19+Lr25*, and all components in equal parts. We also used mixtures of the first (prepared in 2008) and second years (after cultivation in 2007). The control used all lines and Dobrynya. We looked at the agronomical traits heading date, plant height, resistance to lodging, 1,000-kernel weight, and grain productivity. For heading date, the