

## The Problem of Realizing the Potential of Wheat Biological Productivity under the Conditions of the Altai Region

L.V. Sokolova<sup>1</sup>, V.I. Belyaev<sup>2</sup>, V.N. Chernyshkov<sup>2</sup>

<sup>1</sup>Altai State University, pr. Lenina 61, Barnaul, 656049, Russia.

<sup>2</sup>Altai State Agricultural University, pr. Krasnoarmeyskiy 98, Barnaul, 656049, Russia.

E-mail: [sokolova-gg@mail.ru](mailto:sokolova-gg@mail.ru)

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The article is about the comparison the potential and real yields of spring and winter wheat under the conditions of the Altai Region. There is the huge gap between the potential biological productivity of wheat and the actual yield in this territory. It is necessary to create optimal conditions for the period of wheat growing season in order to full realize the genetic potential of biological productivity and to obtain the maximum possible yield.

**Keywords:** Wheat; potential productivity; yield; agriculture; Altai Region

The recent global climate change leads to changes in the productivity of plant communities, including changes in crop yields (Illiger et al., 2014; Bischoff et al., 2016). Wheat is the most valuable food grain in the world. According to FAOSTAT, in 2016, the area occupied by wheat in the world was 220.1 million hectares, 27.3 million hectares of which were located in Russia. The grain of spring wheat contains the most important elements of human nutrition. The amount of protein in the grain of wheat, depending on the variety and growing conditions, ranges from 12-16%. Wheat bread is distinguished by its high taste and excellent digestibility compared to bread obtained from the flour of all other cereals (Korenev, 1983). Altai Region is the largest cultivated area for wheat in Siberia. The areas occupied by wheat are more than 2 Mha, sown area – 5,5 Mha, arable lands - 6,5 Mha, total area – 16,7 Mha (Monitoring, 2016). Modern technologies of wheat cultivation allow obtaining high yields of grain, involve the use of intensive varieties and high levels of mineral nutrition. Of particular importance should be given to the optimization of plant growth and development factors, as well as to the phytosanitary condition of crops (Proskuryakova, 2003). The potential productivity of spring wheat reaches 5.0 t/ha, winter wheat - 7.0 t/ha under the conditions of the Altai Region (Grain crops, 2018). Thus, the potential biological productivity of wheat is at a fairly high level, but the full use of the genetic potential of varieties does not occur. (Belyaev&Volnov, 2010; Korobeynikov et al., 2010). The purpose of this work is to compare the potential and real yields of wheat under the conditions of the Altai Region.

### Material and methods

The study bases on the Rosstat statistical data, as well as the data of meteorological stations of the Altai Region for the period 2007-2011.

### Results and discussion

The wheat yield, the amount of precipitation and the average temperature of the growing season by year are summarized in Table 1.

**Table 1.** The wheat yield, the amount of precipitation and the average temperature of the growing season

	2007	2008	2009	2010	2011	average
Spring wheat yield, t/ha	1.32	1.13	1.51	1.28	1.09	1.27
Winter wheat yield, t/ha	2.20	1.90	2.33	1.37	2.08	1.98
Amount of precipitation of the growing season, mm	258	158	239	159	157	194
Average temperature of the growing season	17.2	18.1	17.4	16.2	17.1	17.2

Analysis of the results showed that the yield of spring wheat was maximum in 2007 and minimum in 2011. The average value was at the level of 1.27 t/ha. The yield of winter wheat was higher, the maximum was obtained in 2009, the minimum - in 2010. The average value was 1.98 t/ha, i.e. 0.71 t/ha higher than spring wheat yield. In this way, we can see the huge gap

between the potential biological productivity of wheat and the actual yield. Annual losses from this discrepancy amount to 3.5-3.9 t/ha for spring wheat, 4.7-5.6 t/ha for winter wheat under the conditions of the Altai Region.

The soil moisture and the soil nutrition conditions are the two main reasons determining the full realization of the genetic potential of wheat varieties in case of strict following the zonal cultivation technology. There is the dependence between the amount of precipitation and the average temperature of the growing season and the wheat yield. Formation of wheat yield in 2007-2011 in the Altai Region occurred against the background of various meteorological conditions. Fluctuations in the weather led to a high variability of yield over these years.

The amount of precipitation of the growing season was low in three out of five years of research. In 2008, 2010, 2011 it was almost equal (157-159 mm) and in these years the lowest wheat yield was obtained. In 2007, 2009 the amount of precipitation of the growing season was almost twice higher and it raised the wheat productivity up to 1.51 t/ha in case of spring wheat and to 2.33 t/ha for winter wheat.

The average temperatures of the growing season in 2007, 2009, 2011 were almost at the same level. In 2008 the minimum precipitation coincided with the maximum temperature, in 2010 the low amount of precipitation was together with the lowest average temperatures. It was this year that the lowest yield of winter wheat was obtained, exceeding this indicator in spring wheat by only 7%.

## Conclusion

It is necessary to create optimal conditions for the period of wheat growing season in order to full realize the genetic potential of biological productivity and to obtain the maximum possible yield. The territory of the Altai Region has great potential for this.

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