

FEATURES OF REALIZATION THE PRODUCTIVITY POTENTIAL OF WINTER AND SPRING WHEAT VARIETIES IN NORTHERN STEPPE OF UKRAINE

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Наведено результати аналізу наявності сортових ресурсів і врожайності зерна різних сортів пшениці озимої та ярої у дослідях з екологічного випробування залежно від мінливих гідротермічних умов. Виділено сорти, що характеризуються стабільною реалізацією генетичного потенціалу в широких межах варіювання середньодобових температур повітря і умов вологозабезпечення.

Ключові слова: *пшениця озима та яра, сорт, клімат, зерно, урожайність.*

In Ukraine every year created and registered a lot of varieties and hybrids of agricultural crops, which can fully provide the production by food and feed grain and raw materials for industry. Modern varieties can generate high crop yields and with adherence of growing technology, the average crop yields of spring small cereals in Ukraine could reach 4,0–6,0 t/ha, as it is in European countries. A characteristic feature the grain production of spring cereals: barley, oat, wheat and triticale in Ukraine have always been varying the levels of crop yields and gross grain yields due to instability of growing conditions [1, 2].

Therefore, the focus of breeding and technological programs for spring small cereals has always prevailed tasks aimed at increasing and stabilizing crop yields. Particularly, in conditions of economic instability the variety value as a factor to increase production efficiency is quite high. Introduction of the newest varieties, which, along with high yield and grain quality, characterized by rational use of nutrients, as well as increased resistance to stressful environmental conditions, makes it possible to significantly reduce the production costs of labor and resources at growing crops and increase the sustainability of grain production. Growing highly well-adapted varieties is one of the cheapest ways to meet the challenges of saving as well as provides an opportunity to increase crop yield and improve its quality with little additional cost. Important in such event an environmental crop variety testing of spring small cereals, which are made annually by institutions and organizations of different ownership forms [3, 4].

The aim of our research was to study the effect of environmental factors on degree of implementation the genetic potential productivity of different varieties of winter and spring wheat from leading national breeding centers (Plant Production Institute nd. a. V. Ya. Yuriev of NAAS, Plant Breeding and Genetics Institute – National center of seed and cultivar investigation, Institute of Plant Physiology and Genetics, Myronivka Institute of Wheat nd. a. V. M. Remeslo and others).

The study was conducted at the Erastivka Experimental Station of the Institute of Agriculture of Steppe zone of NAAS during 2011–2013, according to generally known methods [5, 6]. Soil of experimental field – ordinary chernozem, low-humic, loamy. The humus content in arable soil layer (0–30 cm) – 4,0–4,5 %, total nitrogen – 0,23–0,26 %, phosphorus – 0,11–0,16 %, potassium – 2,0–2,5 %, pH of water extract – 6,5–7,0.

Field experiments were laid in six-field crop rotation. Field experiments were laid after predecessor fellow. Seeding rate of wheat was 4,5, million of grains/ha. In experiments seeded varieties of winter and spring wheat of various breeding centers. Soil preparation, sowing, care of crops and harvesting were carried out according to the zonal recommendations. Variants in a field experiment designed systematically, with three replications. Accounting plots area – 50 m².

Arid conditions of Ukraine's Steppe zone is quite complex. Two-thirds of land in Ukraine, according to the FAO, referred to zone of risky agriculture, but even here you can use 30–50 % and more of varieties capacity, in consideration of importance the local gene pool in creating highly adapted varieties based on local varieties, that are resistant to dry conditions.

Weather conditions during the investigation were different, which made it possible to fully assess its impact on grain productivity potential of spring small cereals.

The adaptive potential of spring cereals varieties as their ability to survive and generate through the constant improvement of adaptation to abiotic and biotic environmental factors was

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determined on base the relative properties of biological characteristics and agronomic attributes, that are listed in the State Register of plant varieties suitable for dissemination in Ukraine. Varieties choice of spring small cereals wide enough and updated every year by a significant number of promising new products.

Ukraine's agro-climatic resources and of Steppe zone in particular, are generally favorable for growing winter and spring wheat, although quite volatile during the growing season. Uneven and sometimes abnormal expression of climatic factors, such as air temperature and precipitations, often (2007, 2010, 2012) has a negative impact on growth, development and productivity of crops.

The wheat variety choice is wide enough and updated every year a large number of promising new ones (Fig. 1).

Graphic representation clearly indicates a steady annual increase in the number of registered varieties of soft winter wheat by 32,7 % and durum – 18,1 %. In general, over the past 15 years, the number of winter wheat in the Register increased by 4,7 times. Thus, if in 2000 in the State Register of plant varieties suitable for dissemination in Ukraine there were 79 varieties of winter wheat (64 – of soft wheat and 7 – durum wheat) in 2005 it were 112 (respectively 102 and 10), in 2010 – 205 (respectively 192 and 13) in 2015 to the register were included 333 varieties of winter wheat (314 – of soft wheat and 19 – durum wheat).

Regarding the spring wheat, it is should be noted that the positive trend in the selection and registration of varieties was observed only till 2010. Over the last 5 years marked a slight decline in the number of registered varieties, obviously due to the gradual loss of interest in grain manufacturers in growing this crop, and respectively – and a decrease in demand for seeds.

So with certainty it is arguable that in Ukraine created a lot of winter and spring wheat varieties, which can fully meet the needs of the state by food and feed grain and the processing industry – by raw materials. Modern varieties are able to form a good crop yields, and in strict compliance with growing technology the average grain yield of winter wheat in Ukraine may reach 8,0–10,0 t/ha and spring – 4,0–6,0 t/ha as it is in European countries. A characteristic feature of production the grain of winter and spring wheat in Ukraine has always been varying crop yields of grain due to instability of growing conditions. Therefore, the focus of selection and technological programs on wheat culture always prevailed objectives aimed at increasing and stabilizing crop yields. Important value has demonstration plots of wheat, which carried out annually.

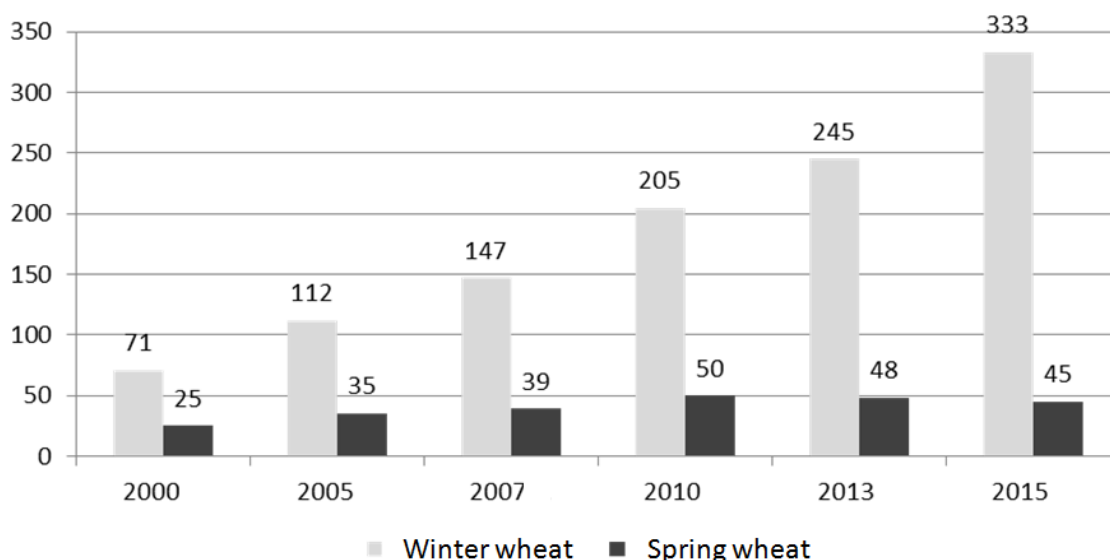


Fig. 1. Number of winter and spring wheat varieties, entered to the State Register (2000–2015).

To study the combined effects of environmental factors and to identify the best varieties listed in the Register, we over 4 years carried out the environmental testing of 51 varieties of winter wheat of leading breeding centers (Fig. 2).

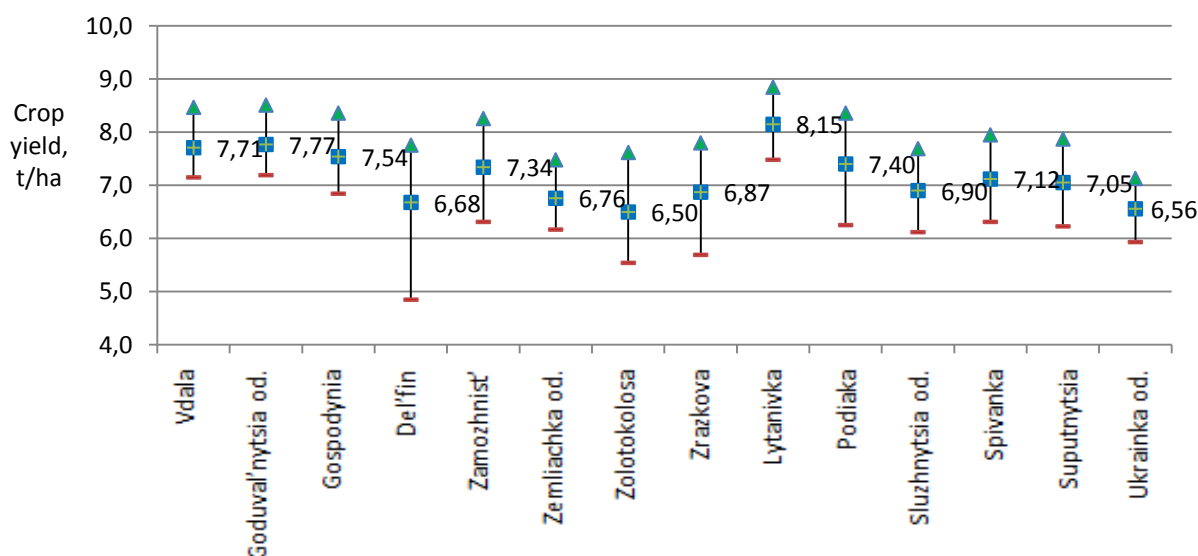


Fig. 2. Range of variation the grain yield of winter wheat varieties, t/ha (average for 2007–2010).

In average years of research the highest level of grain productivity provided winter wheat varieties Vdala, Goduval'nytsia odes'ka, Gospodynia, Del'fin, Zamozhnist', Zemliachka odes'ka, Zolotokolosa, Zrazkova, Lytanivka, Podiaka, Sluzhnytsia odes'ka, Spivanka, Suputnytsia and Ukrainka odes'ka – the crop yield is 6,50–8,15 t/ha.

As illustrated by the figure, among the most productive varieties should be highlighted the soft winter wheat, which show minimal variation of crop yields for years – Vdala, Goduval'nytsia odes'ka, Gospodynia, Lytanivka that is characterized by stable expression of this trait. Reasonably high level of grain yield also provided by a variety of durum winter wheat Delfin (6,68 t/ha). Even extremely dry conditions during the spring and summer growing season in 2007 did not lead to a significant reduction in grain yield of this variety (4,85 t/ha).

Thus, the crop yield of winter wheat varied considerably depending on weather conditions and varietal characteristics of culture.

To study the combined effects of environmental factors we are for 2011–2015 also conducted environmental tests of 8 varieties of spring wheat of leading breeding centers (Fig. 3).

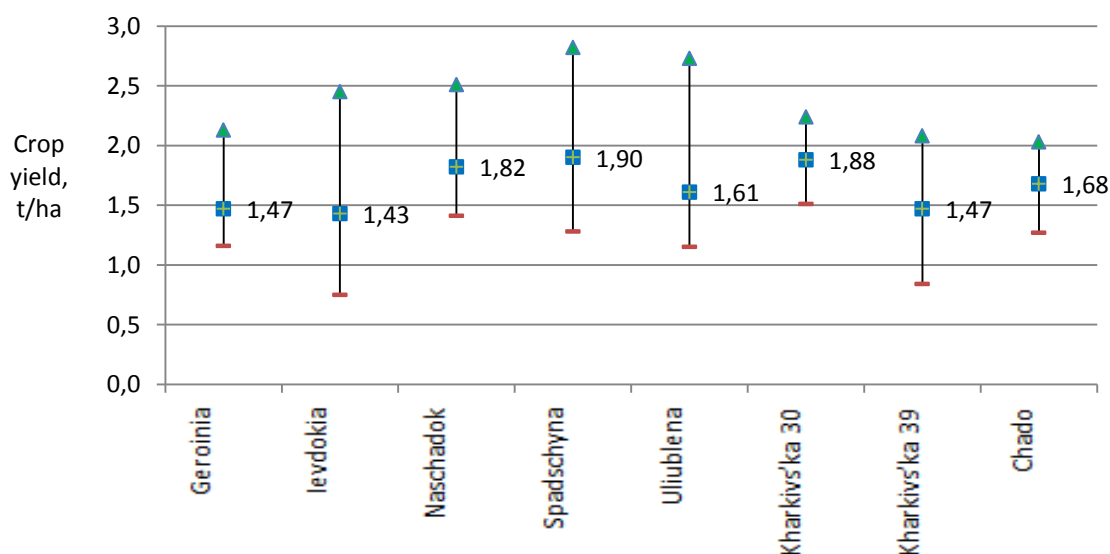


Fig. 3. Range of variation the grain yield of spring wheat varieties, t/ha (average for 2011–2015).

As we see from the obtained data, the crop yield of spring wheat varied considerably depending on year conditions of research and varietal characteristics of culture. On average, during the

years of testing the most comprehensive productivity and resistance to arid conditions of Steppe provided by varieties Naschadok, Spadschyna, Uliublana, Kharkivs'ka 30 and Chado – the crop yield was 1,68–1,90 t/ha. However, it should be noted that this level of crop yields of spring wheat shows the low adaptive capacity the plants of this crop, which is 3–4 times inferior to the best varieties of winter wheat in the conditions of northern Steppe of Ukraine.

Conclusions. Thus, based on the research results, obtained in the environmental testing plots of winter and spring wheat it is should note the following. The level of grain productivity of spring wheat in the northern Steppe of Ukraine indicates a lack of realization the potential productivity of plants this culture is not conducive to the interest of farmers in the cultivation of this product, and thus only strengthen the pace of rapid annual reduction of areas occupied by spring wheat crops and gross grain yields. It is requires, on the one hand, the improvement of existing and development of new effective agrobiological measures (with their immediate implementation in production) to improve the adaptive capacity of plants, on the other – replace the low yielder forms of spring wheat by more productive winter forms.

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