

UDC 631.527:633.11

**NOVAK Z., POLYANETSKA I,** Candidate of Agricultural Sciences  
**ZABOLOTNA I.**

Uman National University of Horticulture

e-mail: nzhanina@mail.ua, Baddi\_IVA@mail.ru

## **PLANT HEIGHT AND DENSITY OF THE SPIKE SAMPLES WINTER WHEAT CREATED METHODS DISTANT HYBRIDIZATION**

*By department of genetics, plant breeding and biotechnology, Uman National University of Horticulture in 2013, identified 100 samples created by hybridization between spelta and varieties of the national selection. In this is analyses plant height and density of spike allocated samples. Spelta is high growth, wheat varieties Panna, Seliyanca, Bilotserkivska napivkarlykova and Kopylivchanka are half dwarf. Three samples are tall, 17 average height, 52 – low the height, and 28 – half dwarfs. 24 samples have loose spike, 55 – average dense, 19 – dense and 2 samples are characterized by very dense spikes.*

**Keywords:** *wheat, spelled, variety, hybrid population, hight plants, dense of spike*

**Introduction.** Wheat is the main bread crop of Ukraine. Her production over many centuries ensured the welfare of our people. In conditions of contemporary of market relations yielding-capacity and quality of wheat grains play an important the role of both for of agrarians and for the country as a whole. The most cheap efficient and environmentally friendly factor in the growth production of plant is breeding [1, 2]

Therefore, a number of scientific institutions constantly conducted breeding work to create high-yielding, resistant to adverse environmental factors and good grain quality variety wheat.

The department of genetics, plant breeding and biotechnology, Uman National University of Horticulture also produced a wide work on the breeding of winter wheat. Among the methods of selection used as intraspecific and more complex remote hybridization. As a donor of useful traits appears half-wild type wheat – spelta.

*Analysis of recent research and publications.* We know that just a century ago, in Ukraine the share of soft wheat accounted for only about 5% of all wheat productions the remainder was hard wheat, and in some regions was grown also spelta [3]. Spelta wheat - a view from the hexaploid genome ABD, therefore its hybridization with soft wheat, which has the same genomic structure, easy to manage, but there are some difficulties associated with morphological structure (spelta tall, while the mostly low-grade and half dwarfs.) and the gap in the time of flowering. There are currently this type of wheat used in some Western European countries, as it is the donor content high-protein, contains almost all the nutrients that a person needs in a harmonious and balanced composition. Spelta unpretentious to growing conditions, grows well in poor mountainous soils, waterlogging resistant and cold-resistant, not damaged by insects and birds [2, 4]. It also contains 18 essential amino acids that can not be derived from animal food. Compared with soft wheat, spelled is richer in unsaturated fatty acids and fiber [5]. Works with spelta are held in Uman National University of Horticulture [6] and the Institute of Plant. Yuriev [7].

Employees of the department selected 100 samples created by hybridization between spelta and varieties of the national selection. These samples represent a hybrid population, as the splitting is not observed (F5).

The aim of the article is to analyze the plant height and density spike wheat hybrid populations created by distant hybridization of winter wheat with spelta and their original forms.

**Materials and methods.** Research conducted during 2012-2013 at the experimental field of Uman National University of Horticulture located in Mankovskiy natural economic district the Middle-Bug Forest Steppe Right Bank district of the province of Ukraine. Soil research fields – podzolized hard clay chernozem, content low humus.

In the research used conventional, except for the thick of plant cultivation technology of winter wheat. Sowing of was carried out in the optimal area for the terms – September 25, 2012. Used a systematic method. Repeated four times, the accounting area - 2 m<sup>2</sup>. Thick of plants – 400 thous / Ha.

**Results and discussion.** Along with other agronomic valuable parameters, we analyzed plant height and spike density – these settings are characterized by brightly highlighted discreteness of between varieties soft winter wheat and spelta.

High-yielding genotype and favorable conditions during flowering, grain formation and filling, ensuring the formation of yielding-capacity and plant resistance to lodging – their safety. We know that lodging is largely predetermined by length because recent decades, more urgent acquires the direction for wheat breeding short stalk. Forms with a low stalk less prone to lodging compared to tall plants. Therefore, we analyzed plant height of new genotypes and their original forms.

Known about seven dwarf gene, but four of them have pleiotropic effects and lead to strong branching stems and formation of small spikelets, so the selection is used three gene dwarf wheat located in homeolohical genomes – Rht1, Rht2 i Rht3 [8]. It is known that the donor gene dwarfism Rht3 is variety Tom Pus, and gene Rht1 and Rht2 – Noreen 10. By way the system crossing these genes were transferred in most modern varieties. [8].

Dorofeev V. F. and his followers [3] prefer tall wheat samples over 120 cen., average height – 105-120 cen., low height – 105-85 cen., half dwarfs have high 85-60 cen., and dwarfs – below the 60 cen.

We analyzed 100 samples, spelta, and four varieties of soft winter wheat: Panna, Selianka, Bilotserkivska napivkarlykova and Kopylivchanka – half dwarf. who were involved in hybridization with the creation of the above numbers. Because the number of samples is large enough, we have grouped them according to plant height by V. F. Dorofeev and specify the number of samples of each group and the average index height of the plants.

Usually spelta tall wheat. As a result of our research – (table 1), the height of this year was 122,7 cen., which confirms the its belonging to the tall wheat.

Varieties of soft winter wheat: Panna, Selianka, Bilotserkivska napivkarlykova and Kopylivchanka – characterized by plant height, respectively, 83,6, 79,9, 70,0 and 75,6 cen., they are half dwarf

Among the five groups, which are divided by plant height of wheat plants (for Dorofeev) among our sample represented four. In this case the division into individual groups, as would be expected, analyzing quantitative index, is uneven. Only three samples are tall, their average height was 123,7 cen.

Number of average height samples in our experiment was 17 pieces the average for this group – 112,6 cen. A little more than it turned out half dwarf – 28 numbers, their average height – 79.3 cen. The largest group – more than half of all the investigated material selection, are stunted samples. On average, this group of plant height was 94,5 cen.

Thus, according to the results of our research among 100 hybrid populations, created with participation of the national winter wheat breeding and wheat spelta, plant height ranged from 79,3 to 123,6 cen.

Spelta has a long and loose spike. By hybridization of varieties of winter wheat, which usually are compact and dense spike, we get a large variety of spike as the length and density.

The density of the spike is calculated parameter, it is determined by the number of spikelets per 1 cen. of the rod. Install it by dividing the sum of all spikelets, except the apical, the length of the rod. To determine the density spike must know the number of spikelets in the spike investigated samples. If soft wheat in terms of 10 cen rod is located less than 16 spikelets, spike is considered not dense, 17-22 – medium density, 23-28 – dense, more than 28 – very dense [9].

Table 1

**Plant height of winter wheat samples, cen**

name of (number) samples	Quantity of numbers	Group of (Dorofeev)	Averages index cen
Spelta		tall	122,7±9,0
Panna		half dwarf	83,6±2,0
Selianka		half dwarf	79,9±3,0
Bilotserkivska napivkarlykova		half dwarf	70,0±2,0
Kopylivchanka		half dwarf	75,6±3,0
1691, 1695, 1726	3	Tall	123,7±11,0
1690, 1719, 1720, 1725, 1727, 1730, 1735, 1739, 1741, 1742, 1743, 1745, 1746, 1749, 1761, 1763, 1776	17	average height	112,6±6,0
1668, 1669, 1682, 1685, 1687, 1688, 1692, 1694, 1696, 1697, 1699, 1700, 1701, 1702, 1704, 1705, 1706, 1713, 1714, 1715, 1716, 1718, 1721, 1724, 1729, 1731, 1732, 1733, 1734, 1736, 1737, 1738, 1740, 1744, 1748, 1750, 1753, 1754, 1755, 1757, 1762, 1765, 1766, 1767, 1768, 1771, 1772, 1775, 1777, 1778, 1779, 1783	52	low- height	94,5±5,0
1666, 1667, 1681, 1683, 1684, 1686, 1693, 1698, 1703, 1707, 1710, 1712, 1717, 1722, 1728, 1747, 1751, 1752, 1756, 1759, 1760, 1770, 1773, 1774, 1780, 1781, 1784, 1785	28	half dwarf	79,3±7,0
NCI <sub>0,5</sub>	-	-	4,7

According to the results of our research (Table 2), in 2013 year the spike density spelled was 11 pcs / 10cen. In varieties Panna, Selianka, Bilotserkivska napivkarlykova and Kopylivchanka this figure was respectively 22, 18, 20 and 25pcs./10cen. spike. That is, spelled wheat spike is not dense varieties Panna, Selianka, Bilotserkivska napivkarlykova – medium density and variety Kopylivchanka – dense.

Hybrid populations analyzed in this study are presented all four groups in the density spike. So, 24 samples are not dense Spike – the average for a group of 14 spikelets in 10 cen. spike rod.

The largest group are the numbers with spikes medium density – 55 hybrid populations with an average for this group of 19 pcs. / 10cen spike. In 19 samples of spike dense (24 spikelets to 10cen headed rod). The smallest group is represented by two samples spike in which is very dense - an average of 3,2 spikelets / 10cen spike.

Hence, the density of spike hybrid winter wheat populations created by complex crosses between varieties of winter wheat breeding national wheat and spelta ranges from 14 to 32 spikelets of 10 cen spike rod.

Table 2

## The density of spike winter wheat samples

name of (number) samples	Quantity of numbers	The density of the spike,	Averages index pccs/10cen,
Spelta		not dense	11
Panna		medium density	22
Selianka		medium density	18
Bilotserkivska napivkarlykova		medium density	20
Kopylivchanka		dense	25
1690, 1691, 1694, 1695, 1719, 1720, 1721, 1724, 1725, 1726, 1727, 1728, 1730, 1735, 1742, 1743, 1755, 1756, 1763, 1765, 1768, 1774, 1781, 1785	24	not dense	14
1666, 1667, 1668, 1669, 1681, 1682, 1684, 1685, 1687, 1693, 1696, 1697, 1698, 1699, 1700, 1701, 1702, 1706, 1713, 1714, 1715, 1716, 1729, 1731, 1732, 1733, 1734, 1738, 1739, 1740, 1741, 1745, 1746, 1747, 1748, 1749, 1750, 1752, 1759, 1760, 1761, 1762, 1766, 1767, 1770, 1771, 1772, 1773, 1775, 1776, 1778, 1779, 1780, 1783, 1784	55	medium density	19
1683, 1686, 1688, 1703, 1704, 1705, 1707, 1710, 1712, 1717, 1722, 1736, 1737, 1744, 1751, 1753, 1754, 1757, 1777	19	Dense	24
1692, 1718	2	Very dense	32
NCI <sub>0,5</sub>	-	-	1,03

**Conclusions.** Plant height and density spike hybrid populations, created with participation of national breeding winter wheat and wheat spelta diverse: three samples are tall 17 – average height, 52 – low height and 28 – half dwarfs. 24 samples are not dense spike, 55 – medium dense, 19 – dense and 2 samples are characterized by very dense spikes.

## References

1. Селекція, насінництво та сортознавство пшениці / [Шелепов В.В., Гаврилюк М.М., Чебаков М.П. та ін.] ; за ред. В.В. Шелепова ; УААН, Миронівський інститут пшениці ім. В.М. Ремесла. – Миронівка, 2007. – 405 с.
2. Морфология, биология, хозяйственная ценность пшеницы / [В.В. Шелепов, В.М. Маласай, А.Ф. Пензев и др.] ; под. ред. В.В. Шелепова ; УААН, Мироновський інститут пшеницы им. В.М. Ремесла. – Мироновка, 2004. – 524 с.
3. Пшеницы мира / [В.Ф. Дорофеев, Р.А. Удачин, Л.В. Семенова и др.]. – Л.: ВО Агропромиздат, 1987. – 560 с.
4. Жуковский П.М. Культурные растения и их сородичи / П.М. Жуковский – Ленинград: Колос, 1971 – 752 с.
5. Горн Е. Лучше чем пшеница, но... / Евгения Горн // Фермерське господарство. – 2008. – №4(372). – С. 21.
6. Новак Ж.М. Характеристика пшениці озимої *Triticum spelta* L. / Ж.М. Новак, І.О. Жекова // Збірник наукових праць Уманського національного університету садівництва. – Умань, 2011. – Вип. 75. – Ч.1: Агрономія. – С. 128-133.
7. Рожков Р.В. Використання малопоширених гексаплоїдних видів пшениці з метою селекційного покращення сучасних сортів м'якої пшениці / Р.В. Рожков, А.К. Нініва //

Біологія: від молекули до біосфери: тези доповідей молодих учених: матеріали II Міжнародної конференції. – Харків, 2007. – С. 155-156.

8. Лифенко С.П. Генетика і селекція пшениці / С.П. Лифенко та ін. // Зб. Генетика і селекція в Україні на межі тисячоліть. – Т.2. – К.: Логос. – 2001. – С. 319–527.

9. Большая советская энциклопедия. – М.: Советская энциклопедия, 1969–1978.

#### **Анотація**

**Новак Ж.М., Полянецька І.О., Заболотна І.Р.**

**Висота рослин та щільність колоса зразків пшениці озимої, створених методом віддаленої гібридизації**

На кафедрі генетики, селекції рослин та біотехнології Уманського національного університету садівництва у 2013 році виділено 100 зразків, створених шляхом гібридизації між спельтою та сортами вітчизняної селекції. У даній статті аналізується висота рослин та щільність колоса виділених зразків. Спельта є високорослою, сорти пшениці Панна, Селянка, Білоцерківська напівкарликова та Копилівчанка – напівкарликами. Три зразки серед досліджуваних є високорослими, 17 – середньорослими, 52 – низькорослими і 28 – напівкарликами. Серед відібраних зразків 24 мають нещільний колос, 55 – середньощільний, 19 – щільний та 2 зразка характеризуються дуже щільним колосом.

**Ключові слова:** пшениця, полба, сорт, гібридна популяція, висота рослин, щільність колоса

#### **Аннотация**

**Новак Ж.Н., Полянецкая И.О., Заболотная И.Р.**

**Высота растений и плотность колоса образцов пшеницы озимой, созданных методом отдалённой гибридизации**

На кафедре генетики, селекции растений и биотехнологии Уманского национального университета садоводства в 2013 году выделено 100 образцов, созданных путем гибридизации между спельтой и сортами отечественной селекции. В данной статье анализируется высота растений и плотность колоса выделенных образцов. Спельта является высокорослой, сорта пшеницы Панна, Селянка, Белоцерковская полукарликовая и Копыливчанка – полукарликовые. Три образца среди исследуемых являются высокорослыми, 17 – среднерослыми, 52 – низкорослыми и 28 – полукарликовыми. 24 образца имеют рыхлый колос, 55 – средне плотный, 19 – плотный и 2 номера характеризуются очень плотным колосом.

**Ключевые слова:** пшеница, спельта, сорт, гибридная популяция, высота растений, плотность колоса