



UDC 664.7

DOI <https://doi.org/10.15673/gpmf.v23i3.2739>

D. Zhygunov, Doctor of technical sciences, Professor, E-mail: dmytro.zhygunov@gmail.com
ORCID: 0000-0001-9435-2266; ResearcherID: D-1372-2015; Scopus Author ID: 55820666600

S. Sots, PhD of Technical Science, Associate Professor, E-mail: sotsserega@gmail.com
ORCID: 0000-0002-3267-2384; ResearcherID: G-9192-2019; Scopus Author ID: 57210357520

I. Kustov, PhD of Technical Science, Associate Professor, E-mail: i.kustov1988@gmail.com
ORCID: <https://orcid.org/0000-0001-7632-1626>, ResearcherID: I-3249-2016

O. Donii, postgraduate student, E-mail: doniy.lesya99@gmail.com
Odesa National University of Technology, 112, Kanatna Str., Odesa, 65039, Ukraine

ANCIENT CEREAL CULTURE FOR THE MODERN GROAT INDUSTRY

Abstract

At the origin of wheat-spelt breeding in Ukraine is the outstanding scientific breeder Fedir Pariy. As of today, seven varieties of wheat-spelt have been entered into the Register of plant varieties suitable for distribution in the territory of Ukraine. The first variety of spelt wheat *Triticum spelta* L. "Zoria Ukrainy" was entered into the register in 2011, and from that began the active study of this type of hulled wheat not only by breeders, but also by technologists, the goal of which was the introduction of hulled wheat in the domestic grain processing industry. Two years later, in 2013, the second variety of domestic spelt wheat "Yevropa" was entered into the register, the work on the selection of which was also headed by Fedir Pariy. The following varieties of spelt wheat were entered into the Register relatively recently during 2017-2021: Attergauer Dinkel (2016), Evrika (2017), Mv Martongold (2018), Vyshyvanka bilotserkivska (2018), Bilberi (2021). Considering wheat-spelt grain as a potential raw material for cereal production, it can be noted that thanks to the excellent chemical composition of the grain and its affinity with the grain of traditional wheat, it can be concluded that it can be processed at domestic grain factories of different productivity, using at the same time as the traditional available on technological equipment at the enterprise, and when building new lines and factories, use more modern solutions offered by world leaders in the production of technological equipment, such as the Buhler company. At the same time, it is possible to produce both a higher-quality product, traditional for the Ukrainian consumer, such as "Artek" and "Poltavska" groats, and to focus on the production of a new range of wheat products - the production of whole groats and flaked kernels, which in turn, with rational construction and the use of more efficient technological equipment, will give be able to produce functional and dietary food products. In addition, due to such products, the export potential of the grain processing industry can be increased, especially taking into account the small amount of spelt wheat cultivation in the countries of the European Union, with the constant increase in demand for environmentally friendly and high-quality products that are available in these countries, with the right approach, can make Ukraine an exporter of wheat-spelt processing products to EU countries and beyond.

Key words: groats production, spelt-wheat, chemical composition, food products, processing into groats, flaked products, new equipment.

Introduction

Wheat-spelt (spelt) is one of the oldest cereal crops known to mankind. The first archaeological references to it are known since the beginning of the 5th millennium BC in the territory of Mesopotamia (territory of Iraq), the first known mentions of spelt on the European continent date back to the 2nd millennium BC in the territory of the mountain ranges of the Swiss and Italian Alps [1,2] Even 150-200 years ago, there was no clear commercial and technological division of wheat into the main types, as it is today, hard and soft, in different regions of the world the most suitable grain of wheat was grown, which caused the wide spread of hulled types of wheat, including wheat-spelt, emmer, wild types of wheat, etc. The processing of such types of hulled wheat mostly took place on a small scale, which cannot be considered industrial, and given the presence of hard floral hulls on the surface of the grain, it was quite difficult and not always effective, considering the development of technological equipment for that period of time.

But with the development of science and tech-

nology, the hulled wheat was replaced by naked grain types, their quality indicators and productivity were increased, which made it possible to make a quantitative and qualitative leap in the development of the grain processing industry [3]. For our country, wheat-spelt does not have such a significant historical significance, the first attempts to grow this crop were recorded about a hundred years ago in the territory adjacent to the Carpathian massifs. According to its origin, spelt wheat is the result of natural hybridization of two types of wheat: emmer (*Triticum dicoccum*) and wild wheat (*Aegilops tauschii*). At the same time, wheat spelt *Triticum spelta* L. is a hexaploid wheat that has a genome composition similar to common wheat [4]. There are 54 varieties of wheat-spelt, which are divided into two main subspecies: Asian (subsp. *kuckuckianum* Gökg.) and European (subsp. *spelta*) [7]

A characteristic feature that did not allow spelt wheat to become widely distributed along with whole grain wheat is the presence of hard floral hulls on the surface of the grain that tightly cover the grain. When



harvesting and threshing the grain, the floral hulls do not separate from the kernel, and when processing this crop into flour or groats, it is necessary to include the technological operation of dehulling. At the same time, the presence on the surface of the wheat-spelt grain of hard floral hulls that tightly cover the kernel of the culture allows us to talk about the potential lower contamination of the surface of the kernel with harmful substances that could get on the surface during cultivation, harvesting, transportation and storage in comparison with traditional grain, which allows, after removing the hulls, to carry out in the further production of groats products from it with a reduced structure of dehulling stages, and when processing into flour, direct the kernel immediately to the grinding system.

Literary review

Today, spelt wheat is grown on small areas in the countries of the European Union: Germany, Belgium, France, Spain, as well as in Switzerland on an area equal to approximately 100 thousand hectares [6].

In Ukraine, wheat-spelt is recommended to be grown in the Steppe, Forest Steppe, and Polissia [5]. Taking into account the small demand for this crop among producers of grain and flour products, the volume of growing spelt wheat in our country remains insignificant compared to traditional crops, and taking this into account, separate statistics on the volume of growing this crop are not even kept. Usually, the share of cultivated wheat-spelt grain in Ukraine is taken into account in the statistics of cultivation of traditional wheat [10].

At the origin of wheat-spelt breeding in Ukraine is the outstanding scientific breeder Fedir Pariy. As of today, seven varieties of wheat-spelt have been entered into the Register of plant varieties suitable for distribution in the territory of Ukraine as of 01.2024 [8]. The first variety of spelt wheat *Triticum spelta* L. "Zoria Ukrainy" was entered into the register in 2011, and from that began the active study of this type of hulled wheat not only by breeders, but also by technologists, the goal of which was the introduction of hulled wheat in the domestic grain processing industry. Two years later, in 2013, the second variety of domestic spelt wheat "Yevropa" was entered into the register, the work on the selection of which was also headed by Fedir Pariy. The following varieties of spelt wheat were entered into the Register relatively recently during 2017-2021: Attergauer Dinkel (2016), Evrika (2017), Mv Martongold (2018), Vyshyvanka bilotserkivska (2018), Bilberi (2021).

An important aspect of the limitation of the use of wheat-spelt in Ukraine is the absence of regulatory regulations that would allow it to be classified according to quality indicators into food and fodder grain, to distinguish and limit the varieties entered in the register according to their purpose: for the production of groats products or flour, to be singled out among the available varieties the most technological and suitable for the food industry. In addition, the Rules for conducting and organizing the technological process at grain or flour mills do not provide for the use of spelt wheat or other types of hulled wheat as raw materials, this makes it impossible to effectively organize its processing on the technological equipment available at the enterprises of the industry and

leads to the unpopularity of this crop among processors. However, taking into account the main advantages and disadvantages of this culture and the need to expand the existing grain products in the country, processing at enterprises is carried out in limited batches according to technical and technological conditions, which usually do not have sufficient scientific justification.

Formulation of the problem

Wheat-spelt is used as a raw material for a wide range of food products. In the world, it is used to produce groats, flaked products, breakfast cereals, and flour. Flour is further used in the bakery, confectionery and pasta industries for the production of bread, loaves, biscuits, cookies, pasta products, as well as other assortment of dietary bakery products. In addition to being used for the production of cereal and flour products, wheat-spelt is also used for the production of alcohol, beer, etc. [12-15]

Chemical composition and technological properties of grain are important for determining the suitability of grain for use in the grain processing industry. A preliminary assessment of the components of the chemical composition of the grain makes it possible to determine the possibility of producing a certain assortment of products for different purposes from it. The technological properties of grain allow determining the main directions of grain processing, modes of cleaning, water-heat treatment, dehulling, sorting of dehulling products, etc. The chemical composition of wheat-spelt grain is significantly different from that of traditional wheat, despite the fact that modern breeding varieties of common wheat originate from wheat-spelt.

Considering the chemical composition, it should be noted that spelt wheat grain is sufficiently researched, despite the small volumes of its consumption in our country and the world. Comparing it with common wheat, which is today the basis for the production of flour, it can be noted that spelt wheat is characterized by an increased mass proportion of substances useful for the human body: protein, fat, micro- and macroelements [16].

For the production of high-quality human food products, one of the most important factors is the mass proportion of proteins, their composition and the characteristics of the amino acid composition, which are taken into account when choosing a particular grain as a raw material and determine the purpose of products from it. It is possible to note the studies of Marconi E. and others [17], which show that the hulled grain of spelt wheat can contain up to 18% protein, at the same time, Drobot V. I. and others [18], examining samples of spelt wheat grown in Ukraine, note their advantage in terms of protein content, it is 1.28 times higher than ordinary wheat, which indirectly contains 9-15 % of protein [17]. It is also possible to note the research of Podpryatov G. I. and Yashchuk N. O. [19], which show that the mass fraction of protein reaches 15% in non-threshed domestic wheat-spelt grain, and after dehulling, the mass fraction of protein increases to 23%.

By fractional composition, wheat-spelt proteins are divided into albumins, globulins, glutenins and gliadins. The fractional composition of wheat-spelt proteins



contains from 23 to 27% of albumins and globulins [20]. These protein fractions are mostly located in the aleurone layer, pericarp and embryo and to a lesser extent in the endosperm. Glutenins and gliadins are the limiting protein fractions in the endosperm and aleurone layer and are practically absent in the pericarp and embryo [21].

The presence of all essential amino acids for the human body, such as: lysine, tryptophan, methionine, threonine, valine, phenylalanine, leucine, isoleucine, is important for a rational human diet. The vast majority of studies of the amino acid composition of wheat-spelt show that it is close to traditional wheat grain, while Zai-ka, N.V. and Karpuk, L.M. [21] note that the amino acid composition of spelt wheat is 50% higher compared to soft winter wheat.

Like most cereals, in wheat-spelt, the carbohydrate complex forms the basis of the chemical composition of the grain, the predominant substance of which is starch. Spelt wheat grain is characterized by a lower total share of carbohydrates, in particular, 1.2 times less starch compared to traditional whole wheat [18]. Studies show that the mass fraction of starch in the unbroken grain of wheat-spelt can reach 36%, after removing the shells, the starch fraction increases and can reach the value of 60% [19]. The mass fraction of sugars in wheat-spelt is 2-3% [22]. Wheat is one of the three cereal crops in the chemical composition of which the non-starch polysaccharide β -glucan is present. Spelt wheat, like ordinary whole wheat, contains a small proportion of β -glucans, which usually does not exceed 1.2% [17,23, 24]. The mass fraction of fiber in spelt wheat ranges from 10 to 15% [17].

Fats consist of fatty acids, which determine their properties. Fatty acids are divided into saturated and unsaturated (monounsaturated and polyunsaturated). The biological activity of fats is determined by the content of polyunsaturated fatty acids: the more of them, the greater the biological activity of fats. Polyunsaturated fatty acids (linoleic, linolenic, arachidonic) are important for the human body, which cannot be synthesized by the human body and are irreplaceable, saturated acids are replaceable, as they are able to be synthesized from carbohydrates and proteins [25-27].

The mass fraction of fat in wheat-spelt, depending on varietal characteristics and growing conditions, does not exceed 4% [28]. The lipid complex of wheat-spelt contains a higher proportion of mono- and polyunsaturated fatty acids and twice the amount of oleic acid compared to common wheat [29].

An insufficient amount or lack of vitamins in the human body causes hypovitaminosis or vitamin deficiency. Vitamins are not able to be independently synthesized in the human body, therefore, for normal vital activity, a constant supply of vitamins to the body is necessary [30, 31].

Spelt wheat contains water-soluble vitamins in its chemical composition: thiamin, riboflavin, and niacin, with an increased proportion of niacin compared to ordinary wheat [32].

Spelt wheat, compared to traditional wheat grain, has an increased share of minerals, containing 15% more potassium, 60% more phosphorus, 70% more sulfur, 30% more zinc, 10% more iron, and 20% more manganese [33].

Results of the study and their discussion

Considering the excellent chemical composition of wheat-spelt, in addition to the production of traditional products in the world, it is also used for the production of ecologically clean bioproducts, dietary and functional food products. In our country, the traditional products of wheat processing are crushed groats "Artek" and "Pol-tavska", which are recommended to be made from durum wheat. The products of wheat-spelt processing in our country are whole groats or flaked grains. In Ukraine, there are several well-known technological solutions for the processing of domestic spelt wheat into groats products.

The basis of these decisions is the production of the entire husked kernel of wheat-spelt and the subsequent processing of the obtained kernel into flaked products [34-36]. The production of groats from the whole kernel involves cleaning the grain from impurities, water-heat treatment, dehulling, sorting of dehulling products.

According to the proposed solution, it is recommended to use the technological equipment traditional for the domestic grain industry: pre-cleans grain separators (drum sieve), separators, destoners and triers, which potentially simplifies the organization of wheat-spelt grain cleaning at existing enterprises of the industry. The next stage before processing is the stage of water-heat treatment of grain according to the structure of cold conditioning with the use of moistening machines and bunkers for tempering. The wheat-spelt prepared in this way is sent to two dehulling systems. The mixture of dehulling products is sorted, the obtained whole kernel is dried and controlled. The stated yield level of the entire groat is 87-90%. In the further production of the flaked groat, the stage of water-heat treatment of the wheat-spelt groat is additionally carried out by the method of hot conditioning, after which the kernel is briefly tempered and flaked [34-36].

There is also a known technological solution for the production of crushed groats from the kernel of spelt wheat, which includes cleaning the grain from impurities and fractional pearling. Cleaning is carried out using equipment traditional for grain production, after which the kernel is divided into two fractions and pearled on dehulling-pearling machines of the ZShN type. The mixture of grinding products is sorted, the pearled groats are crushed and sorted. At the same time, receive groats of three numbers [37].

Considering the known methods [34-36], it can be noted that they involve the use of traditional technological equipment, which will allow the implementation of these technologies on the equipment available at enterprises, however, taking into account the use of somewhat outdated technological equipment for processing modern grain, which is wheat-spelt, does not allow to use it to the full extent the natural potential of this culture.

The use of machines of the ZShN type for dehulling and pearling of wheat-spelt is impractical from the point of view of energy consumption of this equipment, it leads to the removal from the surface of the grain not only of flower hulls, hard-to-digest and harmful elements from the surface of the grain, but also leads to the removal of the most useful for the body of substances, which reduces the efficiency of processing and reduces



the usefulness of products obtained from this grain. Today, world leaders in technological equipment manufacturers offer more advanced equipment for the stages of dehulling, water-heat treatment, and grinding, which is universal and allows processing not only wheat-spelt, but also other cereal crops. Can be highlighted the Buhler MHSA dehuller (Fig. 1), which is designed for dehulling hulled wheat, oats, soybeans and sunflower seeds. This dehuller has high productivity for the specified cultures and allows to adjust the dehulling modes for each culture in such a way as to minimize the formation of crushed kernels. In addition, the most important characteristic of this dehuller is the minimal power consumption for such machines.



Fig. 1. Dehuller Buhler MHSA

To separate husked and unhusked wheat-spelt grains, the Buhler company suggests using the BSOA sorting table (Fig. 2), which allows to effectively separate not only wheat-spelt, but also effectively work with oats, barley, rice, millet, coffee beans, etc. The use of the BSOA sorting table allows to increase the efficiency of processing of spelt wheat due to the separation of husked and unhusked kernels, the efficiency of the entire technological process increases, the husked kernel will not enter the next dehulling stage, which will reduce the growth of by-products and waste and increase the quality properties of the end products. The considered sorting table is also an energy-saving technological equipment that will allow

enterprises to solve one of the most important problems of today - reducing energy costs at the enterprises of the industry.



Fig. 2. The Twitor table separator Buhler BSOA

Conclusions

Considering wheat-spelt grain as a potential raw material for cereal production, it can be noted that thanks to the excellent chemical composition of the grain and its affinity with the grain of traditional wheat, it can be concluded that it can be processed at domestic grain factories of different productivity, using at the same time as the traditional available on technological equipment at the enterprise, and when building new lines and factories, use more modern solutions offered by world leaders in the production of technological equipment, such as the Buhler company. At the same time, it is possible to produce both a higher-quality product, traditional for the Ukrainian consumer, such as "Artek" and "Poltavska" groats, and to focus on the production of a new range of wheat products - the production of whole groats and flaked kernels, which in turn, with rational construction and the use of more efficient technological equipment, will give be able to produce functional and dietary food products. In addition, due to such products, the export potential of the grain processing industry can be increased, especially taking into account the small amount of spelt wheat cultivation in the countries of the European Union, with the constant increase in demand for environmentally friendly and high-quality products that are available in these countries, with the right approach, can make Ukraine an exporter of wheat-spelt processing products to EU countries and beyond.

REFERENCES

1. Tverdokhlib O.V., Holik O.V., Niniieva A. K. Spelta i polba v orhanichnomu zemlerobstvi // Posibnyk ukrain-skykh khliborobiv, 2013, 154– 155.
2. Pashkevych, H.O., & RL, B. Vytoky roslynnytstva Ukrainy (za materialamy istoriko-arkheolohichnykh doslidzhen). Henetychni resursy roslyn, 2019, 24, 129-141.
3. Vasylenko, A. (2016). Spelta: novyi napriamok u vyrobnytstvi pshenyts. URL: <https://www.agronom.com.ua/spelta-noviy-napriamok-uvyrobnytstvi-pshenyts>.
4. Lykhochvor V.V. Roslynnytstvo. Tekhnolohii vyroshchuvannia silskohospodarskykh kultur / V.V. Lykhochvor, V.F. Petrychenko, 3-tie vyd., vypravl., dopovn. - Lviv:Ukrtekhnohii, 2010, 1088.
5. Khomenko, T.M., Kyienko, Z.B., Dzhulai, N.P., & Sonets, T.D. (2016). Sortovi resursy pshenytsi v Ukraini, Zbirnyk naukovykh prats Seleksiino-henetychnoho instytutu-Natsionalnoho tsentru nasinnezhnavstva ta sortovyvchennia, (27), 67-74.
6. Niniieva, A.K. (2012). Uspadkuvannia oznak produktyvnosti kolosa hibrydamy spelyty yaroii (T. Spelta L.) iz pshenytsiu miakoiu yaroii. Visnyk Poltavskoi derzhavnoi aharnoi akademii, (4), 36-41.



7. Niniiieva, A.K. (2012). Henetychne riznomanittia spelty ozymoi za hospodarskymy oznakamy v umovakh skhidnoi chastyny Lisostepu Ukrainy. Seleksiia i nasinnystvo, (101), 156-167.
8. Reiestr sortiv roslyn prydatnykh dla poshyrennia na terytorii Ukrainy [Elektronnyi resurs]: <https://minagro.gov.ua/file-storage/reiestr-sortiv-roslyn>
9. Marchenko V. U drevnoi psenytsi spelty – nove zhyttia. [Elektronnyi resurs]: Narodnyi ohliadach / V. Marchenko. Rezhym dostupu: <https://www.ar25.org/article/u-drevnoyi-pshenytsi-spelty-nove-zhyttia.html>.
10. Tini zabutykh zlakiv: khto v Ukraini vyroshchuie spelty [Elektronnyi resurs]: <https://superagronom.com/articles/259-tini-zabutih--zlakiv-hto-v-ukrayini-viroshchuye-spelty>
11. Barr, S. (2019). Technology of cereals, pulses and oilseeds. Scientific e-Resources.
12. Orhanichni dobryva: navch. posib / S.V. Zhuravel [ta in], Zhytomyr: Vyd-vo Poliskoho un-tu, 2020, 200.
13. Sumskyi, N.A.U. Vykorystannia netradytsiinoi syrovyny u vyrobnytstvi kharchovoi produktsii. Materialy, 455.
14. Mykolenko, S. Yu., & Omelchenko, M. Yu. (2020). Vykorystannia dysperhovanoho zerna spelty dla vyrobnytstva khliba.
15. Palianytsia, L.Ya., Berezovska, N.I., Krykhta, A.H., & Androsiuk, I.O. (2019). Spelta yak syrovyna u Kharchovi promyslovosti. redaktsiina kolehiia, 82.
16. Bulchuk E.A., Nykulyn A. F. (2008), Yspolzovanye spelty v proyzvodstve khlebobulochnnykh yzdelyi: Materyaly II Vseros. nauch.-prakt. konf. molodykh uchenykh y aspyrantov. Ch. 1. Ufa: FHOU VPO «Bashkyskiy HAU».
17. Marconi, E. Kernel properties and pasta-making quality of five European spelt wheat (*Triticum spelta* L.) cultivars // E Marconi, M Carcea, M Graziano, R Cubadda // Cereal Chemistry, 1999, Vol 76, № 1, 25-29.
18. Drobot, V.I. Porivnialna kharakterystyka khimichnoho skladu ta tekhnolohichnykh vlastyvostei sutsilnozmele-noho pshechnoho boroshna ta boroshna spelty / V. I.Drobot, L.A. Mykhonik, A.B. Semenova // Khranenyie y pererabotka zerna, 2014, №4, 37-39.
19. Podpriatov, H. I., Prydatnist zerna psenytsi spelty ozymoi dla khlibopekarskykh ta kormovykh tsilei/ H. I. Podpriatov, N. O.Yashchuk // Novitni ahrotekhnolohii, 2013, № 1, 71-79.
20. Gálová, Z., & Knoblochová, H. (2001). Biochemical characteristics of five spelt wheat cultivars (*Triticum spelta* L.), Acta fytotechnica et zootechnica, 4, 85-87.
21. Escarnot, E., Jacquemin, J.M., Agneessens, R., & Paquot, M. Comparative study of the content and profiles of macronutrients in spelt and wheat, a review.
22. Zaika, N. V., & Karpuk, L. M. Urozhainist ta yakist zerna spelty (*Triticum spelta* L.) v umovakh Lisostepu Ukrainy.
23. Kliuchevych M.M. Zakhyst spelty ozymoi vid khvorob na rannikh etapakh orhanohenezu. Karantyn i zakhyst Roslyn, 2016, № 5, 5–9.
24. Demirbas A., 2005, β -glucan and mineral nutrient contents of cereals grown in Turkey, Food Chem, 90, 773-777.
25. Loje H., Moller B., Laustsen A.M., Hansen A., 2003, Chemical composition, functional properties and sensory profiling of einkorn (*Triticum monococcum* L.), J. Cereal Sci, 37, 231-240.
26. Meurant, G. Lipids in Cereal Technology / G. Meurant, Elsevier, 2012, 425.
27. Simmonds, D. H. Wheat and Wheat Quality in Australia / D.H. Simmonds, Csiro Publishing, 1989, 299.
28. Wrigley, C. Cereal Grains: Assessing and Managing Quality / C.Wrigley, I.Batey, D.Miskelly, Woodhead Publishing, 2016, 830.
29. Relina, L., Suprun, O., Bohuslavskiy, R., Vecherska, L., Leonov, O., Antsyferova, O., & Golik, O. (2021), Comparison of common wheat and spelt by total lipids and fatty acid levels, The Journal of VN Karazin Kharkiv National University. Series «Biology», 36, 94-104.
30. Bal-Prylypko, L.V., Naumenko, O.V., & Derevianko, L.P. Kharchova tsinnist boroshna zi spelty ta polby. 122i richnytsi zasnuvannia Natsionalnoho universytetu bioresursiv i pryrodokorystuvannia Ukrainy, 70.
31. Ball, G.F.M. Bioavailability and analysis of vitamins in foods [Text] / G.F.M. Ball, Springer US, 1998, 569.
32. Rucker, R.B. Handbook of Vitamins, Third Edition / R.B. Rucker, J.W. Suttie, D.B. McCormick, CRC Press, 2001, 600.
33. Ranhorta G.S., Gerroth J.A., Glaser B.K., Lorenz K.J., 1995, Baking and nutritional qualities of a spelt wheat sample, Lebensm. Wiss, Technol, 28, 118-122.
34. Karpysheyn, O., & Moisiienko, V. (2022). Produktynnist psenytsi spelty za pozakorenevoho pidzhyvlennia huminovymy preparatamy, BBK 45.45 K-66, 80.
35. Sposib otrymannia krupy tsiloi zi spelty: Pat. 115198 Ukraina, [Elektronnyi resurs] / V.V. Liubych, V.V. Voziian. – Rezhym dostupu: <http://base.uipv.org/searchINV/search.php?action=viewdetails&IdClaim=234123&chapter=description>
36. Sposib vyrobnytstva krupy pliushchenoi iz zerna psenytsi spelty:Pat.115765 Ukraina, [Elektronnyi resurs]/ V.V. Liubych, V.V. Voziian. – Rezhym dostupu: <http://base.uipv.org/searchINV/search.php?action=viewdetails&IdClaim=234787&chapter=description>
37. Sposib vyrobnytstva krupy z psenytsi spelty №1 i podribnenykh iz psenytsi spelty №1, 2, 3: Pat. 118059 Ukraina, [Elektronnyi resurs] / V.V. Liubych, V.V. Voziian, V.V. Novikov. – Rezhym dostupu: <http://base.uipv.org/searchINV/search.php?action=viewdetails&IdClaim=237698&chapter=description>
38. Sposib vyrobnytstva podribneno krupy z lushchenoho zerna spelty: Pat. 114208 Ukraina, [Elektronnyi resurs] / I.P. Shylov, V.A. Ratushnyi, D.M. Ptashnyk, Rezhym dostupu: <http://base.uipv.org/searchINV/search.php?action=viewdetails&IdClaim=232781&chapter=description>



УДК 664.7

Жигунов Д.О., д-р техн. наук, професор, E-mail: dmytro.zhygunov@gmail.com

Соц С.М., канд. техн. наук, доцент, E-mail: sotserega@gmail.com

Кустов І.О., канд. техн. наук, доцент, E-mail: i.kustov1988@gmail.com

Доній О.І., аспірант, E-mail: doniy.lesya99@gmail.com

Одеський національний технологічний університет, вул. Канатна, 112, Одеса, 65039, Україна

ДРЕВНЯ ЗЛАКОВА КУЛЬТУРА ДЛЯ СУЧАСНОЇ КРУП'ЯНОЇ ПРОМИСЛОВОСТІ

Анотація

У витоків селекції пшениці-спельти в Україні стоїть видатний вчений селекціонер Федір Парій саме його пошук древніх зразків спельти на Західній Україні і дали старт селекції новим сортам пшениці-спельти в Україні. В Реєстр сортів рослин придатних для поширення на території України внесено сім сортів пшениці-спельти. Перший сорт пшениці-спельти *Triticum spelta* L. «Зоря України» було внесено в реєстр у 2011 році і з цього почалося активне вивчення даного типу піввчистої пшениці не тільки селекціонерами, а і технологами, метою якого було впровадження піввчистих пшениць вітчизняну зернопереробну галузь. Через два роки у 2013 році в реєстр було внесено другий сорт вітчизняної пшениці-спельти «Європа», роботу на селекціонування якого також очолював Федір Парій. Наступні сорти пшениці-спельти були внесені в реєстр відносно нещодавно протягом 2017-2021 років: Аттергауер Дінкель (2016 рік), Евріка (2017 рік), Мв Мартонголд (2018 рік), Вишиванка білоцерківська (2018 рік), Білбері (2021 рік). Розглядаючи зерно пшениці-спельти як потенційну сировину для круп'яного виробництва можна відзначити що завдяки відмінному хімічному складу зерна та його спорідненості з зерном звичайної пшениці можна зробити висновок що його можливо переробляти на вітчизняних круп'яних заводах різної продуктивності використовуючи при цьому як традиційне наявне на підприємстві технологічне обладнання так і при побудові нових ліній і заводів орієнтуватися більш сучасні рішення які пропонуються світовими лідерами з виробництва технологічного обладнання, наприклад фірми Buhler. При цьому можна виробляти як традиційний для українського споживача більш якісний продукт типу круп Полтавської або Артек, так і орієнтуватися на виробництво нового асортименту продуктів з пшениці – виробництво цілої крупи та плющеного ядра які вже в свою чергу при раціональній побудові і використанні більш ефективного технологічного обладнання дасть змогу виробляти продукти функціонального та дієтичного харчування. Окрім цього сам за рахунок таких продуктів можна нарощувати експортний потенціал зернопереробної галузі особливо враховуючи невеликі обсяги вирощування пшениці спельти в країнах Європейського союзу при постійному збільшенні попиту на екологічно чисту та високоякісну продукцію яка є в цих країнах при правильному підході може зробити з України експортера продуктів переробки пшениці-спельти в країні ЄС і не тільки.

Ключові слова: круп'яне виробництво, пшениця-спельта, хімічний склад, харчові продукти, переробка в крупи, плющені продукти, новітнє обладнання.

Received 12.09.2023

Reviewed 22.09.2023

Revised 25.09.2023

Approved 29.09.2023



Cite as Vancouver Citation Style

Zhygunov D., Sots S., Kustov I., Donii O. Ancient cereal culture for the modern groat industry. Grain Products and Mixed Fodder's, 2023; 23 (3, 91): 33-38. DOI <https://doi.org/10.15673/gpmf.v23i3.2739>

Cite as State Standard of Ukraine 8302:2015

Ancient cereal culture for the modern groat industry. / Zhygunov D. et al. // Grain Products and Mixed Fodder's. 2023. Vol. 23, Issue 3 (91). P. 33-38. DOI <https://doi.org/10.15673/gpmf.v23i3.2739>



GRAIN STORAGE FORUM
ELEVATOR 2024
2.02.2024 **СУШІННЯ SMART**

ProAgro
GROUP



Асоціація
Елеваторів України