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MULTI-YEAR BREEDING DEVELOPMENTS FOR POTATO GROWERS OF UKRAINE

Russia's large-scale war against Ukraine significantly affected the state of Ukraine's economy in general, and agriculture in particular. The agro-industrial complex has become the second front of our people's struggle for food and financial independence. Not only Ukrainians felt the «humanity of Russians». Considering this, it is difficult to overestimate the importance of food security for our country and the countries of the world.

In the diet of Ukrainians, potatoes are an irreplaceable food product, the most valuable and strategically important type of agricultural product after grain, which ensures the food security of the country. It is not for nothing that the people call it «second bread». The nutritional value of the potato and its useful properties make it unique and versatile. The industry produces fried

potatoes (chips), dried, quick-frozen, in the form of dehydrated slices for frying, potato flakes for mashed potatoes, etc.¹

The consumption of potatoes is traditionally quite stable, since this food product is the most affordable for the price of different social groups of the population. Potato production is one of the promising areas of economic activity for small and medium-sized agribusiness.

The nutritional value of potatoes is determined by their chemical composition. Potatoes contain starch, proteins, carbohydrates, as well as phosphorus, magnesium, calcium and a large number of amino acids. 100 g of young potatoes contains approximately 20 mg of vitamin C².

Potatoes are readily eaten by animals in raw and steamed form. 1 kg contains 0.3 k.o. and 0.02 kg of digestible protein. Silage from green tops and waste from the industrial processing of tubers - bard, zhmak, etc. - are of certain importance.

Potatoes are a valuable raw material for the production of alcohol, starch, glucose, dextrin and other products.

In the technology of growing potatoes in the agroecosystem, it is a good precursor for spring crops, and its early varieties are also for winter crops.

The healing properties of potatoes have been known since ancient times - they are used to treat burns, eczema, respiratory tract, and gastritis. Potatoes are widely used in cosmetics, and their processing products are used in food, confectionery, textile and other industries.

Potatoes are a very important food crop for Ukrainians and the world population. It is grown in 150 countries, where 75% of the world's population lives.

Potato growing in Ukraine is a priority area of agricultural production. Ukraine ranks fourth among potato producers in the world and second in terms of consumption of tubers per person. Ukrainians consume 139 kg/person of potatoes per year, while the world average is 33 kg/year per person.

High productivity of potato tubers is achieved by improving individual elements of growing technology, which provide optimal conditions for plant growth and development.

According to experts' calculations, about 30 % of its yield depends on the variety of potatoes. In 2021, 188 potato varieties, of which 82 are of domestic selection, were entered into the State Register of plant varieties suitable for distribution in Ukraine.

1 Zaviryuha P. Potato varieties selected by the Lviv NAU as a factor in the intensification of potato growing. Scientific and practical aspects of agro-industrial production and development of rural regions: materials of the International science and practice Forum. Lviv, September 21-24, 2011. Lviv, 2011. P. 6-14; Vlokh V. G., Dudar I. F., Lytvyn O. F., Bomba M. I., Dudar O. O. Field resistance of potato hybrids against late blight depending on the combination of parental components. Bulletin of the Lviv National Agrarian University: agronomy. 2016. No. 20. P. 107-111.

2 Vlokh V. G., Dudar I. F., Lytvyn O. F. Productivity criteria of potato seedlings created with participation in the genealogical collection of the Karpatskyi variety. Bulletin of the Lviv National Agrarian University: agronomy. 2016. No. 20. P. 122-126.

The importance of the variety in the technology of cultivation of high yields of potato tubers is indicated in the scientific works of domestic and foreign scientists, in particular: I.D. Nechiporchuk, V.G. Vlokh, A.A. Osypchuk, A.A. Podgayetskyi, H. Kolben and others³. The results of many years of scientific research are embodied in the fields of farms of various forms of management in different soil and climatic zones of Ukraine and beyond.

For more than 30 years, scientists-breeders of the Lviv National Environmental University have been making a significant contribution to the development of agricultural science, in particular potato breeding, among the scientific institutions of Ukraine.

Long-term research was carried out mainly on dark gray forest podzolized medium-loamy soil with a relatively small amount of humus (2–3 %), high saturation with bases and slight acidity. In the 0–20 cm horizon, the humus content (according to Tiurin) is 2.3%, the pH of the salt extract is 6, the amount of absorbed bases is 276 mg-eq./kg of soil, N (according to Kornfield) is 51.2, P_2O_5 (according to Chirikov) – 92 and K_2O_3 (according to Maslova) – 107 mg/kg of soil.

The elements of the crop cultivation technology consisted in placing it after its predecessor - winter wheat. After harvesting winter wheat, the stubble was husked and plowed into 25–27 cm deep with plowing of 30 t/ha of siderat. Potatoes were planted in the second decade of April with a row width of 70 cm. The feeding area of each plant was 70 x 35 cm (2450 cm²), or 40.9 thousand bushes per 1 hectare, the registered area of the plot was 24.5 m².

The degree of damage to tops by late blight was assessed according to an international nine-point scale, in particular: 9 points – no damage to the above-ground part of plants (tops); 8 – isolated spots of plant damage; 7 – damage to the leaf surface of plants by 5–15%; 6 – damage to the leaf surface of plants by 16–25%; 5 – damage to the leaf surface of plants by 26–40%; 4 – damage to the leaf surface of plants by 41–50%; 3 – damage to the leaf surface of plants by 51–70%; 2 – damage

3 Gupta V.K. True Potato Seed – An Alternative Technology for Potato Production in North-eastern Hill Region. CPRI, Shimla, 2004. P. 1–21; Kolbe H. Untersuchungen zur Bedeutung des Nitrat-gehaltes in Kartoffelknollen. Kartoffelbau. 1987. Bd. 38. No.3. P. 105–109; Lytvyn O.F., Dudar I.F. New prospective variety of Stepania potatoes. XXIII International scientific and practical conference «Theoretical and scientific bases of actual tasks», June 14–17, Lisbon, Portugal; Vlokh V.G., Lytvyn O.F., Dobrovolskyi R.S. A new variety of Pyshna potatoes. Bulletin of the Lviv SGI: agronomy. 2003. No. 7. P. 266–270; Dudar I., Lytvyn O., Bomba M., Dudar O. Prospects for the production use of a new Knyazha potato variety. Bulletin of the Lviv National Agrarian University: agronomy. Lviv. Lviv. national agrarian Univ. 2021. No. 25. P. 115–120; Dudar I., Lytvyn O., Bomba M., Dudar O. Prospects for the production use of a new Knyazha potato variety. Bulletin of the Lviv National Agrarian University: agronomy. Lviv. Lviv. national agrarian Univ. 2021. No. 25. P. 115–120; Dudar I., Lytvyn O., Bomba M., Dudar O. Prospects for the production use of a new Knyazha potato variety. Bulletin of the Lviv National Agrarian University: agronomy. Lviv. Lviv. national agrarian Univ. 2021. No. 25. P. 115–120; Dudar I.F. The influence of the level of mineral nutrition on the formation of economically valuable traits in intervarietal hybrids of potatoes in the Western Forest-Steppe zone of Ukraine: autoref. thesis ... candidate s.-g. of science Dublyany, 1998. 17 p.; Dudar I.F., Lytvyn O.F., Dobrovolskyi R.S. Nitrate content in tubers of generative potato hybrids depending on the level of mineral nutrition. Potato farming. Interdepartmental thematic scientific collection. 2000. Issue 30. P. 135–139; Potato Breeding in India. /S.K. Luthra, S.K. Pandey, B.P. Singh [et al]. Shimla: Central Potato Research Institute, 2006. P. 3–71.

to the leaf surface of plants by 71–80% and 1 point – damage to the leaf surface of plants by 81–100%.

The starch content in the tubers was determined in laboratory conditions by the specific mass of the tubers. Calculations were made according to the formula of B.P. Nazarenko:

$$K = 264 \frac{B}{B} - C$$

where K – starch content in tubers, %;

B – mass of tubers in air, g;

B – mass of tubers in water, at a water temperature of 17.5°C;

C – non-starchy part of tubers = 6.

Nitrate content in tubers was determined using an ion-selective electrode according to Samokhvalov's method (1984). Harvest accounting was carried out by continuous collection and weighing of all collected tubers from each plot. The structure of the crop was determined by the weight method.

Potato varieties and hybrids of different origins with characteristically high economic and valuable indicators were used for crossing (Karpatskyi, Polonyna, Apta, Mavka, Slava, Naroch, hybrids 361-80, 315-84 Lugovska, Sozh, Zarevo, Ghanola).

Karpatskyi. Created as a result of intsuht from an endemic form of potato found in the Ukrainian Carpathians, it is widely used in potato breeding.

The variety is high-yielding, high-starch, late, universal. Field resistance to late blight is high. Cancer resistant

The tubers are large, red, round-oval. The pulp is white, it does not darken during cooking, the taste indicators are good.

Today, this variety is included in the pedigree of many domestic potato varieties (Mavka, Verkhovyna, Polonyna, Voryna, Olia, Lysonia, Slava, Vatra, Pishna, Duzha, Lugovska, Malych, Kupava, Oksamyt 99, Kobza, Vira, Svitanok Kyivskyi, Vesta, Bozhedar, Nizhniovorotska, Prydesnianska, Kniazha, etc.) as a donor of a number of economically valuable traits, primarily high resistance against late blight in combination with an increased and high content of starch in the tubers⁴. With the participation of the Karpatskyi variety, a significant number of encrypted numbers were created, which are used in the selection process to create competitive varieties.

Polonyna. Created by crossing the Kyivskyi rannii and Karpatskyi varieties. Late ripening Universal use. Resistant to cancer, highly aggressive races of late blight and viral diseases, has low resistance to Alternaria. Tubers are flesh-pink in color, round and oval with a blunt top and a flattened stolon trace. The pulp is white. The taste qualities are high. The starch content is 17.4–20.3 %. The va-

4 New potato hybrids. /U. M. Răpăgău, U. X. Ukpéj, U. M. Cjămtădătvk, R. Oăpkogn. Shimla: Central Potato Research Institute, 2005. P. 3–44.

riety is characterized by good tuber stability, suitable for mechanized planting and harvesting.

Apta. Created by crossing an interspecific hybrid with the Hindenburg variety. The variety is medium-late, high-yielding, medium-starchy. Resistant to cancer and twisting virus, relatively resistant to late blight.

The tubers are white, round and round-oval, the eyes are shallow. The flesh is light yellow.

Mavka. Created by crossing Apta x Karpatskyi varieties. The variety is high-yielding, medium-starchy, medium-early, universal, resistant to cancer, has field resistance to late blight and viral diseases.

The tubers are white, short-oval and oval, slightly flattened with a blunt top. The flesh is white, does not darken when cut and after cooking. Taste indicators are excellent.

Slava. Created by crossing Mavka x Poliska rozheva varieties. Medium-ripe, high-yielding, has high field resistance against late blight, cancer and viral diseases. Starch content 14.8–15.8 %. The tubers are white, round, and the eyes are superficial. The flesh is white, does not darken during cooking. Taste indicators are good [2].

Naroch. Created by crossing hybrids 1036-057 x 955-075 with subsequent individual selection. Late ripening, for table use. Resistant to cancer and potato nematode. High-yielding, medium starch. Tubers are rounded and flattened with a blunt top. The flesh is creamy, the taste indicators are good.

Hybrid 361-80. Created in the process of inbreeding with a preliminary crossing of F3 [Sternneragis x 588-68 (Verkhovyna x Yubel)]. Late ripening, high-yielding, has high field resistance against late blight and viral diseases. Not resistant to cancer. Starch content is average. Stores well.

The tubers are large, white, round-oval. The flesh is white, does not darken when cut and after cooking.

Hybrid 315-84. Created by crossing Kardia x 588-68 (Verkhovyna x Yubel). Medium-ripening, high-yielding, medium-starchy, phytofluoride-resistant, cancer-resistant, highly resistant to viral diseases. Stores well.

The tubers are white, round and elongated. The flesh is white, does not darken when cut and after cooking.

Lugovska. Created by crossing hybrids 164-1s/72 x 60s/73. Zoned since 1987. Medium-ripe. Dining purpose. Taste indicators 4.0–4.2 points. It is characterized by high field resistance against late blight, *Alternaria* and the most common viral diseases. The tubers are oval, light pink with a superficial layer of cells. The pulp is white and does not darken during cooking. The starch content is 15-16.4%. High-yielding. Stores well.

Zarevo. Created by crossing the 7692c/68 hybrid and the Bekra variety. Zoned since 1983, medium-late. Universal purpose. It is characterized by high field resistance against phytophthora, Alternaria and common scab, moderately affected by viral diseases. The tubers are pink, round-oval, with a blunt top and flattened umbilical cord. The skin is reticulated. The lids are superficial. Potatoes are highly nutritious. Starch content – 21.4–22 %, sometimes up to 30%, protein – 2.3–3.8 %. The taste rating is 4.8–5 points. The pulp is white, does not darken when cut.

Sozh. Created by crossing hybrids 1036-0102 x 1002-08. Late ripening, for table use. High-yielding, medium-ripening.

Resistant to cancer and potato nematode, cleans the soil of affected areas by 66.5% and has high field resistance to the complex of potato mosaic viruses. The tubers are round-oval in shape, the eyes are shallow, the flesh is creamy.

Granola. Created by crossing Zushtamle 333/60 x 267.4. Nematode resistant. Resistant to phytophthora, scab, viruses, mechanical damage, but unstable to cancer. The bush is upright, tall. The stems are small-branched. Inflorescences are red-purple. The formation of berries is rare. The tubers are white, round-oval in shape, and store well.

Research results. The effectiveness of selection work in the field of potato growing depends on various factors, among which the selection of parental pairs for crossing and the conditions for growing generative hybrids occupy a prominent place⁵.

In this direction - the peculiarities of the formation of economically valuable traits in intervarietal hybrids of potatoes depending on the combination of parental components - we have been conducting selection work for many years⁶.

It was established that for the creation of qualitatively new raw material with a complex of economically valuable traits, the most appropriate combination of parent pairs using potato varieties and hybrids obtained with the participation of the Karpatskyi variety. In addition, based on the study of the relationship between economically valuable traits (yield, content of starch and nitrate compounds in tubers), the possibility of creating high-yielding, high starch content in tubers,

5 Shuvar I., Korpita H., Balkovskiy V., Shuvar A. Peculiarities of yield formation of potato depending on the climate conditions of the western forest steppe of Ukraine. E3S Web of Conferences. 254, 02016 (2021). Scopus. <https://doi.org/10.1051/e3sconf/202125402016>. https://www.e3s-conferences.org/articles/e3sconf/abs/2021/30/e3sconf_farba2021_02016/e3sconf_farba2021_02016.html; Agro-ecological bases of growing potatoes in the agroecosystems of Polissia: monograph / Shuvar I. A. et al., edited by I. A. Shuvara. Zhytomyr: Buk-Druk LLC, 2021. 192 p.; Binert B. I., Shuvar I. A., Korpita G. M. Yield and quality of potato tubers depending on the method of pre-planting soil cultivation in the conditions of the Western Forest Steppe. Bulletin of the Lviv National Agrarian University: agronomy. 2019 No. 23. P.45–48. Vlokh V., Dudar I., Lytvyn O. and others. New achievements in the selection of potatoes with the effective use of a genealogical population with the participation of the Karpatskyi variety. Bulletin of the Lviv National Agrarian University: agronomy. 2017. No. 21. P. 232–238.

6 Vlokh V.G. Use of biological potential in potato breeding. Scientists of the Lviv State Agrarian University of Production. Lviv: LDAU, 2005. Issue V. S. 18–20.

potato varieties and hybrids that accumulate nitrate compounds below the maximum permissible level has been proven⁷.

It was also established that each combination of parental pairs gives a significant splitting of the offspring in terms of yield (Figs. 1, 2, 3).

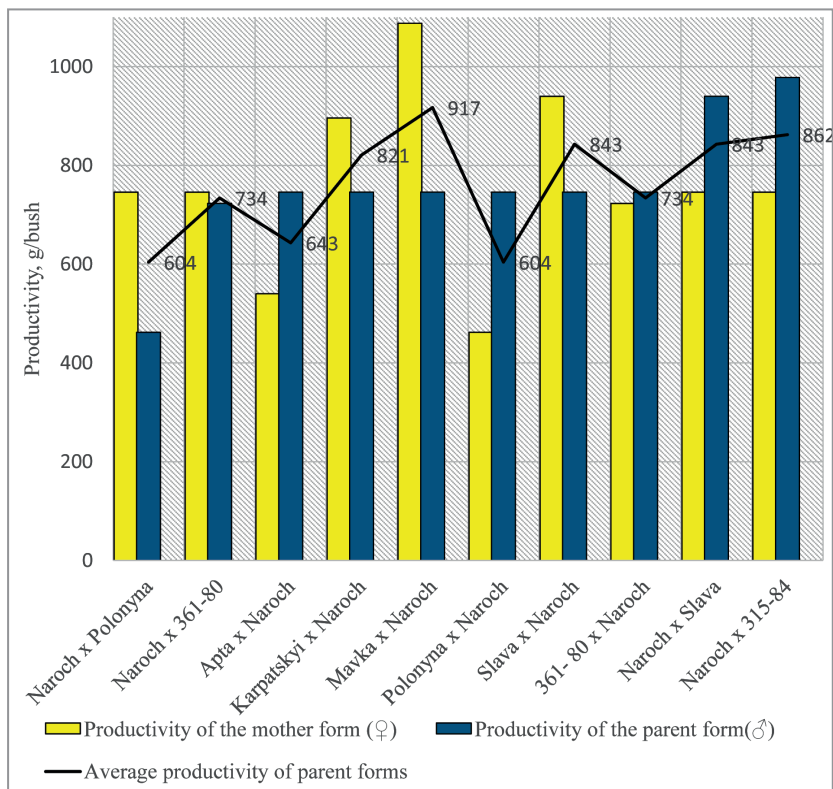


Fig. 1. Productivity of potato parent forms (average for 1991-2017), g/bush

Research results show that in each hybrid combination, along with high-yielding offspring, there are also low-yielding ones, as well as forms whose productivity approached the average yield of the parental forms.

The highest average yield was provided by the hybrids obtained by crossing the Naroch variety with the 315-84 hybrid (721 ± 60 g/bush). This combination has the highest percentage of hybrids (30.8) with a yield that exceeds the yield of the parental forms

⁷ Zaviryuha P. Potato varieties selected by the Lviv NAU as a factor in the intensification of potato growing. Scientific and practical aspects of agro-industrial production and development of rural regions: materials of the International. science and practice Forum. Lviv, September 21-24, 2011. Lviv, 2011. P. 6-14; Vlokh V.G. Use of genetic resources of plants of the Ukrainian Carpathians in potato selection Visnyk of the Lviv National Agrarian University: agronomy. 2009. No. 13. P. 105-109; Vlokh V.G., Dobrovolskyi R.S., Dudar I.F., Lytvyn O.F. etc. Effectiveness of using endemics of the Ukrainian Carpathians in potato selection. Bulletin of the Lviv National Agrarian University: agronomy. 2010. No. 14(1). P. 6-10; Shuvar I.A. Prospects of «second bread» [Electronic resource] Agribusiness today. 2011. Mode of access to the resource: <http://www.agro-business.com.ua/2010-06-11-12-53-00/952-l-r.html>; Shuvar I.A., Korpita H.M. The influence of weediness and herbological protection of agrocenosis on the yield of potato tubers and their correlation dependence. I international scientific internet conference: Current state of science in agriculture and nature management: theory and practice (November 20, 2020). Ternopil 2020. P. 214-216.

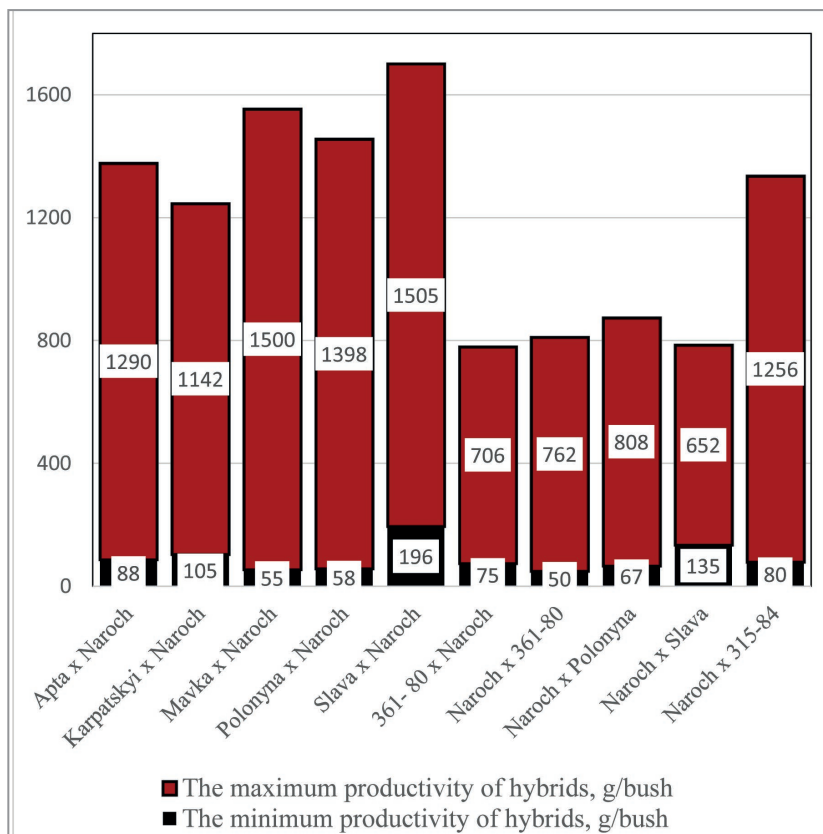


Fig. 2. Extreme variants of hybrid productivity (average for 1991–2017), g/bush

A high average yield (695 ± 51 g/bush) was also obtained from seedlings of the Mavka x Naroch combination, in which a significant proportion of hybrids (15.7 %) provided a higher yield than the varieties used for crossing. The lowest average yield was in the combination of varieties Naroch x 361-80 and Naroch x Polonyna - 370 ± 22 and 342 ± 24 g/bush, respectively, and no forms with a yield of more than 1000 g/bush were found.

In the combination of Naroch x Slava varieties, hybrids with high yields emerged - up to 1652 g/bush.

In reciprocal crossings with the Naroch variety, higher results were obtained with its participation in the role of the parental form. Thus, the descendants of the Polonyna x Naroch varieties provided an average yield of 482 ± 47 g/bush, and in the reciprocal combination of Naroch x Polonyna - 342 ± 24 g/bush. A similar pattern can be observed in crossings with the Slava variety and the 361-80 hybrid, the difference between the average yield was 649 ± 34 vs. 523 ± 45 g/bush and 440 ± 40 vs. 370 ± 22 g/bush, respectively.

Thus, the distribution of potato hybrids of the first tuber generation in terms of yield was uneven and depended on the genetic characteristics of the parental forms and their combining ability for this trait.

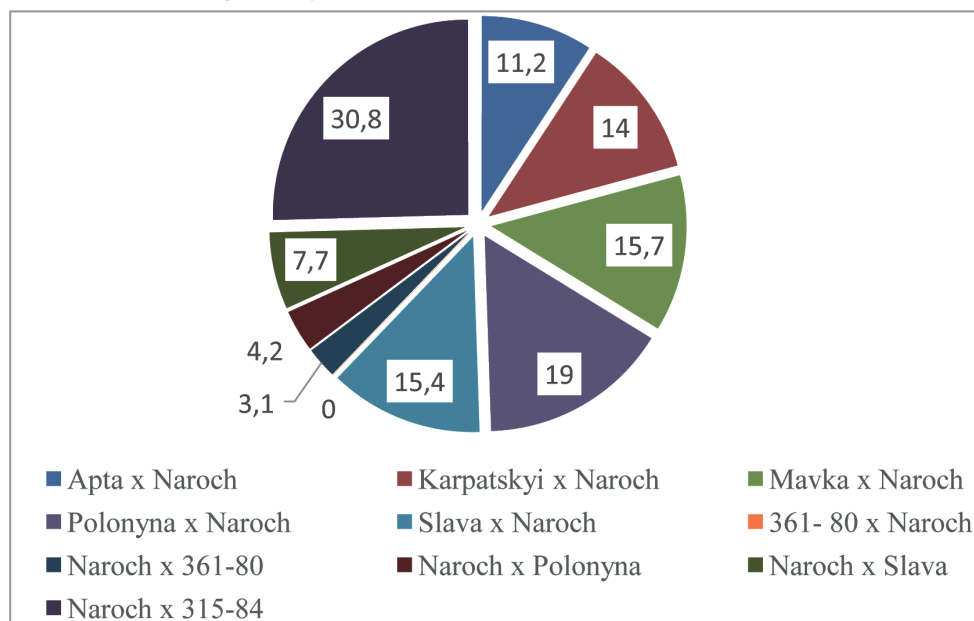


Fig. 3. Productivity of hybrids exceeding the yield rate of parental forms (average for 1991–2017), %

The obtained experimental data confirm the polygenic nature of the yield trait. Productivity is controlled by both dominant and recessive genes. Therefore, dominant, recessive and intermediate inheritance of this trait is observed. Selection for crossing the most productive parental forms does not always ensure obtaining high-yielding hybrids. The greater importance in this belongs to the combining ability of varieties according to this feature. Involvement in the process of crossing forms of low yield, but good combining ability in terms of yield, makes it possible to obtain a large number of high-yield hybrids as a result of heterosis.

On the basis of our accompanying multi-year studies of the effect of the level of mineral nutrition on the formation of economically valuable traits in intervarietal hybrids of potatoes in the Western Forest-Steppe zone of Ukraine, it was established that the differentiated use of fertilizer backgrounds at the primary stages of selection of this crop ensures the targeted selection of the necessary forms as a starting material for economically valuable traits for practical selection. The obtained results of the experimental research significantly expanded and supplemented the theoretical basis for the creation of new potato varieties suitable for cultivation using intensive technologies (suitable for cultivation using intensive technologies even under global

climate changes!), and also expanded the possibilities of using the provided selection of forms for practical selection from various combinations crosses ⁸.

On the basis of many years of research, we have established that the differentiated application of fertilizer $N_{45}P_{45}K_{60}$ (background A) and $N_{90}P_{90}K_{120}$ (background B) at the initial stages of selection ensures a purposeful selection of desired potato forms based on economic and valuable characteristics.

The results of the hybridological analysis indicate that the vegetative offspring of the same combinations of crossings, but grown on different backgrounds of mineral nutrition, show different ability to form signs of yield, starch content, accumulation of nitrates in tubers ⁹. Considering that, special interest among combinations is manifested by the frequency of appearance of complex positive transgressive forms.

In the process of analyzing the material, we isolated from each combination complex transgressions that combine in one genotype such important features as yield (≥ 750 g/bush), starch content ($\geq 15\%$) and nitrate content in tubers (≤ 150 mg/kg raw masses). It was established that the formation of positive transgressive forms in vegetative offspring depended on mineral fertilization (background A) of generative hybrids (Fig. 4).

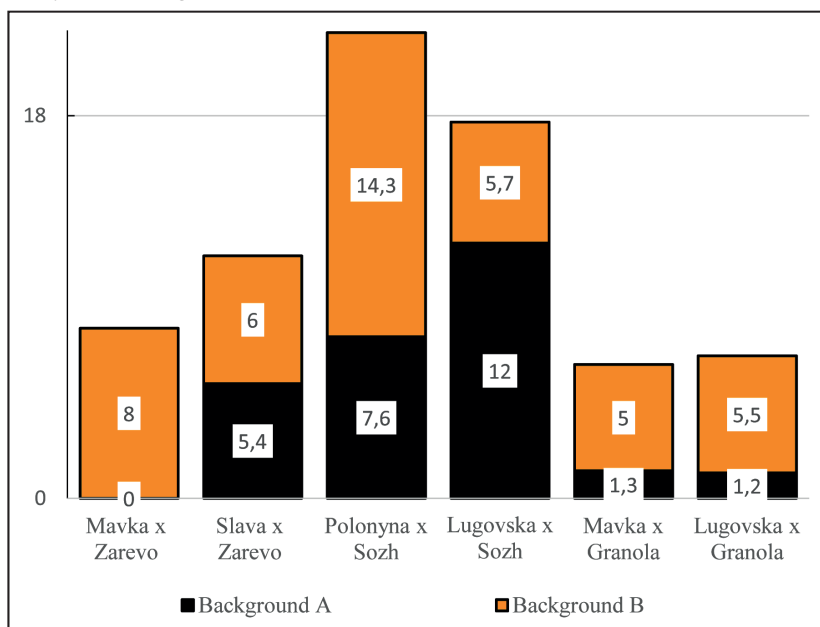


Fig. 4. Formation of positive transgressive forms in vegetative offspring depending on mineral fertilization (background A – $N_{45}P_{45}K_{60}$) of generative hybrids, %

⁸ Osypchuk A.A. Potato breeding at the beginning of the 21st century. Potato growing in Ukraine. 2005. No. 1. P. 7–8.

⁹ Podgaetskyi A.A. Characteristics of potato genetic resources and their practical use. Genetic resources of plants. Kyiv, 2004. No. 1. P. 103–109; Productivity of spring barley and potatoes in agroecosystems of the western forest-steppe of Ukraine: monograph. I. A. Shuvar, H. M. Korpita, A. V. Yunyuk. Lviv: Ukrainian Technologies, 2019. 150 p.

In the first group of crosses with the Zarevo variety, the most complex transgressive forms are formed in the vegetative offspring of the Mavka x Zarevo varieties (background B). In this combination, on the background A, no hybrids with traits that could combine a high starch content with high productivity and, accordingly, with a low nitrate content in tubers, were found.

In the combination of Slava x Zarevo varieties, complex transgressive forms emerged on both backgrounds, which accounted for 5.4% and 6.0% of the total number of hybrids, respectively.

In the second group of crossings, where the Sozh variety was used as the parental form, were more productive in terms of the formation of complex transgressive forms in terms of yield, starch content in tubers and nitrate compounds the combinations Polonyna x Sozh (background B – 14.3 and background A – 7, 6 %) and Lugovska x Sozh (background A – 12 % and background B – 5.7 %).

In the group of combinations with the Granola variety, the largest number of complex transgressive forms was found among hybrids that were grown on the background B (5.5 %) in the Lugovska x Granola combination, while on the background A of this combination, a small number (1.2 %) of complex transgressive forms were formed forms

It was also investigated that an unequal number of positive transgressions appeared in vegetative offspring depending on mineral fertilization $N_{90}P_{90}K_{120}$ (background B) of generative hybrids (Fig. 5).

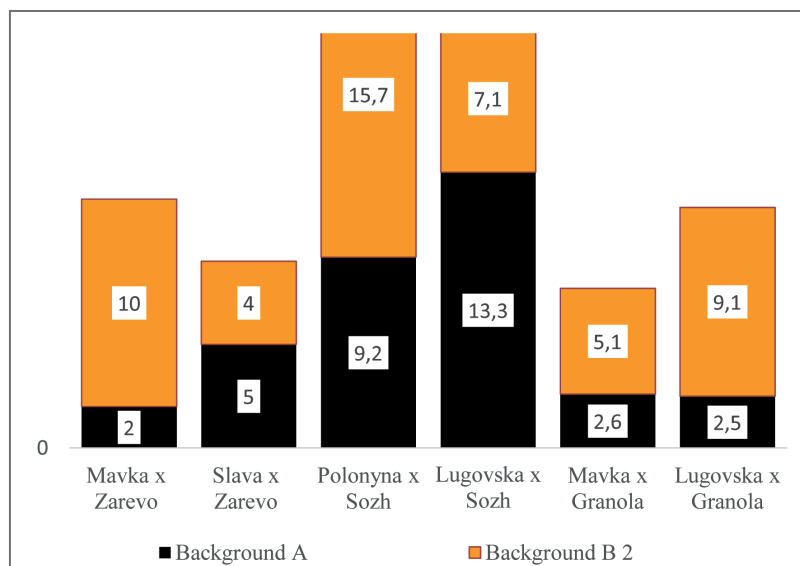


Fig. 5. Formation of positive transgressive forms in vegetative offspring depending on mineral fertilization (background B – $N_{90}P_{90}K_{120}$) of generative hybrids, %

In the group of crossings with the Zarevo variety, the largest number of transgressive forms was formed on the background B (10.0%) of mineral fertilizer in the combination of Mavka x Zarevo varieties, and on the background A – only 2.0 %.

In the group of combinations, where the Sozh variety was used as the parent form, the largest number of complex transgressive offspring was formed among hybrids from the crossing of Polonyna x Sozh varieties (background B – 15.7 %, background A – 9.2 %). A small percentage of the above-mentioned forms was found in the combination of Lugovska x Sozh varieties. Thus, on the background B of mineral nutrition of plants, their number was 7.1 %, and on the background A – 13.3 %.

In the third group of crossings, where the Granola variety was used as a pollinator, the most hybrids with complex transgressions were formed in the descendants of the combination of the Lugovska x Granola varieties (background B – 9.1 %). However, on background A, this indicator was not high and was 2.5 % of the total number of seedlings.

In the combination of Mavka x Granola varieties, both on background A (2.6 %) and on background B (5.1 %), a different number of complex transgressive forms was formed in the vegetative generation.

Thus, the combination of Polonyna x Sozh, Lugovska x Sozh, Mavka x Zarevo varieties is more valuable for practical breeding in terms of economically valuable traits.

According to the competitive variety test, the selected seedlings 305-10, 501-2, 607-42, 604-26, 607-42 are candidates for new potato varieties.

Hybrid 305-10. Created by crossing Lugovska x Sozh varieties as a result of growing generative offspring on the background A. Bulbs are white, round. The lids are superficial. Mid-late High-yielding. The starch content is 18.7–19.6 %. Stores well.

Hybrid 501-2. Created by crossing Karpatskyi x Zarevo varieties as a result of growing generative offspring on the background B. Bulbs are pink, round. The lids are superficial. Late ripening High-yielding. Resistant against late blight. The starch content in tubers is 23.9–24.8 %. Stores well.

Hybrid 604-26. Created by crossing Polonyna x Sozh varieties as a result of growing generative offspring on the background B. The bush is compact, well-foliated. Potatoes are white, round. The eyelids are shallow, few in number. Medium-ripe, high-yielding. Relatively resistant to late blight. The starch content is 13.0–14.5 %. Stores well.

Hybrid 607-42. Created by crossing Mavka x Granola varieties as a result of growing generative offspring on the background A. The tubers are white, round-oval. The lids are medium. Medium ripe. High-yielding. Resistant against late blight. The starch content is 12.8–13.9 %. Stores well.

Many years of breeding work with potato culture has produced positive results. The varieties Lysonya, Dublianka, Pyshna and later the new varieties Duzha, Kniazha, Stepaniya were created¹⁰.

Newly created potato varieties of the Lviv National Environmental University have theoretical and practical value for breeding and are widely used in agricultural production.

Proposals regarding the introduction of new varieties into production are based on the generalized data of the state variety testing of the Ukrainian Institute of Plant Varieties Expertise. Characteristics of newly created and promising potato varieties of the Lviv NUP.

Pyshna variety (Fig. 6). Crossing of Polonyna x Granola varieties was created. The variety is medium-early (from planting to the death of the above-ground mass - 92-111 days), for table use, with good culinary and taste properties. The tubers are short-oval in shape with a blunt top, white, the skin is smooth, the eyes are shallow, the flesh is creamy. The average weight of the tuber is 65–95 g. The starch content in the tuber is 14–17 %. Resistant to cancer, potato nematode; has increased resistance to late blight, common scab, and viral diseases. The potential yield of tubers of the variety is up to 60 t/ha. The bush is semi-erect, multi-stemmed, low to medium in height, well-foliated. The variety is characterized by multi-bulbs, evenness of tubers, compactness of the nest. The variety has been recommended for growing in the Polissia and Forest-Steppe zones since 2010¹¹.

Kniazha variety (Fig. 7) is a mid-early table variety, with good culinary and taste properties of the tubers (8.2 points). The tubers are round in shape, white, the skin is smooth, the eyes are shallow, the flesh is creamy. The average weight of the tubers is 89 g, the starch content in the tubers is 18.3%. Resistant to late blight (8.7 points). Marketability of tubers is 92%. Based on the analysis of the data of the three-year trial of the State Service for the Protection of Rights to Plant Varieties, the Kniazha variety is recommended for cultivation from 2021¹².

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Fig. 6. Pyshna potato variety



Fig. 7. Kniazha potato variety

It is possible to effectively realize the natural resource and adaptive potential of the presented potato varieties only by optimizing the agrotechnical conditions of their cultivation.

Thus, in the conditions of the Western region of Ukraine, the effectiveness of breeding work depends on the selection of parental pairs for crossing and the conditions for growing generative hybrids. The created potato varieties and hybrids meet the requirements of modern agricultural production and are characterized by high potential yield, disease resistance, high starch content and other economically valuable features.

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