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IMPACT OF PARENTAL FORMS ON THE PHENOTYPIC PERFORMANCE CHARACTERISTICS IN THE PROGENY OF SOME UKRAINIAN POTATO VARIETIES AND LINES

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Aim. To evaluate the impact of parental forms on phenotypic performance characteristics in the progeny of some Ukrainian potato varieties and lines, to determine the most profitable crossings in terms of breeding for higher yield and product quality. **Methods**. Field experiments, laboratory analysis, statistical methods. The study involved 973 clones obtained by 85 crossings using 15 potato varieties of ukrainian breeding. The parental material was produced in the laboratory of potato breeding at the Polissia Experimental Department of the Institute for Potato Research, the NAAS using sexual seed. **Results.** When female source material of the Ukrainian varieties Javelina, Mezhyrichka 11, Predslava, Sontsedar, Vyhoda, and Vzirets were used in crossings, yield increased by 4.1–6.1 t/ha as compared to parental forms. An increase in average tuber weight of 7–18 g in the progeny was obtained by using the varieties Alliance, Ivankivska rannia, Javelina, Mezhyrichka 11, Radomysl and Vzirets as female; this was 9–17 g for male material of varieties Alliance, Mezhyrichka 11, Opillia, Rostavytsia, Vyhoda and Vzirets. The progeny, obtained using Fanatka, Javelina, Mezhyrichka 11, Svitana, and Vyhoda as female, had a 1.5–3.2 % higher starch content compared to parental forms, this was 1.5–2.3 % for progeny of Alliance, Javelina, Mezhyrichka 11, Opillia, Rostavytsia, Sontsedar, Svitana, and Vyhoda used as male. The average score of consumption quality characteristics of the progeny exceeded parental forms only by 0.1–0.2 point, it was highest for progeny when using Fanatka, Mezhyrichka 11, Radomysl, Svitana and Vzirets as female, and Alliance, Bazhana and Javelina as male. A decrease of 0.1–0.3 points in consumption quality characteristics was obtained for male progeny of Bazhana, Mezhyrichka 11, Rostavytsia and Vzirets. **Conclusions.** It was confirmed that characteristics of parental forms played a decisive role in forming quantitative and qualitative traits, which was a more critical factor than their place in the crossing scheme. It was also found that the genotype of the maternal component had a considerable impact on the yield level in the progeny, which highlighted the relevance of the accurate selection of the maternal form. The best performance was observed in clones created using the varieties Alliance, Javelina, Mezhyrichka 11, Svitana, Vyhoda and Vzirets. This concerned yield, average tuber weight, starch content and consumption quality, which confirmed previously found regularities: high performance was positively correlated with tubers weight (r = = 0.33–0.76), whereas it was negatively correlated with starch content (r=–0.59) and large tuber size (r = –0.45–0.67), the latter only in case of progeny obtained from maternal material.

Key words: potato, *Solanum tuberosum*, varieties, progeny, quantitative and qualitative indices of performance, correlation.

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INTRODUCTION

The classical method of potato breeding is based on crossing tetraploid parent material (male, via pollen and female, via pistil), selected based on their phenotype, in order to create a genetic variation in the progeny (Caligari, 1992; Bradshaw and Mackay, 1994, Bradshaw, 2021; Zaviriukha, 2022).Identification of parental genotypes with the best characteristics for the creation of new varieties remains the main task of breeding, whether in its classical form or when using diploid hybrids or molecular marker-assisted breeding (Acquaah, 2007; Bradshaw and Bonierbale, 2010;

Zaviriukha 2022; Adams et al, 2022, Bradshaw, 2022; Furdyga, 2022 and Hojsgaard et al, 2024).

The search for suitable parents involves the study of genetic diversity and structure of populations, the search for promising parental combinations within collections, and the crossing to create genetic variations. A further selection is made based on clonal multiplication via tubers and evaluation of target characteristics (Bonierbale et al, 2020; Jo et al, 2022).

This clonal production and selection is long and requires at least eight, but sometimes even more than ten years. In addition, there are frequent practical difficulties with the transfer of specific features or properties of parental organisms to their progeny since they may be combined and recombined in different ways in each particular genotype obtained from seed (Zakharchuk, 2014; Watanabe, 2015, Jansky and Spooner, 2018; Bradshaw, 2022).

Bonierbale et al (2020) noted that the best progeny is often obtained only in a few out of many crossings, since most of them do not result in the formation of seeds or progeny with target features. Furthermore, it is important to determine the optimal genotypes of parental forms before crossing to determine the role of each parental form as a maternal or male component (Zaviriukha, 2023).The high heterozygosity of parental material contributes to the creation of significant genetic diversity in the population, which allows for the production of progeny with more pronounced desirable traits such as appearance, yield, pest and disease resistance, preparation, processing and organoleptic properties (Furdyga, 2010, Furdyga et al, 2017; Muthoni et al, 2012; Jansky and Spooner, 2018; Ilchuk and Ilchuk, 2021; Pandey, 2021;Pysarenko et al, 2022, 2023; Salgotra and Chauhan, 2023).

To improve breeding material, it is important to assess the level and nature of the variability of productive traits in the newly developed breeding material and compare them with the properties of the parental forms. There is currently no apparent consensus on whether the female or male parent is more important for the development of specific productive traits in the progeny or that there is no difference. In our study we hypothesize that this influence may vary, depending on the trait in question (Kravchenko, 2018, Bradshaw, 2000, Zaviriukha (2022). Some studies seem to indicate a more significant influence of the male while others (e.g. Kravchenko et al, 2018) indicate that the female is superior in determining productivity. This suggests that the influence of the parentals may be specific to certain traits and vary depending on the combination of these genotypes used in the crossing.

The aim of the study is to evaluate the phenotypic expression of some qualitative and quantitative performance characteristics in newly developed breeding material, using Ukrainian varieties and lines as parents in comparison with those of these parents.

MATERIAL AND METHODS

The study was conducted in 2021–2023 under field and laboratory conditions at the Polissia Experimental Department of the Institute for Potato Research, the NAAS, Polissia Ukraine.

Plant material. The study involved 973 clones obtained by 85 crossings (with an average of 11 clones per crossing), where the following 15 varieties, presented below and in **Table 1**, served as parental components:

Alliance: High resistance to potato scab (*Streptomyces* spp.) and potato tuber nematode (*Ditylenchus destructor*). Entered into the State register in 2020. Recommended cultivation zones in Ukraine – Forest-Steppe and Polissia.

Bazhana: Yield 40–45 days after germination, 8.0–9.5 t/ha. High resistance to common scab, and stem nematode.

Fanatka: Moderate resistance to tuber soft rot (*Pectobacterium* and *Dickeya* spp.) and potato tuber nematode. Entered into the State register in 2023. Recommended cultivation zones in Ukraine – Forest-Steppe and Polissia.

Ivankivska rannia: Yield 40–45 days after germination, 12.0–13.5 t/ha. Entered into the State register in 2015. Recommended cultivation zones in Ukraine – Forest-Steppe and Polissia.

Javelina: Moderate to high resistance to early blight (*Alternaria* spp.). Moderate resistance to tuber soft rot, potato tuber nematode, potato scab. The variety was submitted to the State Variety Testing for 2023.

Mezhyrichka 11: Yield 40–45 days after germination, 7.0–9.0 t/ha. Moderate resistance to potato tuber nematode. Entered into the State register of crop varieties suitable for spreading in Ukraine in 2014. Recommended cultivation zones in Ukraine – Forest-Steppe and Polissia.

Opillia: No change in color after boiling. The flesh has a powdery consistency and a crumbly texture with a pleasant, rich aroma. Moderate resistance to potato tuber nematode. Suitability for second cropping in

Table 1. Parental varieties used for crossing as male or female in this study with their characteristics as given by the Ukrainian State register

Variety	Type	Potential yield at day 60,ton	Final yield at harvest, ton	Marketable %, ware	Average weight of tubers, g	Tubers per plant	Starch content, %	Dry matter, %	Consumption quality	Cooking type	Skin colour, eye depth, shape	Flesh colour	Resistance potato wart	Resistance cyst nematodes	Resistance potato rust	Resistance late blight	Resistance drought	Resistance viruses
Alliance	ME, C	7–10	36–48	80–86	49–72	10–16	13.4–14.6	20.5	7.4–7.9	B	R, S, O	cream	Common, 3 aggr.	–	++	+	++	n.d.
Bazhana	E, C	6–10.5	33–37	84–90	67–89	8–12	15.4–17.0	24.2	7.9–8.3	B	B, D, R	white	Common, 2 aggr.	+	+	–	++	FR
Fanatka	ME, C	9–12.5	36–40	85–95	52–78	10–14	13.2–15.0	17.9–20.4	8.0–8.3	B	R, S, LO	cream	Common, 2 aggr.	+	–	+	++	FR
Ivankivska rannia	ME, C	8–11	42–46.5	89–94	52–92	8–12	14.4–16.9	22.2–24.0	7.7–8.0	A	R, S, RO	cream	Common	–	–	–	+	FR
Javelina	ME, C	4–7.5	28.2–42.5	83–88	52–74	6–8	13.6–15.4	21.2	7.8–8.0	A	R, S, O	yellow	Common		+	–	++	FR
Mezhyrichka 11	ME, C	8–9.5	35.5–43	86–90	50–69	10–14	14.6–15.7	22.2.	8.2–8.6	A	P, S, R	white	Common	–	++	–	+	FR
Opillia	E,	9–11.5	37.1–45	80–92	49–86	6–10	16.0–17.8	21.0–24.4	7.4–8.2	B	Y, S, R	creamy	Common, 2 aggr.	+	+	+	+	FR
Partner	ME, C	9–10.5	42–45	86–92	56–89	7–10	15.3–16.6	24	8.1–8.4	B	B, S, O	yellow	Common	+	++	+	+	n.d.
Predslava	ME, C	4–6.5	38–45.4	80–88	45–68	14–18	15.6–17	23.7	7.5–8.0	A	Y S, R	cream	Common, 2 aggr.	+	++	+	+	
Radomysl	VE, C	12–17	50	88–96	53–86	8–15	14.8–16.7	22,5	7.8–8.0	A	P, S, RO	Light yellow	Common	–	++	+	++	FR
Rostavytsia	ME, C	5–8.5	35–38	91–93	57–82	8–10	14.4–16.2	19–22.2	8.5–8.8	C	R, S, O	yellow	Common	+	–	+	+	FR
Sontsedar	ME, C	7.4–10	32–35	88–92	55–84	10–14	14.0–15.6	22.7	7.8–8.2	A	R, S, O	cream	Common, 3 aggr.	–	++	+	+	FR
Svitana	ME, C	9.5–12.5	38–40	91–95	73–96	6–8	13.5–14.5	16.2–19.7	7.6–7.9	AB	Y, MD, O	cream	Common, 4 aggr.	–	–	–	++	n.d.
Vyhoda	E, C	10–13	35–42	88–93	50–88	6–10	13.5–15.7	18	7.8–8.1	A	Y, S, OR	Light yellow	Common, 2 aggr.	–	+	–	++	n.d.
Vzirets	VE, C	14–18	35.0–38.0	84–90	43–46	8–14	15.2–16.8	22.2	8.2–8.65	B	Y, S, OR	Light yellow	Common 3 aggr.	+	++	+	+	FR

Note. *Maturing: E = early variety, ME = mid-early VE = very early; L = Late; VL=very late; **Type: C = traditional, for cooking; P = processing *** eye placement: D = deep; MD = mid-deep S = superficial; Form: LO = long oval, O = oval, R = round, RO = round oval, OR = round oval; Cooking type: A = firmly cooking, B = mainly firm cooking, AB= firm/floury cooking, C = floury cooking; Common pathotypes of potato wart in Ukraine: 1(D1); Colour: B = beige, R = red, P = pink, W = white, Y = yellow; n.d. = not determined the south of Ukraine. Entered into the State register in 2020. Recommended cultivation zones in Ukraine: Forest-Steppe and Polissia.

Partner: Moderate resistance to scab and potato tuber nematode. Entered into the State register in 2009. Recommended cultivation zones in Ukraine – Forest-Steppe and Polissia

Predslava: Moderate resistance to bacterial ring rot (*Clavibacter sepedonicus*) and potato tuber nematode. Entered into the State register 2017. Rec-

Table 2 – The scheme of crossings using combinations of varieties and lines, both as male and female parent

Crossing		Nr of clones investigated	Crossing		Nr of clones investigated
♂	♂		♂	♂	
Alliance	Javelina, Ivankivska rannia, Charunka, Volodarka, P.05.52/28, P.10.10/35	64	Alliance	Vyhoda	15
Bazhana	Levada, N.11.8-8, P.15.57/1	23	Bazhana	–	
Fanatka	–		Fanatka	Javelina	38
Ivankivska rannia	–		Ivankivska rannia	Alliance, Poran	51
Javelina	Fanatka,	38	Javelina	Vyhoda Alliance, Partner, P.09.62/1, S.10.251-6	35
Mezhyrichka 11	Svitana	17	Mezhyrichka 11	Sontsedar Bellarossa, Dorohyn, N.13.117-1	56
Opillia	P.11.5-3	10	Opillia	–	
Partner	Javelina, Javelina, N.11.12-8, P.12.14-8	25	Partner	–	
Predslava	–		Predslava	Vyhoda, P.09.88/1, P.10.9-3, Rostavytsia	31
Radomysl	Vektor, Mag, P.15.57/1	43	Radomysl	Bellarossa, Svitana	58
Rostavytsia	Svitana, Levada, Nahoroda, Predslava	61	Rostavytsia	–	
Sontsedar	Mezhyrichka 11, P.10.10/35, P.12.48/8	48	Sontsedar	Zwizdal, N.09.8-14	7
Svitana	Vzirets, Radomysl, Vyhoda, P.10.10/35, P.13.9/1, VM.193/59	124	Svitana	Rostavytsia, Mezhyrichka 11,	42
Vyhoda	Javelina, Bohach, Predslava, Alliance, Blakyt, Yanka, P.09.27/9, VM.12.24-15	49	Vyhoda	Svitana	19
Vzirets	Palats, Vektar, Zorachka, Lilea, Dubrava, Serpanok, Batia, P.13.17-1; P.13.54-2, P.10.9-3	79	Vzirets	Svitana, Talachynskyi, P.12.14-8	40

ommended cultivation zone in Ukraine – Forest-Steppe.

Radomysl: No darkening when boiled. Entered into the State register in 2017. Recommended for cultivation in the Forest-Steppe zone of Ukraine.

Rostavytsia: Yield75 days after planting is 18.6 t/ha; High resistance to potato scab. Moderate resistance to early blight, *Fusarium* blight, and potato tuber nematode. Entered into the State register in 2023. Recommended cultivation zones in Ukraine – Forest-Steppe and Polissia.

Sontsedar: Yield 75 d after planting, 10.4 t/ha. High resistance to potato scab and potato tuber nematode.

Svitana: Rather high resistance to potato scab. Moderate resistance to tuber soft rot. Suitability for second cropping in the south of Ukraine. Entered into the State register in 2023. Recommended cultivation zones in Ukraine – Forest-Steppe and Polissia.

Vyhoda: Moderate resistance to potato tuber nematode and scab of tubers.

Vzirets: Suitability for second cropping in the south of Ukraine. Entered into the State register of crop varieties, suitable for spreading in Ukraine in 2017. Recommended for cultivation in all zones of Ukraine.

The parental material was produced in the laboratory of potato breeding at the Polissia Experimental Department of the Institute for Potato Research, the NAAS using sexual seed. Potato varieties, used in the study, were entered into the State register of plant varieties, (https://minagro.gov.ua/file-storage/reyestr-sortiv-roslin) suitable for spreading in Ukraine in different years (except for the varieties Bazhana (Utility model patent No. 210948 dated 30.11.2021) and Sontsedar (Patent No. 230700 dated 14.11.2023)). The variety Javelina is under investigation at the State Variety Testing Institute.

Field studies. The experimental field was located in the central part of Ukrainian Polissia, at 50°42′4″ north lat. and 29°21′14″ east long. at the height of 148 m above sea level. The annual precipitation amount fluctuated from 550 to 600 mm (https://malyn-rada.gov.ua/sites/default/files/photo/19-01-2024_strategiya_malyn_dlya_oprylyudnennya.pdf page 12).

Results of soil analysis of the experimental field used in our study (Laboratory Prime Lab Tech, protocol No. 2803-1/3-1 dated June 9, 2023)

Results of soil analysis

pH (exchangeable), units	4.7
pH (hydrolytic acidity), mmol/100 g	1.66
Electrical conductivity, mS/m	2.17
Soil organic carbon, %	0.9
Sum of adsorbed bases, mmol/100 g	1.8–3.6

Content of available forms in mg/kg of soil:

N (NH_4)	9.9
N (NO_3)	0.7–1.1
P_2O_5	62.3–93.9
K_2O	28.8–69

The experimental field was subject to a 1:4 crop rotation involving green manure fallow, potatoes, winter rye, and oats. The potato cultivation technology included the following measures. The area of the plot was 29.4 m^2. Forty plants were planted in two rows per plot. Planting of seed material (tubers) was carried out during the first and second decades of May, with a calculated planting density of 40.8 thousand tubers per hectare, following a planting scheme of 70 × 35 cm. The weight of the tubers was standardized within the range of 30–45 g. Mineral fertilizers were applied locally during the potato planting at a ratio of $N_{90}P_{60}K_{90}$. A resource-saving technology was applied to the potato crops, which involved forming large ridges with a rotary cultivator immediately after the emergence of shoots, when they were close to the soil surface. To control weeds the herbicides Zenkor 70 WG (metribuzin, 300 g/ha) and Neitrin BT (quizalofop-p-ethyl, 125 g/l) were applied. During the mass emergence of Colorado potato beetle larvae (beginning of the budding-flowering phase of potatoes), treatment of the crops was carried out with the insecticide Koragen (chlorantraniliprole, 200 g/l). When infections of alternaria and late blight occurred, spraying was done with the fungicide Kurtat® M (cymoxanil – 45 g/kg, mancozeb – 680 g/kg). Treatments were conducted according to the recommendations of the Institute of Potato Research of NAAS (https://ikar.in.ua/potato_intresting/technology/). Harvesting was carried out after the tubers reached physiological maturity, determined by the criteria of dying off the foliage and easy separation of the tubers from the stolons.

Yield was expressed in tonnes per hectare after weighing of all tubers/plot. The average tuber weight was determined by dividing the weight of a sample of 5 kg by the number of tubers in the sample (Bondarchuk et al, 2019, https://www.ikar.org.ua/_files/ugd/69bb4c_77462c9ea8804515b090c3254bffeada.pdf)ст.).

Laboratory analysis. The starch content was determined by sampling average undamaged tubers in two repeats using the principle of weighing by immersion based on specific weight (Nissen, 1955). The specific weight was determined at the controlled water temperature of 17.5 ^{o}C: weight in water × (weight in air − weight in water). The total weight of the sample was 5.0 kg. The principle of weighing by immersion was used in a standardized hydrostatic Reimann-Parow balance, according to Eckert (1975).

Consumption qualities were assessed by an organoleptic method on a 9-point scale, where 9 meant the highest expression of the trait (Bondarchuk et al, 2019, https://www.ikar.org.ua/_files/ugd/69bb4c_77462c9ea8804515b090c3254bffeada.pdf page 540–541). Each analyzed group of 11 potato varieties used as maternal forms and 12 varieties used as male forms, along with progeny created from 392 maternal form crosses and 581 from the male forms of the corresponding variety, were assigned ranks based on the phenological manifestation of productive indicators. The average rank for each potato genotype was determined by averaging all the evaluated productivity indicators.

During the study period (2021–2023), the weather conditions of the summer months differed from long-term norms in terms of both temperature and precipitation. *Temperature mode.* In 2021, the average monthly temperatures in June (25.9 ^{o}C), July (29.2 ^{o}C), and August (25.3 ^{o}C) exceeded the perennial indices (17.6, 18.7, and 17.8 ^{o}C respectively) considerably. In 2022, there was a moderate mode of temperatures, though June (21.4 ^{o}C) and August (22.9 ^{o}C) also exceeded the perennial norm. In 2023, regardless of cooler June and July, August (24.0 ^{o}C) demonstrated a significant exceeding of the perennial index by 6.2 ^{o}C, which created conditions for heat stress of plants. *Precipitation.* In 2021, the precipitation amount in June (20.3 mm) and July (15.7 mm) was much lower than the perennial indices (28.3 mm and 31.7 mm, respectively), whereas August (35 mm) exceeded the norm by 12.7 mm. In 2022, the largest precipitation amount was registered in July (25.3 mm), while June and August remained closer to the norm. In 2023, all months were notable for deficient precipitation, especially August (7.8 mm), which created unfavourable conditions for potato cultivation. Thus, the weather conditions in the investigated period were remarkable, with considerable deviations from the perennial norms, which had a negative impact on the growth and development of potatoes (http://cgo-sreznevskyi.kyiv.ua/index.php/uk/pro-tsho/struktura?id=132).

Statistical analysis. For statistical analysis Microsoft Excel was used. Correlation analysis (Pearson's correlation coefficient) was performed to evaluate the relationships between the characteristics studied. To compare average values between groups, the least significant difference (LSD) criterion was used at $p < 0.05$. Ranking and rank evaluation was applied to compare indicators with different units of measurement (e.g., yield in t/ha, average tuber mass in g, starch content in %, and consumer quality in points).

RESULTS

On average, in three years of studies, parental varieties with the highest *average yield* were Rostavytsia (12.0), Fanatka (12.2), Radomysl (12.4), Svitana (14.5) and Sontsedar (14.3 t/ha) (Table 1).The average yield for the clones, when using the parental variety as female, was 14.9 t/ha, while used as male,13.5 t/ha, which exceeded the average yield of the parental variety by 3.8 t/ha and 2.1 t/ha, respectively. The parental varieties Mezhyrichka 11, Vzirets, Javelina, Predslava, Sontsedar, and Vyhoda yielded the highest gain when used as female, 4.1 to 6.1 t/ha. The least gain in the yield was observed in the progeny of Rostavytsia, Bazhana, Mezhyrichka 11andVyhodawhen used as males,2.6 to 4.7 t/ha.

Lower average yield compared to the parents was noted in the progeny of Fanatka (as female) and Vzirets (as male). Maximum average yield was obtained in the progeny of the varieties Alliance, Bazhana, Ivankivska rannia, Mezhyrichka 11, Radomysl, Sontsedar, and Svitana in the crossing. Progeny of Radomysl and Svitana showed the widest fluctuation in minimum and maximum yield (**Table 3**).

When the parental varieties Alliance, Ivankivska rannia, Javelina, Mezhyrichka 11, Predslava, Radomysl, Sontsedar, and Vzirets were used as female, more than 60 % of the progeny showed higher yield compared to the parent. The use of the parental varieties as male generally resulted in a lower percentage (ranging from 36 to 58 %) of progeny with higher yields compared to the parent. Only the progeny obtained using varieties Alliance, Vyhoda, and Vzirets as male had higher yield than the parent.

The mean increase in *average tuber weight* in the progeny of the 15 parental varieties exceeded the average (mid) value of the parents by 5–6 g. Highest values (> 55 g) were recorded for progeny of the varieties Ivankivska rannia, Partner, Radomysl, Rostavytsia, Sontsedar and Svitana. Higher values (by 7–18 g) of average tuber weight in progeny than that of the female parent were observed for the varieties

Table 3. The impact of parental varieties used either as male (♂) or as female (♀) on potato yield in the progeny (average for 2021–2023)

Variety (parental)	$\overline{X}$ variety yield, t/ha	Progeny from parental ♀			Progeny from parental ♂		
		$\overline{X}$ yield, t/ha	min-max, t/ha	% clones above ♀ parent alerage	$\overline{X}$ yield, t/ha	min-max, t/ha	% clones above ♂ parent alerage
Alliance	11.7	14.7	9.5–22	60	14.0	6.9–24.1	60
Bazhana	10.5	–	–	–	13.7	7.6–25.2	32
Fanatka	12.2	10.9	6.2–17.3	43	–	–	–
Javelina	9.6	13.8	9.2–20.6	85	11.3	6.7–19.8	60
Ivankivska rannia	10.4	16.8	10.2–23.4	82	–	–	–
Mezhyrichka 11	11.2	15.3	8.5–28.2	77	15.2	9.9–19.5	87
Opillia	10.1 *	–	–	–	14.1 *	10.6–19.3*	83*
Partner	11.7	–	–	–	13.5	9.5–17.3	69
Predslava	9.7	14.4	11.1–18.5	89	–	–	–
Radomysl	12.4	16.1	7.5–29.3	70	13.7	7.7–21.8	47
Rostavytsia	12.0	–	–	–	14.6	7.7–21.8	66
Sontsedar	11.2 */14,3 **	17.1 *	10.1–23.8 *	62 *	14.4	8.4–22.5	51
Svitana	14.5	15.2	9.4–22.0	50	15.4	7.1–28.3	54
Vyhoda	8.8	14.9	8.7–20.8	78	13.5	6.7–23.5	86
Vzirets	10.1	14.3	9.4–19.3	77	8.4	4.6–14.5	57
Mean ***	11,4	14.9			13.5		
LSD_{05}	0.3	0.5			0.5		

Note. * average of the parental forms Sonsedar (♀) and Opillia (♂) for 2022–2023 (for comparison with the corresponding progeny). ** average of the parental variety Sonsedar for 2021–2023 (for comparison with progeny from the parental line). *** The overall mean (Mean) is calculated for 2021–2023 without the Opillia variety (data only for 2022–2023). LSD_{05} – least significant difference ($p \leq 0.05$).

Alliance, Ivankivska rannia, Javelina, Mezhyrichka 11, Radomysl and Vzirets, and for male parents this was true for Alliance, Mezhyrichka 11, Opillia, Rostavytsia, Vzirets and Vyhoda (by 9–17 g). For varieties Sontsedar and Svitana as female there was a decrease of 3 and 8g an as male of 1 and 12 g respectively (**Table 4**).

The average starch content in the progeny compared to the average of the parental forms showed a 1.4 % increase when parents were used as female parents and a 1.1 % increase when used as male. In the progeny where females of varieties Fanatka, Javelina, Mezhyrichka 11, Svitana and Vyhoda were used starch content increased with 1.5 to 3.2 %. For the varieties Alliance, Javelina, Mezhyrichka 11, Opillia, Rostavytsia, Sontsedar, Svitana and Vyhodaan increase of 1.5. to 2.3 % was obtained both for females and males (**Table 5**).

Of particular breeding value is the progeny with a high starch content (≥ 19.5 %). The maximum level of this trait was observed in a substantial part of the progeny using Mezhyrichka 11 (19.9 %), Svitana 19.9 %), Vyhoda (19.5 %) and Vzirets (20.7 %) as female and in a higher percentage when using Mezhyrichka 11 (20.6 %), Radomysl (19.5 %), Rostavytsia (20.4 %), Sontsedar (19.7 %), Svitana (19.8 %), Vzirets

Table 4. The impact of parental forms on average potato tuber weight in the progeny (average for 2021–2023)

Variety	$\overline{X}$ weight of tubers of the variety, g	Progeny from parental ♀			Progeny from parental ♂		
		$\overline{X}$ weight of tubers, g	min-max, g	% clones above ♀ parent average	$\overline{X}$ weight of tubers, g	min-max, g	% clones above ♂ parent average
Alliance	51	65	43–95	92	60	35–100	62
Bazhana	52	–	–	–	58	41–87	50
Fanatka	52	53	32–85	47	–	–	–
Javelina	61	68	46–94	64	–	–	–
Ivankivska rannia	53	64	38–99	69	54	32–91	45
Mezhyrichka 11	51	60	40–92	67	61	42–86	55
Opillia	50*	–	–	–	67*	56–82*	58*
Partner	59	–	–	–	59	47–72	47
Predslava	41	44	34–62	52	–	–	–
Radomysl	56	64	38–102	66	58	41–91	51
Rostavytsia	58	–	–	–	67	43–102	52
Sontsedar	63 */55 **	60 *	42–80*	46*	54	38–81	42
Svitana	75	67	39–99	51	63	39–105	36
Vyhoda	50	55	38–92	58	59	38–110	64
Vzirets	43	61	40–101	88	55	32–90	86
Mean ***	54	60			60		
LSD_{05}	2	2			5		

Note. * average of the parental forms Sonsedar (♀) and Opillia (♂) for 2022–2023 (for comparison with the corresponding progeny). ** average of the parental variety Sonsedar for 2021–2023 (for comparison with progeny from the parental line). *** The overall mean (Mean) is calculated for 2021–2023 without the Opillia variety (data only for 2022–2023). LSD_{05} – least significant difference ($p \leq 0.05$).

(19.7 %) and Vyhoda (19.9 %) as male. These parental varieties therefore can be very useful in future breeding for this trait

The varieties (both male and female) Alliance, Javelina, Mezhyrichka 11, Radomysl, Sontsedar, Svitana and Vyhoda yielded a high percentage of progeny with a higher starch content than the parents. The use of Fanatka as female and Opillia and Rostavytsia as males in crossings resulted in ≥ 80 % of progeny with a higher starch content than the parents.

The mean score of consumption qualities in the progeny of the 15 parental varieties increased only slightly (by 0.1–0.2 point) An increase of 0.2–0.5 points was observed only in progeny of female Fanatka, Ivankivska rannia, Javelina, Predslava, Radomysl and Svitana, which have a mean total score of ≤8.1 points among all varieties. Furthermore, male Bazhana, Mezhyrichka 11, Rostavytsia, and Vzirets, which had the highest score for consumption qualities, had a 0.1–0.3-point decrease in the mean score of their progeny. The maximum score (8.9–9) of consumption qualities was observed in the progeny created using female Fanatka, Mezhyrichka 11, Radomysl, Svitana,and Vzirets and male Alliance, Bazhana and Javelina (**Table 6**).

The percentage of the progeny with an increased level of *consumption qualities* is generally rather low, e.g. for the varieties Bazhana, Mezhyrichka 11, Partner,

Table 5. The impact of parental potato forms on starch content in the progeny (average for 2021–2023)

Variety	$\overline{X}$ starch content in variety, %	Progeny from parental ♀			Progeny from parental ♂		
		$\overline{X}$ starch content, %	min-max, g	% clones above ♀ parent average	$\overline{X}$ starch content, %	min-max, g	% clones above ♂ parent average
Alliance	14.6	15.0	13.0–16.4	64	16.3	12.8–19.1	82
Bazhana	16.0	–	–	–	16.3	13.6–18.3	55
Fanatka	14.5	16.2	13.7–18.7	81	–	–	–
Javelina	15.4	16.1	13.9–17.2	67	–	–	–
Ivankivska rannia	14.5	16.4	14.2–18.6	87	16.2	13.7–18.7	92
Mezhyrichka 11	15.2	16.7	13.9–19.9	70	17*	14.1–20.6 *	77*
Opillia	16.2*	–	–	–	17.7*	15.3–18.9 *	80*
Partner	16.2	–	–	–	16.4	14.7–18.5	55
Predslava	15.6	16.8	15.6–18.2	67	–	–	–
Radomysl	15.3	16.1	10.7–19.2	65	16.6	13.1–19.5	68
Rostavytsia	15.6	–	–	–	17.4	13.8–20.4	80
Sontsedar	15.3 */15.6 **	16.7 *	15.4–18.0 *	84 *	17.1	14.2–19.7	74
Svitana	14.3	16.6	13.3–19.9	74	16.6	12.0–19.8	73
Vyhoda	13.7	16.9	14.9–19.5	89	15.7	11.7–19.9	84
Vzirets	16.5	16.7	13.3–20.7	49	16.6	12.8–19.7	59
Mean ***	15.6	16.4			16.7		
LSD_{05}	0.2	0.2			0.16		

Note. * average of the parental forms Sonsedar (♀) and Opillia (♂) for 2022–2023 (for comparison with the corresponding progeny). ** average of the parental variety Sonsedar for 2021–2023 (for comparison with progeny from the parental line). *** The overall mean (Mean) is calculated for 2021–2023 without the Opillia variety (data only for 2022–2023). LSD_{05} – least significant difference ($p \leq 0.05$).

Rostavytsia and Vzirets, with consumption qualities at the level of 8.3–8.5 points, this ranged only from 29–50 %. A higher percentage of progeny with increased consumption qualities (>55 %) was observed for Radomysl, Fanatka, Ivankivska rannia, Javelina, Predslava and Svitana, having consumption qualities in the range of 7.8–8.1 points. This may indicate that these varieties with somewhat lower consumption quality scores may have inherit this trait a bit better.

The parent varieties Fanatka, Mezhyrichka 11, Radomysl, Sontsedar, Svitana and Vzirets, were ranked highest for the four performance indices mentioned in **Tabel 7**. High scores for these 4 indices in female progenies were found again when using Mezhyrichka 11, Radomysl, Sontsedar and Svitana, as well as Ivankivska rannia, (Table 5) but not Fanatka. For male progeny this concerned Partner, Sontsedar, Svitana, Rostavytsia, Mezhyrichka 11, and Opillia.We used a Pearson's correlation analysis to determine the dependence between the traits of the 15 parental potato varieties and the parental progeny. For the parental female progeny, a positive average relationship was established between the traits in bold and indicated with a *in **Table 9**.

An inverse mean correlation was established between the pairs indicated in Table 9 in italics and with a **.

For the parental male progeny, a positive average relationship was established between the traits in bold

Table 6. The impact of parental forms on potato consumption qualities in the progeny (mean for 2021–2023)

Variety	$\overline{X}$ consumption quality of a variety, score	Progeny from parental ♀			Progeny from parental ♂		
		$\overline{X}$ consumption quality, score	min-max, score	% clones above ♀ parent average	$\overline{X}$ consumption quality, score	min-max, score	% clones above ♂ parent average
Alliance	7.9	7.9	7.2–8.4	30	8.2	7.3–8.9	64
Bazhana	8.5	–	–	–	8.4	7.6–8.9	42
Fanatka	8.1	8.3	7.7–8.9	65	–	–	–
Javelina	7.8	8	7.5–8.7	66	–	–	–
Ivankivska rannia	8	8.2	7.6–8.6	67	8.2	7.7–8.9	73
Mezhyrichka 11	8.5	8.3	7.7–9	29	8.2	7.7–9	32
Opillia	8.2 *	–	–	–	8.2 *	8–8.4 *	36 *
Partner	8.3	–	–	–	8.4	7.7–8.7	50
Predslava	7.9	8.1	7.6–8.6	72	–	–	–
Radomysl	8	8.3	7.3–9	70	8.3	7.7–8.9	58
Rostavytsia	8.5	–	–	–	8.3	7.3–8.7	40
Sontsedar	7.8	8.4	7.6–8.9	86	8.2	7.3–9	73
Svitana	8.2 */8,3 **	8.2 *	7.6–8.8 *	50 *	8.3	7.5–8.8	62
Vyhoda	8.1	8.1	7.5–8.6	41	8.1	7.3–8.8	47
Vzirets	8.4	8.3	7.4–9	41	8.3	7.2–9	50
Mean ***	8.1	8.2			8.3		
LSD_{05}	0.16	0.05			0.03		

Note. * average of the parental forms Sonsedar (♀) and Opillia (♂) for 2022–2023 (for comparison with the corresponding progeny). ** average of the parental variety Sonsedar for 2021–2023 (for comparison with progeny from the parental line). *** The overall mean (Mean) is calculated for 2021–2023 without the Opillia variety (data only for 2022–2023). LSD_{05} – least significant difference ($p \leq 0.05$).

Table 7. Ranking of the four performance indices and their overall ranking (yield, average tuber weight, starch content and consumption quality) of the 15 parental varieties and their female and male progeny (average for 2021–2023), used in this study

Variety	Rank (R)														
	Y			ATW			SC			CQ			Overall ranking		
	P	♀	♂	P	♀	♂	P	♀	♂	P	♀	♂	P	♀	♂
Alliance	8	5	7	4	9	8	5	1	3	3	1	2	4	2	4
Bazhana	5	–	5	6	–	4	9	–	3	9	–	11	8	–	6
Fanatka	9	1	–	6	2	–	3	4	–	7	7	–	6	1	–
Ivankivska rannia	5	10	–	9	11	–	9	2	–	1	2	–	5	7	–
Javelina	2	2	2	7	7	1	3	5	2	5	5	2	2	4	1
Mezhyrichka 11	6	8	11	4	4	9	6	7	9	11	7	2	8	9	10
Opillia	3	–	8	2	–	11	10	–	12	10	–	2	5	–	11
Partner	7	–	3	11	–	6	10	–	5	10	–	11	12	–	7
Predslava	3	4	–	1	1	–	10	10	–	3	3	–	2	3	–
Radomysl	10	9	5	8	7	4	7	2	6	5	7	7	10	7	5
Rostavytsia	9	–	10	10	–	11	7	–	11	7	–	7	10	–	12
Sontsedar	6	11	9	10	4	1	7	7	10	9	5	7	11	10	8
Svitana	11	7	12	11	10	10	2	6	6	1	11	2	6	11	9
Vihoda	1	6	3	3	3	6	1	11	1	7	3	1	1	5	2
Vzirets	4	3	1	2	6	3	11	7	6	10	7	7	8	5	3

Note. Y = yield; ATW = average tuber weight; SC = starch content; CQ = consumption quality

Table 8. correlation between average performance indices of the maternal form of potato in the progeny (average for 2021–2023)

	VY	PY ♀	ATWV	ATWP♀	SCV	SCP♀	CQV	CQP♀
VY	1.00							
PY ♀	0.22	1.00						
ATWV	0.54 *	0.53 *	1.00					
ATWP♀	0.36 *	0.33 *	0.56 *	1.00				
SCV	–0.14	0.19	–0.28	–0.01	1.00			
SCP♀	–0.59 **	–0.12	–0.45 **	–0.67**	–0.05	1.00		
CQV	–0.24	–0.06	–0.34 **	–0.56**	0.11	0.37 *	1.00	
CQP♀	0.54 *	–0.04	0.38 *	0.04	–0.21	0.08	0.20	1.00

Note: VY – parent variety yield, PY ♀ – yield of the parental female progeny, ATWV – average tuber weight of the parent variety, ATWP♀ – average tuber weight of the parental female progeny, SCV – starch content of the parent variety, SCP♀ – starch content of the parental female progeny, CQV – consumption quality of the parent variety, CQP♀ – consumption quality of the parental male progeny, *– positive significant correlation at $p < 0.05$,** – negative significant correlation at $p < 0.05$.

Table 9. The correlation between average performance indices of the male form of potato and the progeny (average for 2021–2023)

	VY	PY ♂	ATWV	ATWP♂	SCV	SCP♂	CQV	CQP♂
VY	1.00							
PY ♂	0.65 *	1.00						
ATWV	0.76 *	0.34 *	1.00					
ATWP♂	0.16	0.64 *	0.05	1.00				
SCV	–0.08	–0.25	–0.16	–0.09	1.00			
SCP♂	0.39 *	0.62 *	0.10	0.44 *	0.43 *	1.00		
CQV	–.21	–0.04	–0.20	0.06	0.63 *	0.35 *	1.00	
CQP♂	0.25	–0.27	0.37 *	–0.33 **	0.68 *	0.05	0.54 *	1.00

Note: VY – parent variety yield, PY ♂ – yield of the parental male progeny, ATWV – average tuber weight of the variety, ATWP♂ –average tuber weight of the parental male progeny, SCV – starch content of the parental variety, SCP♂ – starch content of the parental male progeny, CQV – consumption quality of the parental variety, CQP♂ – consumption quality of the parental male progeny, *– positive significant correlation at $p< 0.05$, ** – negative significant correlation at $p< 0.05$.

and indicated with a *in **Table 10**. An inverse mean correlation was established between the pairs indicated in Table 9 in italics and with a **.

DISCUSSION

The high genetic heterogeneity of potatoes, caused by the polygenic nature of many traits and epistatic interactions between genes, complicates predicting the breeding results and limits the effectiveness of traditional breeding methods (Machida-Hirano, 2015). Since the cultivated potato (*Solanum tuberosum*) is a tetraploid, the manifestation of heterosis is caused by the action of many genes. Increasing the heterozygosity and diversity of allelic loci contributes to the increase of quantitative and qualitative traits of a crop. There are various strategies to maximize heterozygosity in potatoes, including parental selection based on genetic diversity and analytical crossing designs using sexual hybridization to increase heterozygosity (Gopal, 2014).

Potato variety performance depends on a number of traits resulting from complex polygenic heredity and the influence of abiotic and biotic environmental factors. According to Bradshaw (2017) and Ruiz de Arcaute (2022), traditional breeding of new tetraploid potato varieties has not shown break-through increases in yield despite ongoing breeding efforts. Traditional potato breeding is limited by the complexity of tetrasomic heredity and the need to evaluate a large number of traits (Slater, 2014; Bradshaw, 2022). Therefore, modern directions in potato breeding use diploid hybrids and marker-assisted breeding (Bradshaw, 2021 and 2022; Hojsgaard et al, 2022)

In our study using classical breeding techniques, (as well as those of Furdyga 2022; Ilchuk et al, 2023; Taktaiev et al, 2023) we found that the use of varieties Alliance, Sontsedar and Radomysl as female parents ensured a progeny with higher yields (≤ 60 %) compared to the parental components. This was only 36–58 % when using them as male parents, but the correlation analysis still showed significant positive relationship between the yields of the male variety and its progeny. This again indicates a significant influence of the parental effect on the formation of progeny yields. In contrast an insignificant positive correlation between the maternal form and its progeny may be due to the fact that maternal forms are usually selected for improvement of a set of other economically valuable traits. The data obtained can be used to develop effective hybridization schemes and create new potato varieties with higher yields.

Key component of potato variety and clone performance are the number of tubers per plant and average tuber weight (Ross, 1986; Podhaietskyi et al, 2019a and b). Tuber weight is controlled by multiple genes (Howard, 1978). High temperatures negatively affect potato productivity by reducing both the number and weight of tubers (Kravchenko et al., 2019; Lambert et al, 2006). According to Lambert et al (2006), this can lead to significant economic losses for producers, reducing yields by about 58 % and the number of large tubers by about 25 %. According to the results of breeding studies by Zaviriukha (2022) and Podhaietskyi et al (2022), the success of selecting highly productive progeny with large tubers largely depends on the genotypic characteristics of the parental forms and their combinations in crossing. Our study complements the results of Podhaietskyi et al (2019a and b), for the effect of parental genotype on average tuber weight in the potato progeny, namely a direct relationship between average tuber weight in maternal plants and their progeny, and only a weak negative dependence on the males. The results of the study confirm the average positive correlation of the maternal genotype on the average tuber weight in the progeny, and the influence of the male was insignificant ($r = 0.05$), but positive. However, in another study, Podhaietskyi et al (2022) found the opposite trend: negative average and low correlations between the average tuber weight of the females and males and the share of hybrids that exceeded the average tuber weight.

According to the studies by Meise et al (2019) and Hu et al (2023), abiotic cultivation conditions, including soil properties and fertilization regime, have a significant impact on starch accumulation. However, as shown by Baranowska (2018), Li et al (2019), Wadas et al (2019), Koval et al (2022) and Prysiazhniuk et al (2023), the genetic characteristics of the variety also play an important role in determining the structure and functional properties of starch. According to Kloosterman (2010), most quality traits of tubers, including starch content and nutritional quality (content of vitamins, carotenoids, and methionine), are regulated by several genes (polygenes). It is possible to increase the manifestation of a trait in the progeny via transgressive segregation (Hunnius, 1969; Mackay et al, 2021). However, success in this regard depends on the accurate selection of parental forms, particularly their combinational ability in terms of starch content. According to Podhaietskyi et al (2019a and b), a high negative correlation was found between the dry matter content in maternal forms and their progeny. Our present study showed a slight negative correlation between the starch content in maternal forms and their progeny and an average positive correlation between the starch content of males and their progeny.

Typically, classical potato breeding is focused primarily on tuber yield, marketability, quality traits, and resistance to biotic and abiotic stresses (Bradshaw, 2021). However, modern consumers demand improved consumption quality of tubers, including their nutritional value (McGregor, 2007; Morris and Taylor, 2019). This important aspect was recently highlighted in Dufour et al (2021). Therefore, evaluation of potato quality by its consumption characteristics (based on sensory parameters such as palatability, texture and color changes of boiled potatoes (Spear et al 2018, Kravchenko et al, 2021; Wadas, 2023) is of high importance, too. The analysis of many studies on the consumption qualities of potato varieties is concentrating on the influence of defects, unpleasant taste (e.g. Mestdagh et al, 2008; Blanda et al, 2010), the relationship between sensory data and analytical measurements (such as moisture content or hardness) (Seefeldt et al, 2011; Caetano et al, 2017), comparison of potato cooking methods and food choices of certain consumer segments (Rizzo et al, 2018; Sharma et al, 2020) and development of cooking methods for better differentiation of potato varieties in sensory research (Ciccone et al, 2020). Although work has been done on breeding of potatoes with improved consumption (including organoleptic) quality (Carputo et al, 2005; Bryan et al, 2008; Larson, 2014; Kumari et al, 2018; Bough et al, 2020) a breakthrough has not yet been reached. Our study indicates an on average positive effect of the male variety on the organoleptic characteristics of progeny, in particular on the intensity of taste, the aroma and the texture of tubers, while the effect of the maternal form was less pronounced. Jansky (2010) noted that improving consumption qualities of potato via breeding is complex, as it requires an understanding of biochemistry, changes in compounds during cooking, little-known aspects of genetics and the influence of environmental factors during growth and storage. According to Flis et al (2012), Samaniego et al (2020) and Ilahy et al (2023), the quality of potato tubers is significantly influenced by the interaction of factors such as variety, location and cultivation system. Nevertheless Bough et al (2020) and Mudege et al (2021), emphasize that consumption characteristics of potato tubers should be among the mandatory traits in breeding programs.

Relationships with a positive and statistically significant correlation coefficient could be important as selection criteria (Ishartati et al,2022). Increasing that value of one trait can contribute to the positive development of another. Characteristics with positive correlation coefficients can serve as a reliable criterion for selecting progeny with improved values of these traits (Maris et al, 1988). Our study confirmed the presence of significant negative correlation between quantitative indicators yield, structure and starch content in tubers, which is consistent with the data of Ortiz et al (2021) and Prysiazhniuk et al (2023). But, unlike the female progeny, the male progeny showed a positive correlation between yield, average tuber weight, and starch content. This indicates the possibility of combining high values of performance elements and increased starch content in one genotype via the relevant selection of males. The study of Dudar et al (2019), Fantaw et al (2019) and Nigussie et al (2023) showed a direct correlation between yield and the average tuber weight. These data indicate the need to take these relationships into account when developing breeding programs. The positive correlations found between the performance of parental forms and their progeny confirm the importance of careful selection of parental components to obtain highly productive clones with improved quality traits. In the future, we will continue breeding studies involving new potato varieties to identify highly productive progeny adapted to abiotic and biotic environmental factors.

CONCLUSIONS

The study of the influence of parental forms on performance indices of the progeny showed that the average yield of clones created with the female exceeded the same index in the progeny with the male by 1.7 t/ha.

When using the female of the varieties Javelina, Mezhyrichka 11, Predslava, Sontsedar, Vyhoda and Vzirets, and the male of Bazhana, Mezhyrichka 11, Rostavytsia, and Vyhoda, we found a predominance of clones with higher yields compared to the parental form.

The choice of parental pairs significantly affected average tuber weight in the progeny. Highest average tuber weight was obtained when using the female of Alliance, Ivankivska rannia, Javelina, Mezhyrichka 11, Radomysl and Vzirets and the male of Alliance, Mezhyrichka 11, Opillia, Rostavytsia, Vyhoda and Vzirets.

Most promising varieties for breeding to increase starch content were Fanatka, Javelina, Mezhyrichka 11, Svitana and Vyhoda as female, and Alliance, Javelina, Mezhyrichka 11, Rostavytsia, Opillia, Sontsedar, Svitana and Vyhoda and as male. The use of these varieties in crossing led to an increase in starch content in the progeny by an average of 1.5–3.2 %.

There was a slight increase in the total average score of consumption qualities in the progeny compared to the parental forms. This was observed for Fanatka, Mezhyrichka 11 Radomysl, Svitana and Vzirets, as female and Alliance, Bazhana and Javelina, as males. However, in the varieties Bazhana, Mezhyrichka 11, Rostavytsia and Vzirets, which had the highest score for consumption qualities, the average score in their progeny decreased.

Positive significant correlations were found between the performance index of parental forms and their progeny: between the yield and average tuber weight of the variety, yield of the variety and consumption quality of the progeny from ♀, yield of the progeny from ♀ and average tuber weight of the variety, average tuber weight of the variety and average tuber weight in the progeny from ♀, yield of the variety and yield of progeny from ♂, yield and average tuber weight of the variety, yield of the progeny and average tuber weight in the progeny from ♂, yield of the progeny and starch content of the progeny from ♂, starch content and consumption qualities of the variety, starch content of the variety and consumption qualities of the progeny from ♂, consumption qualities of the variety and consumption qualities of the progeny from ♂. A *negative significant correlation* was registered: between the yield of the variety and the starch content in the progeny from ♀, the average tuber weight and the starch content in the progeny from ♀, and the average tuber weight in the progeny from ♀ and the consumption quality of the variety.

These results confirm the previously established patterns: high yield correlates positively with tuber weight (r = 0.33–0.76), while starch content decreases with increasing performance (r = –0.59) and increasing tuber size (r = –(0.45–0.67)) (the latter was remarkable only of the progeny obtained using the variety as female).

Adherence to ethical principles. This article does not contain any studies by any authors using humans and animals as study objects.

Conflict of interests. The authors claim the absence of any conflict of interests.

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Вплив батьківських форм на фенотиповий прояв показників у нащадках деяких українських сортів та ліній картоплі

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Мета. Оцінити вплив батьківських форм на фенотиповий прояв показників у потомстві деяких українських сортів та ліній картоплі з метою виявлення найефективніших схрещувань для селекції на підвищення врожайності та якості продукції. **Методи.** Польовий, лабораторний, статистичний. Досліджено 973 клони, отримані шляхом 85 схрещувань за використання 15 сортів картоплі української селекції. Вихідний матеріал отримано в лабораторії селекції картоплі Поліського дослідного відділу Інституту картоплярства НААН. **Результати.** Встановлено, що при залученні у схрещування як материнської форми сортів картоплі Джавеліна, Межирічка 11, Предслава, Сонцедар, Вигода та Взірець у потомстві спостеріга-ли підвищення врожайності порівняно з батьківськими формами на 4,1–6,1 т/га. На збільшення у нащадків середньої маси бульби на 7–18 г позитивно вплинули сорти як материнські форми Альянс, Іванківська рання, Джавеліна, Межирічка 11, Радомисль та Взірець; на 9–17 г – сорти як чоловічі форми Альянс, Межирічка 11, Опілля, Роставиця, Вигода та Взірець. У потомства, отриманого за участі сортів картоплі, як материнської форми – Фанатка, Джавеліна, Межирічка 11, Світана і Вигода спостерігали збільшення вмісту крохмалю порівняно з батьківськими формами на 1,5–3,2 %. Чоловічі форми, зокрема сорти Альянс, Джавеліна, Межирічка 11, Опілля, Роставиця, Сонцедар, Світана і Вигода сприяли підвищенню цього показника на 1,5–2,3 %. Середній бал споживчих якостей у нащадків перевищує батьківські форми лише на 0,1–0,2 бали. Найвищий бал споживчих якостей спостерігали в потомства, створеного за використання в якості материнських форм сортів картоплі Фанатка, Межирічка 11, Радомисль, Світана та Взірець, і за використання сортів Альянс, Бажана та Джавеліна в якості чоловічих форм. У потомства, створеного за участі в якості чоловічих форм сортів Бажана, Межирічка 11, Роставиця та Взірець спостерігали зниження середнього показника споживчих якостей на 0,1–0,3 бали. **Висновки.** Підтверджено, що характеристики батьківських форм відіграють вирішальну роль у формуванні кількісних і якісних ознак, що є більш вагомим фактором, ніж їх розміщення у схемі схрещування. Водночас встановлено, що генотип материнського компонента має істотний вплив на рівень урожайності у нащадків, що підкреслює важливість правильного підбору материнської форми. Виявлено, що вище значення елементів продуктивності спостерігалося у клонів, створених за участі сортів Альянс, Джавеліна, Межирічка 11, Світана, Вигода та Взірець. Встановлено значущі зв'язки між продуктивністю батьківських форм та їх нащадків за показниками врожайності, середньої маси бульб, умістом крохмалю та споживчими якостями, які підтверджують раніше встановлені закономірності: висока врожайність позитивно корелює з масою бульб (r = 0,33–0,76), тоді як вміст крохмалю

знижується з підвищенням продуктивності (r = –0.59) та збільшенням розмірів бульб (r = –(0,45–0.67)) (останнє було характерним лише для потомства, одержаного за використання сорту в якості материнської форми).

Key words: картопля, *Solanum tuberosum*, сорти, нащадки, кількісні і якісні показники продуктивності, кореляція.

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