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RESEARCH ARTICLE

Evaluation of potato varieties of different maturity groups based on a complex of economic and consumer traits

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Abstract

Based on the combined assessment of energy value, the potential for increasing potato production as a food product per unit area, and excellent and good culinary qualities, an evaluation of potato varieties of different maturity groups was carried out. The dependence of these indicators on the maturity group and genotype was established. The classification of potato varieties according to culinary and consumer type, oriented toward specific consumer requirements, provides opportunities to enhance the competitiveness of newly zoned potato varieties in the modern food market. The research was conducted under the conditions of the North-Eastern Forest-Steppe of Ukraine (Sumy region) during 2021-2023 with the cultivation of potato varieties belonging to different maturity groups. According to culinary and consumer classification, most of the studied varieties were assigned to types A, B, and C. In terms of productivity, mid-season varieties predominated (Sifra-20.2 thousand kcal/ha and Jelly-19.1 thousand kcal/ha), demonstrating the highest energy yield. The Sifra variety exhibited the maximum caloric content (58.3 kcal/100 g). To obtain maximum profit per unit area (based on energy indicators), it is advisable to select the Sifra variety. For the early production market, the most suitable varieties are Colomba and Anushka, despite their lower caloric content. Bernina represents a stable “mid-range” variety with high consumer characteristics, making it attractive for retail markets.

Keywords: Potato, Productivity, Caloric value, Economic and consumer traits, Energy value, Variety

Introduction

Under conditions of increasing potato production and its use as a food product, the issue of quality becomes particularly urgent. Scientists are continuously searching for relationships between individual quality indicators and the physical, anatomical, and physiological characteristics of tubers, as well as their biochemical composition. An objective evaluation of various quality traits and their variability depending on the variety makes it possible to meet consumer requirements. However, the modern state variety register classifies potatoes only as table potatoes without division into culinary-consumer types (Jayanty, et al. 2018, Stark, et al. 2020).

Modern global science confirms the key role of potatoes in ensuring global food security in the future (Navarre, et al. 2016). The Chinese government announced (Gain Report Number: CH15036) efforts aimed at increasing potato production to 98 million tons and transforming the crop into the fourth-largest “grain” in the country after rice, wheat, and maize (Frederick and Lei, 2015). Under con-

ditions of increasing potato production and its use as a food product, the issue of quality becomes especially significant. Researchers are continuously studying the relationships between quality indicators and the physical, anatomical, physiological, and biochemical characteristics of tubers. Objective evaluation of quality traits and their variability depending on variety allows satisfaction of consumer demands. However, the current state varietal classification still categorizes potatoes only as table varieties without differentiation by culinary-consumer types (Wolters, et al. 2021, Bradshaw, 2022, Adams, et al. 2022).

Over the past 20 years, numerous studies have been conducted on the culinary properties of potatoes, which have been highlighted in both domestic and international scientific publications (Pysarenko, et al. 2022, Taktayev, et al. 2023). These studies have established the dependence of physicochemical, technological, culinary, and textural characteristics of potatoes on varietal selection, quality indicators, anatomical and physiological characteristics of tubers, and their biochemical composition (Jayanty, et al. 2019, Hussain, et al. 2021, Goffart, et al. 2022).

Potato breeders are working on the development of new varieties suitable for industrial processing and table varieties with enhanced nutritional value and high culinary quality. The development of next-generation potato varieties has determined the direction of modern research.

The purpose of the study was to evaluate the consumer quality of potato varieties. The objectives included identifying the most promising varieties based on their energy and nutritional value, technological and culinary characteristics, and classifying them according to culinary-consumer types among table potato varieties.

Materials and Methods

The research was conducted under the conditions of the North-Eastern Forest-Steppe of Ukraine (Romny district, Sumy region) during 2021-2023. The coordinates of the experimental plots were 50.778915° N latitude, 33.867416° E longitude, 137.7 m above sea level (Map data ©2025 Google). Potato varieties of different maturity groups were studied: Early-maturing (Colomba, Anushka), medium-early (Bernina, Baltic Fire), and mid-season (Sifra, Jelly). Different weather conditions during the potato growing seasons, according to data from the Institute of Agriculture of the North-East of NAAS of Ukraine, ensured an objective evaluation of the obtained research results (2021-excessive moisture, 2022-sufficient moisture, 2023-drought conditions).

Culinary qualities (taste, cooking disintegration, consistency, mealiness, and flesh darkening) were evaluated using an organoleptic method based on a 9-point scale, where 9 represents the highest expression of the trait, according to the methodological recommendations of the Institute of Potato Growing of NAAS of Ukraine, 2002.

The caloric value of the varieties was determined using an express method. Based on caloric yield per 100 g of product, the classification of potato varieties according to culinary-consumer type was carried out following the methodology of the European Association for Potato Research (EAPR): Type A-salad and vinaigrette type, Type B-suitable for frying, Type C-suitable for most dishes, Type D-suitable for mashed potatoes (Kononuchenko, 2002).

Results and Discussion

The study involved potato varieties of different maturity groups (Colomba, Anushka, Bernina, Baltic Fire, Sifra, Jelly), which were evaluated using a five-grade classification system (groups 9-8, 7-6, 5-4, and 3 points) based on five key indicators.

The summarized data on culinary quality indicators of potato varieties belonging to different maturity groups are presented in Tab 1. A greater number of varieties were characterized by scores of 7-6 points, while approximately one-third of the studied varieties received scores of 5-4 points.

Table 1. Distribution of potato varieties according to culinary quality indicators (average for 2021-2023).

Indicators	Rating of potato varieties in points			
	9-8	7-6	5-4	3
Taste	Colomba, Anushka	Bernina, Jelly	Baltic Fire, Sifra	Jelly
Cooking disintegration	Colomba, Bernina	Anushka, Baltic Fire, Sifra	Jelly	-
Consistency	Anushka, Baltic Fire	Colomba, Jelly	Bernina	Sifra
Mealiness	Baltic Fire	Colomba, Anushka, Bernina	Jelly, Sifra	-
Flesh darkening	Colomba, Anushka	Bernina, Baltic Fire, Sifra	Jelly	-

The best taste characteristics were demonstrated by the Colomba and Anushka varieties (9-8 points). The fastest and most uniform cooking disintegration was observed in Colomba and Bernina. According to consistency indicators, the highest scores were obtained by Anushka and Baltic Fire. The highest mealiness indicator was recorded only for the Baltic Fire variety. Regarding resistance to flesh darkening, the Colomba and Anushka varieties showed the lowest level of darkening after cooking. The Jelly variety demonstrated medium and low performance indicators and appeared to be the weakest variety according to most parameters. It received the lowest

taste score (3 points) and low scores for other characteristics (5-4 points). The Sifra variety exhibited the lowest consistency score (3 points) and moderate performance in taste and mealiness.

Thus, the early-maturing varieties Colomba and Anushka can be considered the most universal and high-quality varieties. They demonstrated high taste scores and strong resistance to flesh darkening. The medium-early variety Bernina showed excellent cooking disintegration but moderate consistency and mealiness indicators. The Baltic Fire variety (medium-early) was distinguished by high mealiness and good consistency, making it suitable for certain dishes, such as mashed potatoes. Overall, based on culinary characteristics, the best-performing varieties were Colomba and Anushka, which excelled in taste and resistance to darkening. The Jelly variety demonstrated the lowest culinary performance among the studied varieties.

According to the culinary-consumer classification, the majority of the studied varieties were assigned to types A, B, and C (Tab. 2).

Table 2. Distribution of potato varieties according to consumer culinary type (average for 2021-2023).

Type	Variety	Maturity group	Score					
			Taste	Cooking disintegration	Consistency	Mealiness	Flesh darkening	Average score
A	Colomba, Anushka	Early-maturing	6.0	8.8	5.2	4.4	7.1	6.3
B	Bernina	Medium-early	5.6	6.4	7.1	5.7	6.7	6.3
C	BalticFire	Medium-early	7.2	5.8	7.4	5.7	6.5	6.5
D	Sifra, Jelly	Mid-season	7.7	3.7	9.0	8.1	5.1	6.7

Mid-season varieties (Sifra, Jelly) were classified as Type D. These varieties demonstrated superior taste quality (7.7), high consistency density (9.0), and the highest mealiness level (8.1).

Comparison of key indicators showed that the best taste was characteristic of Type D varieties (7.7 points), whereas the lowest taste score was observed in Type B (5.6 points). The highest cooking disintegration was recorded in Type A (8.8 points), which is typical for early-maturing varieties. The poorest cooking disintegration was observed in Type D (3.7 points).

Regarding resistance to flesh darkening, Type A varieties showed the best results (7.1 points), indicating better color retention after cooking. The lowest indicator was observed in Type D (5.1 points). Type D varieties demonstrated the highest mealiness (8.1), which makes them most suitable for mashed potato preparation. Despite differences in individual characteristics, the average scores among all types were relatively similar, ranging from 6.3 to 6.7 points. The highest average score was obtained by mid-season varieties of Type D (Sifra, Jelly), due to their high taste, consistency, and mealiness indicators.

Therefore, for salads and whole boiling, Types A and B are the most suitable. For mashed potatoes and baking, Types C and D are considered the best choice due to their higher mealiness and improved taste qualities. A comparison of the study of new zoned potato varieties of different maturity groups in terms of nutritional value, the possibility of increasing potatoes as a food product per unit area, and the study of culinary qualities showed that the best combination of valuable traits is productivity and energy value (Tab. 3).

Table 3. Characteristics of potato varieties based on a complex of economic and consumer traits (average for 2021-2023).

Variety	Maturity group	Energy yield, thousand kcal/ha	Caloric content, kcal/100 g	Type
Sifra	Mid-season	20.2	58.3	D
Baltic Fire	Medium-early	20.1	41.8	C
Jelly	Mid-season	19.1	50.3	D
Colomba	Early-maturing	18.3	35.3	A
Anushka	Early-maturing	18.0	30.9	A
Bernina	Medium-early	17.8	49.6	B

The data presented in Tab. 3 demonstrate a direct relationship between maturity group and energy yield. In terms of productivity, mid-season varieties predominated (Sifra-20.2 thousand kcal/ha and Jelly-19.1 thousand kcal/ha), demonstrating the highest energy yield. This can be explained by a longer vegetation period, which allows plants to accumulate a greater amount of dry matter. Regarding tuber caloric value, the Sifra variety exhibited the highest caloric content (58.3 kcal/100 g). Salad-type varieties (Type A), Colomba and Anushka, demonstrated the lowest caloric values (30.9 kcal/100 g). The universal variety Bernina (Type B) showed a medium caloric value (49.6 kcal/100 g).

Conclusion

The early-maturing varieties Colomba and Anushka demonstrated the highest versatility and overall quality. They showed high taste scores and strong resistance to flesh darkening. According to the culinary-consumer classification, the majority of the studied

varieties were assigned to Types A, B, and C. In terms of productivity, mid-season varieties predominated (Sifra-20.2 thousand kcal/ha and Jelly-19.1 thousand kcal/ha), demonstrating the highest energy yield. The Sifra variety exhibited the maximum caloric content (58.3 kcal/100 g). To achieve maximum profit per unit area based on energy indicators, the Sifra variety is recommended. For the early production market, the most suitable varieties are Colomba and Anushka despite their lower caloric value. The Bernina variety represents a stable mid-range option with high consumer characteristics, making it attractive for retail markets.

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