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Original article

INFLUENCE OF POLISHING DEGREE ON TECHNOLOGICAL TRAITS OF GRAIN OF DIFFERENT RICE VARIETIES

E.Y. Papulova, N.G. Tumanyan, S.S. Chizhikova, R.N. Troyan, T.B. Kumeyko

Abstract

Background. The quality of rice products, their physical properties and nutritional value depend on the degree of grain processing, including its polishing, which removes the surface shells and the germ. The task of the work is to assess the effect of the degree of grain polishing of Russian-bred rice varieties with different grain sizes and shapes on the physical (technological) traits of the grain.

Purpose. The goal of the study was to assess the influence of the grain polishing degree of Russian-bred rice varieties with different grain sizes and shapes on the physical (technological) traits of the grain.

Materials and methods. The research material included the following varieties: Favorit, Veles, Trio, Regul 2, Forsazh, Strombus, Prestige, Vector, most of which are approved for use. The set of parameters for assessing grain quality included the following indicators: grain size, vitreousity, grain fracturing, total milling yield, head rice content, and bran yield during polishing. The duration of polishing was 50, 90, and 120 seconds.

Results. The mass of 1000 absolutely dry grains was in the range of 25.6–26.6 g in the group of medium-weight varieties and 28.4–33.1 g in the group of large-grain rice varieties. In the group of large-grain varieties, the varieties Forsazh and Strombus were the most resistant to intensive polishing, the varieties Prestige and Regul 2 were the least resistant; in the group of medium-weight varieties, the corresponding indicators of the head rice content were significantly lower.

Conclusion. Significant dynamics of the indicators was noted already at the initial stage of grain polishing (90 s) in the rice varieties Favorit and Strombus for the indicator “head rice content”, Favorit and Utes - for the bran yield; at the stage of 120 s - in the vari-eties Regul 2 and Vector, Prestige for all traits, the varieties Trio

and Forsazh for the indicators “total milling yield” and “bran yield”. Equivalent changes in the indicator of traits with different degrees of polishing were typical for the varieties Strombus and Utes for the indicator of total milling yield; Trio, Utes and Forsazh- for the head rice content and the variety Strombus - for the bran yield.

Keywords: rice; technological traits; rice quality; polishing degree

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Научная статья

ВЛИЯНИЕ СТЕПЕНИ ШЛИФОВАНИЯ НА ТЕХНОЛОГИЧЕСКИЕ ПРИЗНАКИ ЗЕРНА РАЗЛИЧНЫХ СОРТОВ РИСА

Э.Ю. Папулова, Н.Г. Туманьян, С.С. Чижикова, Р.Н. Троян, Т.Б. Кумейко

Аннотация

Обоснование. Качество рисопродуктов, их физические свойства и пищевая ценность зависят от степени обработки зерна, в том числе его шлифования, при котором удаляются поверхностные оболочки и зародыш. В работе поставлена задача провести оценку влияния степени шлифования зерна сортов риса российской селекции с различной крупностью и формой зерновки на физические (технологические) признаки зерна.

Цель. Целью исследования являлась оценка влияния степени шлифования зерна сортов риса российской селекции с различной крупностью и формой зерновки на физические (технологические) признаки зерна.

Материалы и методы. Материалом исследования служили сорта Фаворит, Велес, Трио, Регул 2, Форсаж, Стромбус, Престиж, Вектор, большинство из которых допущено к использованию. В комплекс параметров оценки качества зерна входили показатели признаков: крупности, стекловидности, трещиноватости зерна, общего выхода крупы, содержания целого ядра и выхода мучки при шлифовании. Длительность шлифования: 50, 90, 120 секунд.

Результаты. Масса 1000 а. с. зерен находилась в диапазоне 25,6-26,6 г в группе средних по массе сортов и 28,4–33,1 г в группе крупнозерных сортов риса. В группе крупнозерных сорта Форсаж и Стромбус были наиболее устой-

чивы к интенсивному шлифованию, сорта Престиж и Регул 2 - наименее; в группе средних по массе сортов соответствующие показатели содержания целого ядра в крупе были значительно ниже.

Заключение. Была отмечена значительная динамика показателей уже на начальном этапе шлифования зерна (90 с) у сортов риса Фаворит и Стромбус для показателя «содержание целого ядра», Фаворит и Утес – для выхода мучки; на этапе 120 с – у сортов Регул 2 и Вектор, Престиж для всех признаков, сортов Трио и Фор-саж для показателей «общий выход крупы» и «выход мучки». Равнозначным изменением показателей признаков при различной степени шлифования характеризовались сорта Стромбус и Утес для показателя общего выхода крупы; Трио, Утес и Форсаж – для выхода целого ядра и сорт Стромбус – для показателя выхода мучки.

Ключевые слова: рис; технологические признаки; качество риса; степень шлифования

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Introduction

Rice (Oryza sativa L.) is considered the main source of energy and nutrients for more than half of the world's population [1]. Consumer preferences for rice depend on the cultural traditions of the population and are associated with various grain quality parameters, including the amylose content of the reserve starch.

The rice caryopsis is a grain, in which the seed is covered with an outer coat (pericarp), developing from the walls of the ovary. Behind the pericarp are two layers of cells, which are the seed coat. The outer layer of the endosperm, adjacent to the coat, is filled with aleurone grains, rich in protein. The inner, central part of the endosperm consists of starch grains. In the lower part of the grain is the embryo, the length of which does not exceed 1/3 of the grain length. The embryo contains a significant amount of fat [2].

Rice is consumed mainly in the form of milled rice, the production of which involves a range of technological operations aimed at improving its consumer properties, the most important of which are the processes of hulling and polishing. During the hulling process, the flower films are removed, and during polishing, the peripheral layers of the grain (outer and seed coats), the germ, and

partially or completely the aleurone layer are removed, which form a by-product - rice bran. Husked rice is relatively rich in vitamins and contains thiamine (B_1), riboflavin (B_2), nicotinic acid (PP) and some others. Industrial enterprises usually polish rice to improve the physical and taste qualities of rice grains and stability during storage [1; 3].

The nutritional value of rice is one of the most important indicators of its quality. The main purpose of polishing is to separate the germ, outer and seed coats from the grain endosperm. The degree of removal of the grain layers is determined by the polishing degree, which determines the whiteness of the rice [4]. Kernels that have undergone different degrees of polishing have different functional and taste properties [5; 6].

Polished rice consists mainly of carbohydrates (80%) and a small amount of proteins (6-7%), minerals, fats, etc. The proteins contained in rice are particularly nutritious, rich in the essential amino acid lysine and hypoallergenic. It has been shown that 61% of mineral elements and about 84.2% of kernel proteins are concentrated in the outer endosperm, and with further polishing their concentration decreases [7]. The central part of the endosperm is mainly composed of starch (84.6%). The ratio of magnesium and potassium has a great influence on the viscosity of rice [8].

Wang et al. (2014) suggested that the degree of polishing has little effect on cooking and taste of rice, but has a significant effect on nutrient content.

Chagam Koteswara Reddy from Pondicherry University, India (2017) in his research claimed that 9% polishing resulted in decrease in moisture, ash, protein and fat content in pigmented rice while carbohydrate content (including amylose) increased in pigmented rice. Monks J.L.F. et al. from Federal University of Pelotas, Brazil (2013), Roy R. et al. from National Food Research Institute, Japan (2008) also reported that fat content in brown rice decreased with 12% polishing.

Differences in the amount and composition of the bran formed during grain polishing may arise depending on the characteristics of genotypes, environmental conditions and agronomic cultivation practices [1]. Research by Belgian scientists has shown that the loss of protein content is lower in pigmented rice (from 3.08% to 5.02%) due to polishing (9%), which was possible due to the fact that the absolute protein content in the endosperm of rice grains is higher than in the bran layers [11].

The amylose content plays a decisive role in determining the taste of rice grains [12] and in the cooking process, it affects the viscosity of the starch dispersion and the consistency of cooked rice [4]. With an increase in the de-

gree of polishing, the amylose content increases. With an increase in the duration of grain polishing of eleven varieties, an increase in the concentration of amylose, nitrogen, minerals towards the center of the grain was found, and the outer parts of the grain were rich in phosphorus, magnesium, potassium and manganese [7]. These results indicated that the outer part contains various compounds other than starch, while the inner part contains relatively pure starch. Rice flavor and other characteristics can be improved by controlling the polishing degree.

Analysis of the relationship between protein content and the polishing degree showed that protein is unevenly distributed in the kernel of husked rice [13]. Increasing the degree of polishing rice grains leads to the loss of essential amino acids such as glutamic acid, lysine and tartaric acid, which are mainly responsible for the aroma and taste qualities when cooking rice [5]. Varietal response to polishing was found, with iron content loss ranging from 25 to 84% for different varieties. Like other nutrients, selenium was also lost during polishing [14]. Important functions of selenium include its antioxidant properties and its ability to perform enzymatic functions, making it an essential element of food products [15].

Evaluation of the physicochemical and biochemical quality traits of rice varieties with different degrees of polishing is necessary for developing optimal modes of processing grain of different varieties in order to preserve the necessary nutrients in rice.

Purpose. The goal of the study was to assess the influence of the grain polishing degree of Russian-bred rice varieties with different grain sizes and shapes on the physical (technological) traits of the grain.

Materials and methods

The material for the study was the grain of medium-weight and large and medium-grain rice varieties grown at the experimental production site of the Federal Scientific Rice Centre and in rice-growing farms of Krasnodar region in 2024 (Table 1). The variety Favorit was used as a standard. The studied rice varieties Favorit st, Veles, Trio, Regul 2, Forsazh, Strombus, Prestige, Vector are included in the State Register of Breeding Achievements approved for use in the North Caucasus region. When the seeds reached full ripening, rice grain samples were collected (full ripening phase). The panicles were cut, dried to a standard grain moisture content of 14% and stored. The grain size was determined by the trait of "mass of 1000 absolutely dry grains" in accordance with GOST 10842-89 "Grain of cereal and legume crops and oilseeds"

using the ELVIZ-2 moisture analyzer, the ASESh-8-2 air-thermal measuring unit and the SLY-C automatic seed counter. Vitreousity was determined according to GOST 10987-76 "Grain. Methods for determining vitreousity". Fracturing and vitreousity were assessed in transmitted light using the DZZ-3 device. The morphological grain traits (grain shape) were determined by its linear dimensions on the scanner (image analysis system LA 2400, WinFOLIA using the Seedling computer program, Canada). The quality traits of the milled rice were assessed under certain parameters: moisture 10–14%, shaft rotation speed 600–900 rpm. The rice grains were hulled and polished on a Yasar Makina CRM 125 2T unit (Turkey) for 50 (46), 90 (87), and 120 (117) seconds. Technological quality traits were determined by standardized methods: grain size by the mass of 1000 absolutely dry grains (mass of 1000 a.d. grains) - according to GOST 10842-89. The yield of polished rice was determined according to GOST R 50438-92. Total milling yield, head rice content, the percentage of crushed rice (kernels that were less than two-thirds of the grain length were considered crushed) were determined. The duration of grain polishing was 50, 90, 120 seconds.

Statistical processing was performed in Excel (M), standard error of the mean (±SEM), LSD at 5% significance level.

Table 1.

Research material – Russian-bred rice varieties

Variety	Patent	Group of varieties according to grain shape
Favorit, st	№ 7226	medium-grain
Utes	-	medium-grain
Veles	№ 10934	medium-grain
Trio	№ 13458	medium-grain
Regul 2	-	medium-grain
Forsazh	№ 13457	medium-grain
Strombus	-	medium-grain
Prestige	№ 12435	medium-grain
Vector	№ 86788	medium-grain

Results and discussion

The research included differentiation of varieties by grain size and shape (Table 2). The group of medium-grain varieties with medium grain weight included the varieties Utes, Veles, Trio; the group of medium-grain large-grain varieties included Favorit, Regul 2, Forsazh, Strombus, Prestige, Vector.

With different grain polishing intensities, the kernels differed in color (Fig. 1).

Fig. 1. Rice grain, husked rice, polished rice.
1 - rice grain, 2 - husked rice, 3 - rice polished for 50 s, rice polished for 90 s, rice polished for 120 s.

When rice is husked, the seed coat and outer coat of the grain are preserved. When polished for 50 s, the germ and seed coat are partially preserved, as evidenced by the cream color of the kernel. When polished for 90 s, traces of the seed coat are visible on the surface of the kernel, the germ is absent. When polished for 120 s, all kernels are typically white, while the germ, seed coat and outer coat are completely removed, the kernel is the endosperm.

The assessment of physical (technological) quality traits was carried out based on the characteristics of grain size, shape, filminess, vitreousity, and fracturing (Table 2).

The weight of 1000 a.d. grains was in the range of 25.6-26.6 g in the group of medium-weight varieties and 28.4-33.1 g in the group of large-grain rice varieties. The highest value of the trait was noted in the medium-weight variety Utes (26.6 g) and in the large-grain variety Strombus (33.1 g), which was 3.5 g lower and 3.0 g higher than the values of the standard variety Favorit, respectively.

The filminess of the studied rice varieties was within 16.8–22.8% in the group of medium-weight varieties and 16.2–19.2% in the group of large-grain varieties. The highest value of the trait was noted in the varieties Utes (22.8%)

and Regul 2 (19.2%), which exceeded the filminess of the standard variety Favorit by 4.2 and 0.6%, respectively.

Table 2.

Characteristic of rice varieties by technological grain quality traits

№	Variety	Mass of 1000 a.d. grains, g	Gran length-to-width ratio (l/b)	Filminess, %	Vitreousity, %	Fracturing, %
			medium-weight rice varieties			
1	Utes	26,6±0,10	2,5±0,06	22,8±0,21	99±1,15	38±0,58
2	Veles	25,9±0,06	2,4±0,10	16,8±0,10	98±1,53	22±1,00
3	Trio	25,6±0,20	2,8±0,10	20,0±0,25	90±1,25	27±1,73
			large-grain rice varieties			
1	Favorit st	30,1±0,08	2,4±0,10	18,6±0,15	75±1,75	19±1,10
2	Regul 2	29,4±0,20	2,4±0,08	19,2±0,22	90±1,10	88±1,15
3	Forsazh	31,9±0,10	2,3±0,20	16,6±0,17	80±1,60	21±1,73
4	Strombus	33,1±0,15	2,5±0,17	16,2±0,18	89±1,32	17±1,00
5	Prestige	29,1±0,22	2,3±0,15	18,6±0,21	87±1,45	45±1,73
6	Vector	30,6±0,17	2,3±0,10	19,0±0,23	85±1,10	71±1,52
	LSD_{05}					

Vitreousity in the group of large-grain varieties was average and varied within the range from 80 to 90%. The highest value of the trait was noted in the variety Regul 2 (90%), which exceeded the trait value in the standard variety Favorit by 15%. In the group of medium-weight varieties, vitreousity was highest in the variety Utes (99%), and lowest in the variety Trio (90%).

Grain fracturing ranged from 22 (Veles) to 38% (Utes) in the group of medium-weight rice varieties and from 17 (Strombus) to 88% (Regul 2) in the group of large-grain varieties. The variety Regul 2, with high vitreousity, exhibits high cracking.

Analyzing the values of the traits by groups, we concluded that the filminess and vitreousity were higher in medium-weight varieties. The medium-weight variety Utes and the large-grain variety Strombus were recognized as the best quality varieties.

The results of the influence of the polishing degree on the total yield of polished rice and the head rice content for medium-weight and large-grain varieties are presented in Tables 3, 4 and in Figures 2, 3. The total yield of polished rice was the highest for all medium-weight varieties in the experiment when polished for 50 seconds (73.3% for Utes, 74.6% for Veles and 73.2% for Trio) (Table 3).

Table 3.

Characteristics of medium-weight medium-grain rice varieties by polishing intensity

Variety	Indicator	Polishing time, s		
		50	90	120
Utes	total yield of polished rice, %	73,3	68,2	65,3
	head rice content,%	82,3	81,6	81,0
	bran, % from grain	3,9	9,0	12,0
Велес	total yield of polished rice, %	74,6	73,2	65,5
	head rice content,%	82,0	81,8	80,8
	bran, % from grain	8,6	10,0	17,7
Трио	total yield of polished rice, %	73,2	68,7	60,9
	head rice content,%	70,0	69,2	67,4
	bran, % from grain	7,7	12,0	19,7

With increasing polishing time, the values of the trait decreased: when polishing for 90 seconds - by 5.1% for Utes, 1.4% for Veles, 4.5% for Trio; at 120 seconds - by 8.0% for Utes, 9.1% for Veles and 12.3% for Trio. The total yield of polished rice was higher for the variety Veles.

Head rice content was the highest when polished for 50 seconds (82.3% for Utes, 82.0% for Veles, and 70.0% for Trio). With an increase in the polishing time, the values of the trait increase: with a polishing time of 90 seconds by 0.7% for Utes, 0.2% for Veles, and 0.8% for Trio; with a polishing time of 120 seconds by 1.3% for Utes, 1.2% for Veles, and 2.6% for Trio. Head rice content of the varieties Utes and Veles differed insignificantly, and in the variety Trio it was significantly lower.

The bran yield was studied under conditions of different polishing degrees of medium-weight varieties. The bran content was determined in the experiment in relation to the initial mass of grain and to the mass of husked rice. With the shortest polishing time (50 seconds), the bran content in relation to the initial grain mass is minimal: 3.9% for Utes, 8.6% for Veles, 7.7% for Trio. The values of the trait increase with increasing polishing time: by 5.1 and 8.1% for Utes, 1.4 and 9.1% for Veles, 4.3 and 12.0 for Trio with a polishing time of 90 and 120 seconds, respectively.

The large-grain varieties showed the same tendency as the medium-weight varieties. The total milling yield decreased with increasing polishing time. The values of the trait were the highest for all varieties in the experiment when polishing for 50 seconds (72.3% for Favorit, 75.1% for Regul 2, 74.8% for Forsazh, 75.0% for Strombus, 74.0% for Prestige, and 73.2% for Vector) (Table 4).

Table 4.

Characteristics of large-grain medium-grain rice varieties by polishing intensity

Variety	Indicator	Polishing time, s		
		50	90	120
Favorit	total yield of polished rice, %	72,3	69,5	67,4
	head rice content,%;	88,1	84,7	84,1
	bran, % from grain;	9,1	11,9	14,0
Regul 2	total yield of polished rice, %;	75,1	68,9	60,6
	head rice content,%;	30,9	28,0	19,2
	bran, % from grain;	5,7	11,9	20,2
Forsazh	total yield of polished rice, %;	74,8	74,0	67,6
	head rice content,%;	82,6	81,8	78,8
	bran, % from grain;	8,6	9,3	15,8
Strombus	total yield of polished rice, %;	75,0	71,6	67,1
	head rice content,%;	83,0	80,4	80,3
	bran, % from grain;	8,8	12,2	16,7
Prestige	total yield of polished rice, %;	74,0	69,7	62,4
	head rice content,%;	30,8	27,5	21,4
	bran, % from grain;	7,4	11,7	19,0
Vector	total yield of polished rice, %;	73,2	68,1	55,7
	head rice content,%;	25,2	26,6	43,5
	bran, % from grain	7,8	12,9	25,3

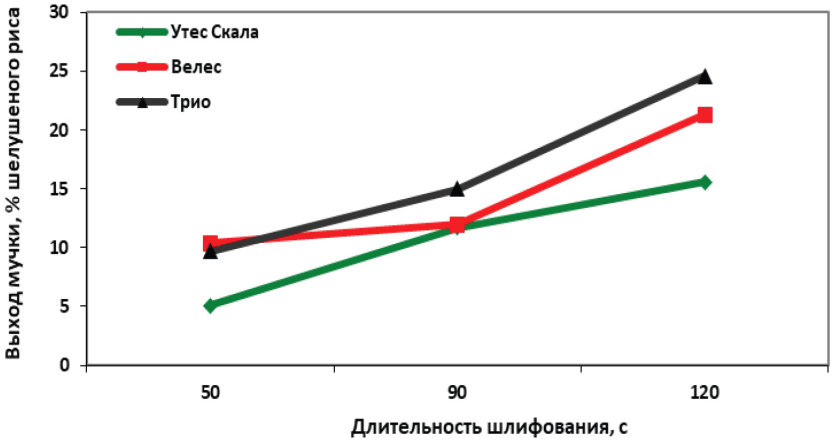

Fig. 2. Bran yield under conditions of varying grain polishing degrees of medium-weight medium-grain rice varieties.

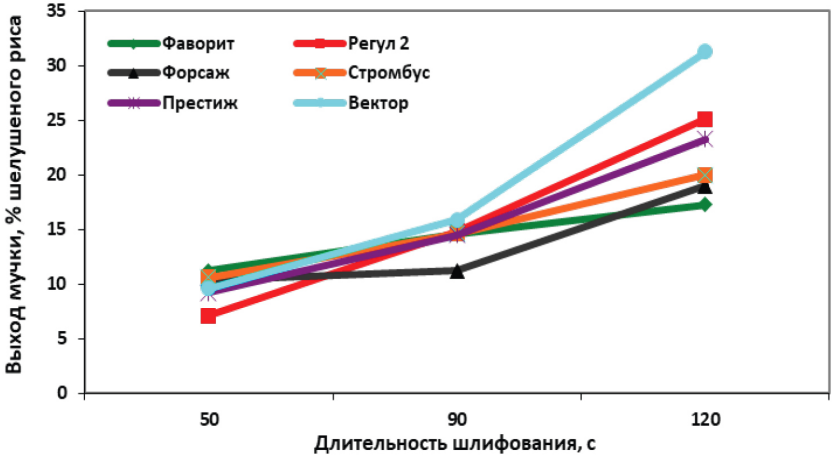

Fig. 3. Bran yield under conditions of varying grain polishing degrees of large-grain medium-grain rice varieties.

With the increase of polishing time, the values of the total milling yield decreased: with a polishing time of 90 seconds by 2.8% for Favorit, 6.2% for Regul 2, 0.8% for Forsazh, 3.4% for Strombus, 4.3% for Prestige, 5.1% for Vector; with a polishing time of 120 seconds by 4.9% for Favorit; 14.5% for Regul 2; 7.2% for Forsazh; 7.9% for Strombus; 11.6% (7.3%) for Prestige; 17.5% for Vector. The total yield of polished rice was higher for variety Forsazh.

Head rice content was the highest at a polishing time of 50 seconds: 88.1% for Favorit, 30.9% for Regul 2, 82.6% for Forsazh, 83.0% for Strombus, 30.8% for Prestige, 26.6%. The trait values decreased with an increase in the polishing time to 90 and 120 s: by 3.4 and 4.0% for Favorit, 2.9 and 11.7% for Regul 2, 0.8 and 3.8% for Forsazh, 2.6 and 2.7% for Strombus, 3.3 and 9.4% for Prestige, 1.4% and 18.3% for Vector, respectively, at 90 and 120 s.

The bran content in relation to the initial grain weight is minimal with the shortest polishing time (50 seconds): 9.1% for Favorit, 5.7% for Regul 2, 8.6% for Forsazh, 8.8% for Strombus, 7.4% for Prestige, 7.8% for Vector. The trait values increase with increasing polishing time: by 2.8 and 4.9% for Favorit, 6.2 and 14.5% for Regul 2, 0.7 and 7.2% for Forsazh, 3.4 and 4.5% for Strombus, 4.3 and 11.6% for Prestige, 5.1 and 17.5% for Vector, with a polishing time of 90 and 120 seconds respectively.

The bran content during grain polishing was estimated in order to eliminate the effect of rice filminess on the indicator (Fig. 2, 3). The bran content rela-

tive to the weight of husked rice increased with increasing polishing time for all varieties in the experiment. For varieties with a medium grain weight, the value of the trait at 50 seconds was 5.1% for Utes, 10.4% for Veles, and 9.7% for Trio. With a polishing time of 90 seconds, the bran yield increased by 6.6% for Utes, 1.6% for Veles, and 5.3% for Trio (Fig. 2). With a further increase in the polishing time to 120 seconds, the values of the trait increased by 10.5% for Utes, 10.9% for Veles, and 14.9% for Trio.

The bran content relative to the mass of husked rice increased with increasing polishing time for all varieties in the experiment: at 50 seconds, the value of the trait was 11.2% for Favorit, 7.1% for Regul 2, 10.3% for Forsazh, 10.6% for Strombus, 9.2% for Prestige, and 9.6% for Vector. At a polishing time of 90 seconds, the bran yield increased by 3.4% for Favorit, 7.7% for Regul 2, 0.9% for Forsazh, 4.0% for Strombus, 5.3% for Prestige, and 6.3% for Vector (Fig. 3). With a further increase in the polishing time to 120 seconds, the trait values increased by 6.1% for Favorit, 18.0% for Regul 2, 8.7% for Forsazh, 9.4% for Strombus, 14.1% for Prestige, and 21.7% for Vector.

Thus, increasing the polishing time to 120 seconds reduces the total yield of polished rice to a lesser extent in the varieties Utes and Favorit, the head rice content in the varieties Veles and Strombus, the bran content relative to the initial grain weight in the varities Utes and Strombus, and the bran content relative to the mass of husked rice in the varieties Utes, Veles and Favorit. The varieties with medium-weight grains were characterized by resistance of rice grain to polishing due to crushing.

For the varieties, unequal dynamics of quality traits were noted under conditions of intensified polishing: in some varieties, significant changes occurred already with an increase in the polishing duration to 50 s, while in others they occurred at 120 s, as in the varieties Vector and Veles (total yield).

Conclusion

Rice varieties were grouped according to grain size. When polished for 50 s, the germ and seed coat were partially preserved; when polished for 90 s, traces of the seed coat were visible on the surface of the kernel, the germ was absent; when polished for 120 s, all kernels were white, while the germ, seed coat and outer coat were completely removed. The mass of 1000 a.d. grains was in the range of 25.6-26.6 g in the group of medium-weight varieties and 28.4-33.1 g in the group of large-grain rice varieties. The grain fracturing was in the range from 22 for the variety Veles to 38% for the variety Utes in the group of medium-weight rice varieties and from 17 for the variety Strombus to 88% for

variety Regul 2 in the group of large-grain varieties. Filminess and vitreousity were higher in medium-weight varieties.

The total yield of polished rice was the highest for all medium-weight varieties in the experiment when polished for 50 seconds. With an increase in the polishing duration to 120 s, total milling yield decreased by 55.7% for the large-grain variety Vector to 67.6% for the variety Forsazh. Among large-grain varieties, the maximum decrease in the total milling yield was typical for varieties Trio (12.3%) and Regul 2 (14.5%). Among medium-weight varieties, the decrease in the total milling yield was significantly less: up to 65.3-67.4%.

With increasing polishing duration, kernel crushing increased, which led to a decrease in the head rice content. In the group of large-grain varieties, Forsazh and Strombus were the most resistant to intensive polishing: the head rice content decreased by 3.8 and 3.7% at 120 s; the varieties Prestige and Favorit were the least resistant (11.7 and 18.3%). In the group of medium-weight varieties, the corresponding indicators of the head rice content were significantly lower: 1.2-2.6%.

Thus, significant dynamics of the indicators was noted already at the initial stage of grain polishing (90 s) in the rice varieties Favorit and Strombus for the indicator “head rice content”, Favorit and Utes - for the bran yield; at the stage of 120 s - in the varieties Regul 2 and Vector, Prestige for all traits, the varieties Trio and Forsazh for the indicators “total milling yield” and “bran yield”. Equivalent changes in the indicator of traits with different degrees of polishing were typical for the varieties Strombus and Utes for the indicator of total milling yield; Trio, Utes and Forsazh- for the head rice content and the variety Strombus - for the bran yield.

Differences in the nature of the influence of the polishing degree on the rice quality traits may be due to the physical properties of the grain: the endosperm structure, grain shape and size. The relationship between the polishing degree and the rice quality parameters must be taken into account in the breeding process in accordance with the task of developing new genotypes with certain technological traits and nutritional values and in the production processes of cereals (polished rice).

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AUTHOR CONTRIBUTIONS

The authors contributed equally to this article.

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DATA ABOUT THE AUTHORS

Elina Yu. Papulova, Ph.D. in Biology, Senior Scientist of Laboratory of Rice Quality
Federal State Budgetary Scientific Institution «Federal Scientific Rice Centre»
3, Belozerny, Krasnodar, 350921, Russian Federation
elya888.85@mail.ru
SPIN-code: 3118-1175
ORCID: https://orcid.org/0000-0002-0636-4409
ResearcherID: AFF-6035-2022
Scopus Author ID: 57218104152

Natalya G. Tumanyan, Dr. Sc. (Biology), Professor, Head of Laboratory of Rice Quality
Federal State Budgetary Scientific Institution «Federal Scientific Rice Centre»
3, Belozerny, Krasnodar, 350921, Russian Federation

tngerag@yandex.ru
SPIN-code: 9234-5609
ORCID: https://orcid.org/0000-0002-5843-0930
ResearcherID: ABW-7206-2022
Scopus Author ID: 6506633861

Svetlana S. Chizhikova, Ph.D. in Biology, Senior Scientist of Laboratory of Rice Quality
Federal State Budgetary Scientific Institution «Federal Scientific Rice Centre»
3, Belozerny, Krasnodar, 350921, Russian Federation
Kvetochka2005@yandex.ru
SPIN-code: 8023-0685
ORCID: https://orcid.org/0000-0001-5465-3603
ResearcherID: OIS-2400-2025
Scopus Author ID: 57218100898

Ruslan N. Troyan, Post-Graduate Student
Federal State Budgetary Scientific Institution «Federal Scientific Rice Centre»
3, Belozerny, Krasnodar, 350921, Russian Federation
1998troyan@gmail.com
SPIN-code: 9739-2184
ORCID: https://orcid.org/0009-0008-5157-5601

Tatyana B. Kumeiko, Ph.D. in Agriculture, Senior Scientist of Laboratory of Rice Quality
Federal State Budgetary Scientific Institution «Federal Scientific Rice Centre»
3, Belozerny, Krasnodar, 350921, Russian Federation
tatkumejko@yandex.ru
SPIN-code: 6928-5880
ORCID: https://orcid.org/0000-0002-2190-7408
ResearcherID: OIS-2306-2025
Scopus Author ID: 57218252312

ДАННЫЕ ОБ АВТОРАХ

Папулова Элина Юрьевна, канд. биол. наук, старший научный сотрудник лаборатории качества риса

Федеральное государственное бюджетное научное учреждение «Федеральный научный центр риса»
п. Белозерный, 3 , г. Краснодар, 350921, Российская Федерация
elya888.85@mail.ru

Туманьян Наталья Георгиевна, д-р биол. наук, профессор, заведующая лабораторией качества риса
Федеральное государственное бюджетное научное учреждение «Федеральный научный центр риса»
п. Белозерный, 3 , г. Краснодар, 350921, Российская Федерация
TNGeraG@yandex.ru

Чижикова Светлана Сергеевна, канд. биол. наук, старший научный сотрудник лаборатории качества риса
Федеральное государственное бюджетное научное учреждение «Федеральный научный центр риса»
п. Белозерный, 3 , г. Краснодар, 350921, Российская Федерация
kvetochka2005@yandex.com

Троян Руслан Николаевич, аспирант
Федеральное государственное бюджетное научное учреждение «Федеральный научный центр риса»
п. Белозерный, 3 , г. Краснодар, 350921, Российская Федерация
1998troyan@gmail.com

Кумейко Татьяна Борисовна, канд. с.-х. наук, старший научный сотрудник лаборатории качества риса
Федеральное государственное бюджетное научное учреждение «Федеральный научный центр риса»
п. Белозерный, 3 , г. Краснодар, 350921, Российская Федерация
tatkumejko@yandex.ru

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