

озимая рожь хороший предшественник для многих культур. Возделывание озимой ржи позволяет разгрузить пиковые нагрузки на машинно-тракторный парк и рабочие силы хозяйства и тем самым сократить затраты.

Озимая рожь самый ранний корм весной для сельскохозяйственных животных, поэтому в зеленом конвейере она часто является первой культурой и позволяет предупредить развитие авитаминоза у животных ранней весной. Поедаемость зеленой массы ржи животными очень высокая и использовать ее можно примерно на 2 недели раньше, чем посеги многолетних трав. На зеленую массу ее скашивают в период «выход в трубку-колошение». Рожь дает зеленую массу для пастьбы крупного рогатого скота и лошадей и поздней осенью при наступлении морозов.

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EFFICIENCY OF CULTIVATION OF POTATO VARIETIES OF DIFFERENT EARLY MATURITY IN THE CONDITIONS OF THE WEST KAZAKHSTAN REGION

Abstract

The importance of the variety has significantly increased in the context of the transition of crop production from chemical-technogenic farming systems based on comprehensive industrialization and chemization to adaptive (ecological-biosphere) systems aimed at preserving and increasing soil fertility and crop yields, based on the creation of sustainable agrobiocenoses that do not violate the natural processes occurring in the biosphere. It is believed that at the current rate of development of agriculture and breeding, the contribution of the variety to the further growth of potato productivity will continuously increase and reach 60-80%. In this regard, one of the most pressing problems in potato growing is the economic, biological and economic assessment of each variety cultivated in production.

We have made an economic assessment according to three groups of indicators: all types of material and monetary costs (expenditure part); output of products in kind and value forms (income part); indicators of economic efficiency, which serve as the basis for an objective assessment of the advantages or disadvantages of a particular variety. The general indicators of economic efficiency are the net income per unit of planting area, the cost of a unit of production, and the level of profitability. The expenditure part includes labor costs with deductions, the cost of seeds, the cost of their preparation, fertilizers, plant protection products, the maintenance of fixed assets, including the cost of fuel, amortization, general economic expenses and other costs. Economic calculations have shown that the efficiency of potato cultivation largely depends on the variety.

Keywords: *potatoes, sorts, different early maturity, economic efficiency, energy assessment.*

Introduction. To intensify potato growing in the West Kazakhstan region, it is necessary to use such varieties that, along with valuable economic characteristics, would have high resistance to heat and drought. Without this, any variety here has no practical significance. Unfortunately, it is very difficult to find varieties that are resistant to heat and drought. And, if the fight against drought is carried out by irrigation, then with the heat it is more difficult.

Climatic and weather conditions of the West Kazakhstan region (long summer with frequent droughts and dry winds, with high temperatures and low relative humidity) promotes the degeneration of potatoes. This process is greatly enhanced when the seed material is infected with numerous

viruses, the reproduction of which is also promoted by the arid climate. Significant crop growth cannot be achieved without the introduction of new high-yielding varieties that are adapted to local conditions and have a complex resistance to major diseases, especially viral ones, as well as without a detailed study of their cultivation technology. In recent years, many domestic and foreign varieties have been included in the breeding register, but due to the lack of fruit and vegetable variety sites in the West Kazakhstan region, no one is practically engaged in testing them. But it is well known that not every variety is suitable for cultivation in all zones. In this regard, we continued to study the productivity of 11 varieties of potatoes selected from abroad, 13 varieties of Russian selection and 2 varieties of domestic (Kazakhstan) selection.

The experimental work was carried out on the irrigated area of the RSE «Uralsk Agricultural Experimental Station». The main tillage consisted of autumn plowing to a depth of 25-27 cm and spring tillage with a KPE-3.8 cultivator to a depth of 15-17 cm, followed by cutting ridges and planting to a depth of 6-8 cm according to the 70 x 35 cm scheme. Seed tubers weighing 50-80 g were selected for laying experiments. During the growing season of potatoes, the soil moisture was maintained by watering at the level of 70-75 % HB before germination, then until the end of flowering – 80-85 % HB, after flowering-70-75% HB, and the field was kept clean of weeds. In the fight against the Colorado beetle, the drug decis-extra and confidor were used. The meteorological conditions of the growing seasons in the years of research were different. The growing season of 2017 was characterized by the rate of heat accumulation, dry spring, cool summer and relatively high humidity in the second half of summer. The average air temperature in the first decade of April was 20⁰C, in the second – 6.50⁰C, in the third-9.70⁰C, the monthly average-6.10⁰C, which is lower than the long-term average by 1.60⁰C. May, June, and July were cooler than usual, while August was warmer. In April, precipitation fell less than normal, in May, June and July, on the contrary, more than normal. The weather conditions in 2018 differed from 2017 with higher temperatures and less precipitation. The growing season of 2019 differed in weather conditions both in comparison with 2017 and 2018.

Phenological observations were conducted daily for all variants of the experiment. Noted the following phases of development: the beginning of germination, full sprouting, budding, beginning of flowering, full flowering, start dying foliage. The density of standing plants was calculated after the emergence of seedlings and before harvesting on all plots for all repetitions of the experiment. The height of the plant was determined by the isomer of 10 consecutive standing bushes, every 10 days on each plot for all repetitions. The assimilation surface of the leaves was determined by the "die-cut" method, the intensity of photosynthesis by the «halves» method, and the dynamics of crop accumulation by dynamic digs, the content of starch, vitamin C in the tubers, and the structure of the crop. The yield data were processed mathematically by the method of dispersion analysis (according to B. A. Dospekhov).

The research results showed that in the conditions of the West Kazakhstan region, not all varieties provide a high yield, especially in a hot year, such as 2018. As a rule, yield and marketability of tubers of early varieties are superior to middle-and middle -, middle-and have advantages over the mid and medium. Thus, the lowest potato yield in 2017 was obtained for the zoned mid-late variety Lorch (21.1 t / ha), while such mid-late varieties as Asterix and Bintier exceeded it in yield by 13.9-14.0 t/ha. The highest yield this year was obtained for the early varieties Udacha and Zhukovsky early, the yield of which was 44.5 and 42.9 t/ha, respectively. In 2018, a decrease in yield was noted for all varieties in comparison with 2017. In 2019, a significant increase in the yield in comparison with the standard (Nevsky variety) was obtained for the varieties Zhukovsky early, Karatop, Timo, Udacha, Rosara, Petersburgsky, Alaya zarya, Yagodny 19, Arosa, Volzhsky, Doriza, Desire, Zekura. On average, for 3 years, the highest yield was obtained from the varieties Udacha (36.6 t/ha), Rosara (32.4 t/ha) and Zekura (36 t/ha).

The ongoing agrarian reform and the main tasks of the national project in agriculture aims to reform all parts of agriculture, the formation of a mixed economy, the revival of the owner – the owner, and on this basis the stabilization and increase in agricultural production, improving living standards of the population and economy of the Republic. The difficult natural and climatic conditions of the West Kazakhstan region determine the instability of agriculture and the low level of crop productivity. Under these conditions, for many potato farms, variety substitution is practically the only

available factor for the intensification of the industry. Replacing old varieties with new ones not only increases productivity, but also allows better use of other factors of production: agricultural machinery, fertilizers, machinery, irrigation. In essence, the variety acts as a biological foundation on which all other elements of yield are built [1].

The importance of the variety has significantly increased in the context of the transition of crop production from chemical-technogenic farming systems based on comprehensive industrialization and chemization to adaptive (ecological-biosphere) systems aimed at preserving and increasing soil fertility and crop yields, based on the creation of sustainable agrobiocenoses that do not violate the natural processes occurring in the biosphere. It is believed that at the current rate of development of agriculture and breeding, the contribution of the variety to the further growth of potato productivity will continuously increase and reach 60-80 %. In this regard, one of the most pressing problems in potato growing is the economic, biological and economic assessment of each variety cultivated in production.

We have made an economic assessment according to three groups of indicators: all types of material and monetary costs (expenditure part); output of products in kind and value forms (income part); indicators of economic efficiency, which serve as the basis for an objective assessment of the advantages or disadvantages of a particular variety. The general indicators of economic efficiency are the net income per unit of planting area, the cost of a unit of production, and the level of profitability. The expenditure part includes labor costs with deductions, the cost of seeds, the cost of their preparation, fertilizers, plant protection products, the maintenance of fixed assets, including the cost of fuel, amortization, general economic expenses and other costs.

The economic efficiency of cultivation of different varieties is calculated in Kazakhstani tenge, the cost of the crop is accepted at the prevailing prices for a certain period. Economic calculations have shown that the efficiency of potato cultivation largely depends on the variety (Table 1). Thus, the highest crop value in the group of early-maturing varieties was obtained for the Udacha variety (2562 thousand tenge / ha), which is more than in comparison with other varieties of this group by 294 – 1225 thousand tenge/ha. In the group of medium-early varieties, the highest value was obtained for the Zekura variety – 2520 thousand tenge/ha, which is 833 – 1071 thousand tenge. tenge is more in comparison with other varieties of this group, and 42 tenge less than for the Udacha variety. Very high yield value was obtained for early-maturing varieties of Rosara (2268 thousand tg/ha, Arosa (2100 thousand tg/ha), Karatop (1995 thousand tg/ha), Zhukovsky early (1939 thousand tg/ha), Yagodny 19 (1876 thousand tg/ha). The lowest value of the crop in the group early-maturing varieties obtained for grade Utenok (1337 thousand tenge/ha), the group's middle-grade Dorisa (1449 thousand tenge/ha), in the group of middle-grade Record (1162 thousand tenge/ha) and in the group of medium – grade Lorch (952 thousand tenge/ha). The highest costs were in the cultivation of such varieties as Udacha, Rosara, Arosa, Zekura, which is associated with the cost of harvesting, transportation of additional crops, but they were insignificant and amounted to 10-16 thousand tenge/ha. But when cultivating these varieties, the lowest cost is obtained. The minimum cost of potatoes was obtained when cultivating the Udacha variety 1630 tg/t, which is less than in comparison with other varieties by 25.5 – 2587.6 tg/t.

The highest conditional net income (1965 thousand tenge/ha) was also obtained from the cultivation of this variety, and the lowest – from the cultivation of the mid – late variety Lorch (378.4 thousand tenge/ha). The highest profitability was provided by the varieties Udacha (329.4%), Rozara (282.8%), Zekura (322.8%), Arosa (255.9%), Karatop (238.9%), Zhukovsky Early (229.9%). The lowest profitability was obtained for the mid-late Lorch variety (65.9%) and the mid-ripe Record variety (101.5%).

Along with the generally accepted methods of evaluating the efficiency of production by means of cost and labor indicators, the universal energy indicator of the ratio of energy accumulated in products and spent on its creation has recently become increasingly widespread in the world practice. The ever-increasing energy shortage requires accounting for the energy costs of producing each type of agricultural product. Bioenergy assessment of agricultural technologies makes it possible to determine the socially necessary energy costs in the production process and in the final products of agriculture [2,3].

Table 1-Economic efficiency of cultivating potato varieties

Sorts	Yield, t / ha	The cost of the crop, thousand tg / ha	Expences, thousand tenge / ha	Prime cost, tg/thousands	Conditional net income, thousand tenge / ha	Profitability, %
Early maturing sorts						
Zhukovsky early	27,7	1939	587,7	2121,6	1351,3	229,9
Ufenok	19,1	1337	579,1	3031,9	757,9	130,8
Karatop	28,5	1995	588,5	2064,9	1406,5	238,9
Penza skorospelka	21,2	1484	581,2	2741,5	902,8	155,3
Timo	21,6	1512	581,6	2692,5	930,8	160,0
Udachya	36,6	2562	596,6	1630,0	1965,4	329,4
Rosara	32,4	2268	592,4	1828,3	1675,6	282,8
Arosa	30,0	2100	590,0	1966,6	1510,0	255,9
Impala	25,3	1771	585,3	2313,4	1185,7	202,5
Yagodny 19	26,8	1876	586,8	2189,5	1289,2	219,7
Pushkina	21,7	1519	581,7	2680,6	937,3	161,1
Medium-early sorts						
Nevsky (st)	24,1	1687	584,1	2423,6	1102,9	188,8
Vladikavkazshy	23,3	1631	583,3	2503,4	1047,7	179,6
Zekura	36,0	2520	596,0	1655,5	1924,0	322,8
Volzhannin	20,9	1463	580,9	2779,4	882,1	151,8
Dorisa	20,7	1449	580,7	2805,3	868,3	149,5
Medium-ripened sorts						
Desiree	21,5	1505	581,5	2704,6	923,5	158,8
Record	16,6	1162	576,6	3473,4	585,4	101,5
Petersburg	26,3	1841	586,3	2229,2	1254,7	214,0
Carolyn	16,9	1183	576,9	3413,6	606,1	105,0
Post 86	20,6	1442	580,6	2818,4	861,4	148,3
Alaya Zaryya	23,1	1617	583,1	2524,2	1033,9	177,3
Mid-late sorts						
Asterix	24,6	1722	584,6	2376,4	1137,4	194,5
Bintier	20,4	1428	580,4	2845,0	847,6	146,0
Lorch	13,6	952	573,6	4217,6	378,4	65,9

A comparative energy assessment of cultivar cultivation showed that bioenergetic efficiency can be improved by selecting varieties, increasing the energy stored in the new crop (Table 2).

Table 2-Energy rating of potato varieties

Sorts	Yield, t / ha	Yield accumulation energy, MJ / ha	Total energy consumption, MJ / ha	The energy efficiency ratio
Early maturing sorts				
Zhukovsky early	27,7	96119	72087	1,33
Utenok	19,1	66277	67787	0,97
Karatop	28,5	98895	72487	1,36
Penza skorospelka	21,2	73564	68837	1,06
Timo	21,6	74952	69037	1,08
Udacha	36,6	127002	76537	1,65
Rosara	32,4	112428	74437	1,51
Arosa	30,0	104100	73237	1,42
Impala	25,3	87791	70887	1,23
Yagodny 19	26,8	92996	71637	1,29
Pushkina	21,7	75299	69087	1,08
Medium-early sorts				
Nevsky (st)	24,1	83627	70287	1,18
Vladikavkazshy	23,3	80851	69887	1,15
Zekura	36,0	124920	76237	1,63
Volzhanin	20,9	72523	68687	1,05
Dorisa	20,7	71829	68587	1,04
Medium-ripened sorts				
Desiree	21,5	74605	68987	1,08
Record	16,6	57602	66537	0,86
Petersburg	26,3	91261	71387	1,27
Carolyn	16,9	58643	66687	0,88
Post 86	20,6	71482	68537	1,04
Alaya Zarya	23,1	80157	69787	1,14
Mid-late sorts				
Asterix	24,6	85362	70537	1,21
Bintier	20,4	70788	68437	1,03
Lorch	13,6	47192	65037	0,72

Thus, the greatest energy accumulated by the crop was obtained during the cultivation of the early-maturing variety Udacha-127002 MJ/ha, which is more in comparison with the production of other varieties by 2082-79810 MJ/ha. Much energy is accumulated by the crop during the cultivation of the medium-early variety Zekura (124920 MJ/ha), early-maturing varieties Rosara (112428 MJ/ha), Arosa (104100 MJ/ha), Karatop (98895 MJ/ha), Zhukovsky early (96119 MJ/ha), Berry 19 (92996 MJ/ha), medium-maturing variety Petersburg (91261 MJ/ha).

But when growing these varieties, the total energy costs per 1 ha also increase, which is associated with harvesting, loading and transporting additional crops. Thus, when cultivating the early-maturing variety Udacha, the total energy expenditure amounted to 76537 MJ/ha, which is more than for other varieties by 300-11500 MJ/ha.

An agricultural technique, cultivation technology, or system is considered effective if the bioenergy efficiency coefficient is greater than one. Analysis of energy storage and consumption data showed that for most varieties, the energy efficiency coefficient exceeds this level and ranges from 1.03 to 1.65. Less than one, the energy efficiency coefficient was obtained for the early-maturing Utenok variety, the mid-maturing Record variety, and the mid-late Lorch variety. The highest energy

efficiency coefficient was obtained for the Udacha variety (1.65), and the lowest for the Lorch variety (0.72).

Based on the research results, the following **conclusions** can be drawn:

1. High economic indicators (conditional net income, low cost, high profitability) were obtained when cultivating early-maturing varieties of Luck, Rosara, Arosa and medium-early varieties of Zekura.

2. The highest economic and energy efficiency is obtained when cultivating the early-maturing Udacha variety.

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ТҮЙІН

Ауыл шаруашылығы мен селекцияның қазіргі даму қарқынымен сорттың картоп өнімділігінің одан әрі өсуіне қосқан үлесі үздіксіз артып, 60-80% жетеді деп саналады. Осыған байланысты картоп өсірудегі өзекті мәселелердің бірі – өндірісте өсірілетін әр сортты экономикалық, биологиялық және экономикалық бағалау.

Алынған көрсеткіштердің үш тобы бойынша экономикалық бағалау жүргізілді: материалдық және ақшалай қаражат шығындарының барлық түрлері (шығыс бөлігі); өнімнің заттай және құндық нысандарда шығуы (кіріс бөлігі); қандай да бір сорттың артықшылықтарын немесе кемшіліктерін объективті бағалау үшін негіз болатын экономикалық тиімділік көрсеткіштері.

Экономикалық тиімділіктің жалпылама көрсеткіштері отырғызу алаңының бірлігінен таза кіріс, өнім бірлігінің өзіндік құны, рентабельділік деңгейі болып табылады.

Энергияның жинақталуы мен шығындары туралы мәліметтерді талдау көрсеткендей, көптеген сорттар үшін энергия тиімділігі 1,03-тен 1,65-ке дейін коэффициентті құрап және осы деңгейден асты. Бірліктен аз энергия тиімділігі коэффициенті ерте пісетін сорты Утенок, орташа пісетін Рекорд және орташа кеш пісетін Лорх сорты бойынша алынды.

Энергия тиімділігінің ең жоғары коэффициенті Удача сорты бойынша алынды (1,65), ал ең төмен (0,72) Лорх сорты бойынша болды.

РЕЗЮМЕ

Значение сорта значительно возросло в условиях перехода растениеводства от химико-техногенных систем земледелия, базирующихся на всесторонней индустриализации и химизации, к адаптивным (эколого-биосферным) системам, направленным на сохранение и повышение плодородия почв и урожайности культур, на основе создания устойчивых агробиоценозов, не нарушающих естественных процессов, протекающих в биосфере.

Считается, что при существующих темпах развития земледелия и селекции вклад сорта в дальнейший рост продуктивности картофеля будет непрерывно возрастать и достигнет 60 – 80%. В связи с этим одна из актуальных проблем в картофелеводстве – хозяйственно-биологическая и экономическая оценка каждого сорта, возделываемого в производстве.

Произведена экономическая оценка по трем группам показателей: все виды затрат материальных и денежных средств (расходная часть); выход продукции в натуральной и стоимостной формах (приходная часть); показатели экономической эффективности, которые служат основанием для объективной оценки достоинств или недостатков того или иного сорта.

Обобщающими показателями экономической эффективности является чистый доход с единицы площади посадки, себестоимость единицы продукции, уровень рентабельности.

Агротехнический прием, технология возделывания или система считаются

эффективными, если коэффициент биоэнергетической эффективности больше единицы.

Анализ данных накопления и затрат энергии показал, что по большинству сортов коэффициент энергетической эффективности превышает этот уровень и составляет от 1,03 до 1,65. Меньше единицы коэффициент энергетической эффективности получен по раннеспелому сорту Утенок, среднеспелому сорту Рекорд и среднепозднему сорту Лорх.

Самый высокий коэффициент энергетической эффективности получен по сорту Удача (1,65), а самый низкий по сорту Лорх (0,72).

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БИДАЙДЫҢ САБАҚТЫҚ ТАТҚА ТӨЗІМДІЛІК ГЕНДЕРІН МОЛЕКУЛАЛЫҚ ИДЕНТИФИКАЦИЯЛАУ

MOLECULAR IDENTIFICATION OF WHEAT RESISTANCE GENES TO STEM RUST

Аннотация

Бидайдың сабақтық тат ауруы (*Puccinia graminis* Pers. f. sp. tritici Erik. et Henn) әлемнің көптеген аумағында кең таралған. Аурудың эпифитотиясы кезінде өнімнің ысырап болуы 50-70% құрайды. Бұл жұмыста *Sr*-гендерді арнайы молекулалық маркерлердің көмегімен ПТР арқылы талдау нәтижесінде зерттелген *Sr26*, *Sr31*, *Sr32*, мен *Sr38* гендерінің қазақстандық ген тасымалдаушылары анықталды. Зерттеу нысаны ретінде Қазақстанда көп егілетін жаздық және күздік бидай сорттары Жетісу, Алмалы, Егемен, Байтерек және Казахстанская 10 алынды. Сабақтық татқа төзімділіктің *Sr26* генінің тасымалдаушыларын *Sr26#43*, *Sr31* генінің SCSS30.2₅₇₆, *Sr32* генінің cs*Sr32#1* және *Sr38/Lr37/Yr17* ген кешенінің тасымалдаушыларын Xcmwg682 молекулалық маркерлер арқылы анықталды. Жетісу сортында 3 эффективті *Sr*-гендер (*Sr31*, *Sr32* мен *Sr38*) анықталды. Егемен сортында *Sr31* гені бар болып шықты. Сабақтық татқа төзімділік гені *Sr26* ешқандай зерттелген сорттарда табылған жоқ. Ал *Sr32* генінің көзі *Aegilops speltoides*, ол Жетісу сортында табылды. *Sr38* генінің көзі *Triticum ventricosum* болып табылады, аталған ген Жетісу мен Байтерек сорттарында анықталды.