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BIOLOGICAL POTENTIAL OF NEW WINTER CROPS IN THE CONDITIONS OF DRY STEPPE ZONE

Abstract

The favorable conditions for moistening during the growing of winter crops provided high yields of Saratovskaya 7 rye and soft wheat Zhemchuzhina Povolzhya, Kyzyl Biday and Arap. The main indicators of economic efficiency were soft wheat Zhemchuzhina Povolzhya, Saratovskaya 90, Arap, rye Saratov 7 and Triticale Balausa 8.

Keywords*: productivity, soft winter wheat, hard winter wheat, winter rye, winter triticale, winter barley.*

Production of grain was and remains as the strategic branch of Kazakhstan The natural conditionals of the country allows to receive stable grain yields in the majority of years and to export it successfully abroad.

The western Kazakhstan has rather fertile land grounds for crops cultivation. One of the limiting factors is the imperfection of the structure of sown areas with a dominance of summer early cultures, mainly wheat. Winter crops in the region are sowed reluctantly and mainly rather large-scale enterprises. There is very low level of the standard of farming, especially in small country farms.

An agrotechnical basis of field crop rotations in the region are winter crops which it is several times better summer grain use the bioclimatic capacity of the territory [1]. As a result of improvement of conditions of a rewintering of plants, it is necessary to reconsider the relation to winter solid wheat and winter barley as to high-yield, earlier not cultivated, to cultures. Cultivation of winter solid wheat will give the chance to satisfy needs of the region for grain for production of pasta. Expansion of crops of winter forage crops (rye, triticale, barley) will improve a food supply in connection with priority development of livestock production in the region. They can be used for receiving a forage and early green material, a valuable forage for the lactic cattle.

The prospects of cultivation of a solid winter wheat, winter and summer triticale, winter barley, brewing summer barley in the region are studied insufficiently. The main crops of winter solid wheat are concentrated in Ukraine and in the south of Russia [2] where conditions allow to receive rather big crops at a good rewintering of plants. In a dry steppezone with the small height of snow on fields, low temperatures of a dormant period, demands deep studying of agrobiological bases of cultivation of a solid winter wheat and winter barley. In earlier conducted researches [3, 4] the possibility of cultivation of a solid winter wheat in the region is proved.

Similar situation and with cultivation of winter barley. In the southern regions of Russia [5] there is an experience of cultivation of culture. In a dry steppe zone of the region [6], on an outcome of the XX century, studied a possibility of cultivation of winter barley in experiences. On average

for comparable years its advantage apparent, but taking into account death at a rewintering on average for 3 years the summer form of culture had higher productivity. Selection work on culture in the Samara SRIA after N.M. Tulaykov [7] creates possibilities of the cultivation of the new grades of winter barley adapted to local soil and weather conditions deepened studying in the region of agrobiological bases.

New culture in the region is triticale. As well as on winter barley work on winter of triticale is conducted in the border area of Russia [8, 9].

Studying of agrobiological bases of cultivation of this culture in comparison with new cultures (a solid winter wheat, winter barley) is of great scientific interest.

Now at climate change, a high-quality variety of cultures and introduction of the modern technologies further studying of agrobiological bases of cultivation of new cultures is of scientific and practical interest.

Researches are executed in the feed steppe grain and livestock zone of the West Kazakhstan region which farms specialize in production of grain, oil-bearing, forage crops, potatoes and vegetables, fruit and berry production. Also here the livestock production is well developed that predetermines existence of a food supply.

The climate of the region [10] differs in sharp continentality. In the feed zone 312 mm of rainfall, drop out of them for the warm period of-125-135 mm on average. Steady snow cover remains 120-130 days with a height of 25-30 cm and water supplies in it 75-95 mm. The State Customs Committee 0,5-0,6, the sum of positive average daily air temperatures is higher 10^0C – about 2800^0C. The period of the fissile vegetation of plants – 150-155, bezmorozny – 130-135 days.

The region often is surprised various types of a drought [11] therefore development of the agrotechnical actions directed to fight for accumulation, saving and more rational use of soil moisture by field cultures.

Dark-chestnut soils make the fixed agricultural assets of the West Kazakhstan region and have sufficient natural potential fertility for cultivation of field cultures. The maintenance of a humus in the arable horizon of the soil in UAFI makes 3,34%. Security with available forms of phosphorus - low, nitrogen – raised, a potassium – high. The significant area of dark-chestnut soils demands their antierosion protection [10].

Weather conditions in 2015-2017 agricultural years.

2015 agricultural year. Average annual air temperature exceeded long-term norm on $2,0^0$C, and the quantity of an atmospheric precipitation was reduced by 58,6 mm.

2016 agricultural year. Average air temperature and a rainfall exceeded long-term indicators respectively on $4,0^0$C and 111,8 mm.

2017 agricultural year. Average air temperature and a rainfall exceeded long-term indicators respectively on $1,1^0$C and 21,0 mm.

Thus, on the developing weather conditions, 2015 agricultural year are extremely droughty with extremely high temperatures of air during vegetation of the studied cultures, and 2016 and 2017 agricultural years – the favorable for body height and development of winter crops. Rewintering conditions in 2017 were very difficult for a solid winter wheat and winter barley, and the strong dryness at the end of summer and the first half of fall reduced field viability winter on the harvest eve of the next year.

The purpose of researches - to Develop agrobiological bases and practical resource-saving methods of cultivation of new cultures: a solid winter wheat (Triticum durum), winter barley (Hordeum vulgare), winter and summer triticale (Triticosecale) on grain and a forage for increase food safety of the country and appeal of agrarian branch.

The scheme of experience 1 on cultivation of winter crops (traditional technology with crops by the disk Wintersteiger seeder) in 2016 and 2017 included 20 options in UAFI: the weak winter wheat (Lutescens 72, Bezenchukskaya 380, Zhemchuzhina Povolzh'ya, Saratovskaya 90, Kyzyl бидай, Arap, Farabi, winter rye (Saratovskaya 7), solid winter wheat (Amazon, Kurant, Kazakh yantar', Ema, Adiya, Setti14), winter triticale (Kroha, Taz, Kozha, Balausa 8, Aziada), winter barley (Aydyn, Merey 80).

Frequency 3 – fold in 3 tiers. The total area of an allotment on grain – 28,5 m^2, the registration area – 22,0 m^2. The area of an allotment on green material – 3 m^2.

The scheme of experience 2 on cultivation of winter crops (resource-saving technology with crops by the sternevy SKP-2,1 seeder) in 2016 included 12 options in UAFI (the Lutescens 72, the Arap, Saratovskaya 7, Amazon, Kurant, Ema, Setti14, , Balausa 8, Aziada, Aydyn, Merey 80).

3-fold frequency. The total area of an allotment on grain – 54,6 m^2, the registration area – 33,0 m^2.

In 2017 22 options were studied (A Lutescens 72, Bezenchukskaya 380, Saratovskaya 90, Zhemchuzhina Povolzh'ya, Kyzyl бидай, the Arap, Farabi, Saratovskaya 7, Saratovskaya 5, Amazon, Kurant, the Kazakh yantar', Ema, Adiya, Setti14, Krocha, Taz, Kozha, Balausa 8, Aziada, Aydyn, Merey 80).

Frequency 3-fold in 3 tiers. The total area of an allotment on grain – 27,3 m^2, the registration area – 14,8 m^2. The area of an allotment on green material – 3 m^2.

The accompanying observations were carried out according to programkmy according to the practical standards [12].

In experiences the recommended zonal agrotechnology taking into account biology of traditional and new cultures was applied [10].

Receiving well-timed complete shoots of winter crops is more difficult task as it is not simple to keep moisture to crops. The period of a parovaniye of 2015 passed in very droughty conditions, but good shoots of cultures allowed to receive humidification of sowing and arable layers. In experience with crops by the disk Wintersteiger seeder the field viability of the zoned grades of the weak wheat the Lutescens 72 and Zhemchuzhina Povolzh'yawas 72,9 and 77,0%. Higher rates are received at grades Kyzyl бидай and the Arap – 91,1-91,8%. Solid wheat for germination of seeds needs more moisture, than the weak therefore the field viability at its grades changed from 61,7% (Amazon) up to 84,3% (Adiya). Grades of triticale had field viability of 64,1-74,8%, and two grades of Merey barley 80 studied in experience and Aydyn provided the highest, among the studied cultures and grades, an index - 92,4-92,9%.

In experience with crops of SKP-2,1 the weak wheat had the highest field viability the Arap - 87,6% and grades of barley - 82,2-82,8%. The low field viability (51,0-53,0%) characterized by triticale , solid Settiwheat 14, Amazon and a rye Saratovskaya 7. Other grades had an index within 63,0-67,0%.

In researches of 2016 was the favorable till July. In August average air temperature considerably exceeded norm - 25,9^{0}C, with the maximal values in separate decades to 38,2-42,3^{0}C. Within a month there was practically no rainfall (2,8 mm), but despite it in experience were received, generally well-timed complete shoots of winter crops.

The highest field viability in experience with crops of Wintersteiger barley grades, solid Adiya wheat and a rye Saratovskaya 7 - 90,0-92,8% provided, triticale – 84,3%. At other grades of triticale the field viability changed from 63,4% (Kozha) up to 78,2% (Asiada). The under viability of seeds in the conditions of a year was the characteristic of the majority of grades of solid wheat (Ema, Setti14, Amazon, Kurant) – 60,2-61,4%.

In 2016 at crops winter the sternevy SKP-2,1 seeder the field viability on average in experience was 76,8% that is 3,0% more, than when using the disk Wintersteiger seeder that concerned 13 grades. The highest rates are noted at the weak Farabi wheat – 91,5%, the Lutescent of 72 - 89,2%, solid wheat Ema – 88.0%, Aydyn barley of-87,8% and the weak wheat the Arap – 87,0%. The under viability remained at solid wheat Amazon (56,3%) and triticale Kozha (67,3%).

In experience with crops by the Wintersteiger seeder the winter rye at a rewintering in 2016 ensured safety of 98,8%. More than 90% of plants remained at the weak wheat the Lutescens 72, Bezenchukskaya 380, Zhemchuzhina Povolzh'ya, triticale Kroha, Balausa 8. Less than 80% of plants remained at Merey barley (79,8%), Aydyn barley (76,1%), solid Adiya wheat (70,8%).

In 2017 the rewintering for cultures and their grades developed unequally. Very strongly grades of solid Adiya wheat, the Kazakh yantar', Ema, Merey barley 80 at which the safety was 2,0-9,8% suffered. Only 31,8% of plants of an overwintered at winter Aydyn barley. Safety of solid wheat Amazon and Kurant made 71,5-73,3% that it is slightly more, than at a grade of Setti14 (66,3%).

Rather quite good rewintering of three grades of solid wheat testifies to need of searching of more winter-hardy and productive grades, it is desirable steppe ecotype and development of methods of increase in stability of plants during the winter period.

A wintered triticale from 61,8% (Balausa 8) up to 75,4% (Aziada). Quantity of the rewintering plants at the weak wheat the Zhemchuzhina Povolzh'ya changed from 63,5% at a grade of Farabi up to 93,2% at a grade, and at a winter rye made 75,7%.

In experience with crops winter the stubbly SKP-2,1 seeder the safety of plants by experience is 8,8% higher, than when using Wintersteiger. One of explanations is the possibility of more deep seal of seeds, and respectively, kushcheniye knot, and it is impossible to do more deep preseeding cultivation for Wintersteiger in a summer heat because of siccation of a sowing layer. Scattered sowing crops of SKP-2,1, in this case the area of a delivery of plants optimum are positive. With row seeding crops the competitive relations between plants are shown stronger that weakens them a little.

In general on cultures remained at a rewintering the weak wheat (84,1%), triticale (83,8%) and a rye (79,9%) better. At the barley which was strongly injured at a rewintering 20,6% of plants, and at solid wheat - 44,9% remained on average.

Among the grades remained the weak Bezenchukskaya wheat 380 better (95,9%), Saratovskaya 90 (92,7%), Zhemchuzhina Povolzh'ya (92,3%), Kyzyl biday (90,0%), Balausa triticale 8 (92,1%). From grades of solid wheat were allocated Kurant (85,4%) and Amazon (72,2%). More than 80% of plants Settiat grades of the weak wheat the Arap and the Lutescens 72, triticale Kroha, Kozha and Aziada, a winter rye Saratovskayaskaya 7.

Thus, the thickness of standing of plants after the rewintering in 2017 provided further necessary conditions for realization of potential of efficiency of cultures, except for some grades of winter barley and a solid winter wheat.

Favorable humidification conditions in 2016 contributed to the formation of a dense stem of winter crops and their high competitiveness. Species composition of weeds was limited and they were, as a rule, in the lower tier. From juvenile weeds there were buckwheat wader, white marie, shirits; perennial - Lactuca tatarica, field and field bindweed. Before harvesting in soft wheat Bezenchukskaya 380 and triticale Balaus 8 weeds were absent. In hard wheat, Amazon, Kurant, Kazakh yantar' and Ema weediness was 5,0-6,7 pieces m^2, and for the remaining options of the experiment – 0,3-3,0 pieces/m^2. The absence of harmfulness of weeds is indicated by their small air-dry mass, which did not exceed 1,5 g m^2.

In 2017 the specific structure of weeds in UAFI was reduced and in winter crops (experience crops of SKP-2,1) several types met: the buckwheat, pigweed white, Molokans Tatar and a bindweed field. They dominated Molokans Tatar which met everywhere. However winter crops competed with it, is often successful and its growth was limited to the lower tiers. Other perennial a bindweed field is noted in 4 options of experience, and the grechishka vyyunkovy and марь white is even more rare.

Weeds were absent in crops of triticale of Taz, and in a winter rye Saratovskaya the 7 th their quantity was 0,3 pieces/m^2. Most of all weeds were in cultures which were injured at a rewintering: winter Aydyn barley (7,7 pieces/m^2), solid Settiwheat 14 and Amazon (5,3-6,0 pieces/m^2). The air-dried mass of weeds changed from 0,2-0,6 g/m^2 (Saratovskaya 7, Kozha, Balausa, Kroha, Saratovskaya 5) up to 4,2-4,3 g/m^2 (The Amazon and Aydyn).

Thus, the grown-up winter crops had both years high competitiveness, providing a top phytosanitary condition of crops.

The spring and summer vegetation of winter crops on the experimental site of the UAFI in 2016 proceeded in conditions favorable for humidification, which enabled the crops to fully realize their biological potential (table).

Table – Yields (c/ha) of winter crops in UAFI

Culture, sort	Wintersteiger sowing		Sowing SKP-2.1	
	2016 y.	2017 y.	2016 y.	2017 y.
Soft wheat Lutescens 72	55,0	35,6	48,5	40,8
Soft wheat Bezenchukskaya 380	52,7	-	-	41,3
Soft wheat Zhemchuzhina Povolzh'ya	64,6	37,7	-	47,2
Soft wheat Saratovskaya 90	-	40,4	-	45,6
Soft wheat Kyzyl biday	69,5	33,6	-	40,3
Soft wheat Arap	63,9	38,7	61,3	44,9
Soft wheat Farabi	63,5	23,9	-	30,9
Winter Rye Saratovskaya 7	65,4	45,0	45,9	45,7
Winter Rye Saratovskaya 5	-	-	-	43,8
Hard Wheat Amazonka	46,4	18,3	40,8	21,6
Hard Wheat Kurant	46,7	26,9	41,3	31,7
Hard wheat Kazakh yantar'	45,2	3,9	-	7,2
Hard Wheat Yema	39,5	8,5	37,2	13,2
Hard Wheat Adia	42,8	0	-	4,9
Solid Wheat Setti 14	55,7	17,7	52,3	23,5
Triticale Kroha	46,1	40,1	39,8	43,7
Triticale Taza	46,6	37,3	-	40,8
Triticale Kozha	47,9	40,8	-	42,1
Triticale Balausa 8	42,3	42,4	44,6	45,5
Triticale Aziada	45,7	37,7	44,9	41,2
Barley Aydyn	50,3	9,7	49,0	20,3
Barley Merey 80	62,1	0	53,5	4,2
$НСР_{05}$	2,8	2,4	2,6	2,3

In the experiment with sowing of winter sowing machines, Wintersteiger, a sort of soft wheat Kyzyl bidai with a yield of 69,5 c/ha was distinguished, which is 4,9-6,0 c/ha more than in Farabi, Arap and Zhemchuzhina Povolzh'ya. The yield of wheat Bezenchukskaya 380 and Lutescens 72 was 52,7-55,0 c / ha. On average, 61,5 c/ha of grain was obtained for soft wheat varieties. The yield of winter rye was 65,4 c ha, second only to the result of soft wheat Kyzyl biday.

Merey stood out in barley with a yield of 62,1 centners per hectare and he surpassed Aydin by 11,8 centners per hectare. On average, 56,2 centners per hectare were obtained for crops and more were rye and soft wheat.

With an average yield of varieties of durum wheat at 46 c/ha, it varied from 39,5 c/ha (Ema) to 55,7 c/ha (Setti 14). The productivity of Kazakh yantar', Amazon and Kurant was at the same level - 45,2-46,7 c/ha, and in the Adiya variety it is 2,4-3,9 c/ha less.

The yield of triticale was 45,7 c/ha and varied from 42,3 c/ha in Balausa 8 to 47,9 centners per hectare in the Kozha grade. The remaining varieties had a productivity index of 45,7-46,6 c/ha.

In the conditions of the year, when sowing winter stubble with a SKP-2,1 seed drill, the yield was somewhat less than in the Wintersteiger experiment, while maintaining general regularities.

The yield of soft wheat varied from 61,3 c/ha in Arap to 48,5 c/ha in the Lutescens 72 variety. The yield of hard wheat, as well as soft wheat, varied from 37,2 c/ha in the Ema variety to 52,3 c/ha in the Setti variety 14. Amazon and Kurant varieties provided practically the same productivity in the conditions of the year - 40,8-41,3 c/ha.

Winter rye with a yield of 45,9 c/ha yielded only to soft wheat, barley and a variety of durum wheat Setti14. Among the varieties of barley, the best was Merey (53,5 c/ha), which exceeded the Aydin yield by 4,5 c/ha . The average yield of triticale was at the level of durum wheat from 39.8 c/ha

(Kroha) to 44,6-44,9 c/ha (Balausa 8 and Asiada).

The difficult wintering conditions in 2017 and the deterioration of the moisture supply of crops have reduced the yield of winter crops. Nevertheless, it remained for many cultures at a high level for the region. In the experiment with sowing Wintersteiger, yields in the range 40,0-45,0 c/ha provided the Triticale Kroha, Kozha, Balausa, 8 Wheat Saratovskaya 90 and rye Saratovskaya 7. The remaining varieties of soft wheat and triticale had results from 33,6 to 38,7 c/ha, excluding Farabi variety (23,9 c/ha).

The best for solid wheat was Kurant - 26,9 c/ha. At the re-winter, Adiya died, and Kazakhstan's Amber and Ema were badly affected (3,9-8,5 c/ha), while Setti 14 and Amazon had a low result of 17,7-18,3 c/ha. A similar situation arose with barley, when Merey 80 was killed, and the yield of the Aydin variety declined to 9,7 c/ha.

Resource-saving technology with sowing of winter crops SKP-2.1 increased in the conditions of the year the yield, on average, by experience of 5,8 c/ha. The yield of soft wheat, as a rule, exceeded 40,0 c/ha and reached Arap, Saratovskaya 90 and Zhemchuzhina Povolzh'ya values of 44,9-47,2 centners per hectare, except for the Farabi variety (30,9 c/ha).

At the same level (40,8-45,7 c/ha), the yields of winter rye and triticale varieties were observed. In the first case, the Saratovskaya 7 was somewhat distinguished, in the second case Balausa 8 and Kroha.

Hard wheat was considerably inferior to soft yields, which varied from 4,9-7,2 c/ha (Adia and Kazakh yantar') to 31,7 c/ha (Kurant). Low results in winter barley, where the Aydin variety formed 20,3 c/ha of grain, and Merey 80 - only 4,2 c/ha.

The main elements of the crop structure are the density of productive stalk, grain size, 1000 grains, general and productive bushiness.

Under the conditions of 2016, the density of the productive stalk of winter crops was high at the experimental site of the UAFI (sowing Wintersteiger) 497,2-608,0 pcs/m^2, which, in combination with the green spike and large enough grain, made it possible to form high yields.

The advantage of Kyzyl bidai was achieved, mainly due to the mass of 1000 grains (46,4 g), Zhemchuzhina Povolzh'yahad the maximum density of productive stalk (608.0 pcs/m^2), Arap, Farabi and Saratovskaya 7 - maximum grain size.

Rye was inferior to the yield of Kyzyl biday on a productive stalk and the mass of 1000 grains, having a green spike. In solid wheat, the mass of 1000 grains was stable - 32,8-35,6 g, and the number of productive stems varied within 368.7-578.8 pcs/m^2.

Triticale varieties differed in the elements of the crop structure. By mass of 1000 grains (37,2 g), the Asian brand was distinguished, the density of productive stems (466,0 pcs/m^2) - Kroha.

Barley Merey 80 had an advantage over the Aydin variety due to an increase in the number of grains in the ear by 4,4 pcs. and a mass of 1000 grains per 3,4 g. For culture, a relatively small grain size is characteristic, especially in the Aydin variety - 25,6 pcs.

The height of the plants varied from 73,1-86,5 cm for hard wheat Amazon and Kurant to 136,9-140,4 cm for soft wheat Bezenchukskaya 380 and rye Saratovskaya 7. High crops were also found in triticale - 126,1-128,4 cm, with the exception of Kroh's variety (117,6 cm).

In the experiment with sowing of the stubble seeder SKP-2,1, the number of productive stems in cultures was significantly less than when using a disk seeder.

Soft wheat Arap (438,3 pcs/m^2), Merey barley (402,7 pcs/m^2) and rye Saratovskaya 7 (395,0 pcs/m^2) were allocated on productive stems.

The earliness of the ear was 34,9-43,4 pcs. and higher was in Krohi and Balausay 8, rye and Kurant. Large grains (38,7-42,9 g) were formed by Arap, Asiada and Merey 80. The yield of Arapwas increased thanks to a dense productive stalk. Barley Merey 80 had the advantage of a mass of 1000 grains and the number of productive stems.

The height of the plant was highest in the experiment: Saratovskaya rye 7-135,0 cm, in soft wheat Arap, triticale Balausaa 8 and Asiada, it was 113,5-114,1 cm. The low-sown crops were characterized by the varieties of hard wheat Kurant and Amazon (68,4- 81,6 cm).

The conditions of 2017 influenced the elements of the structure of crop yields.

In the experience with Wintersteiger, the number of productive stems varied from 133,3-192,7 pcs/m^2 (Aydin, Amazon and Setti 14) to 483,7-439,7 pcs/m^2 (Saratovskaya 90, Zhemchuzhina Povolzh'ya and Saratovskaya 7) . The comparatively high grain size of the spike in triticale (31,7-37,7 pcs.). The mass of 1000 grains varied from 34,1-35,3 g (Kroha, Saratovskaya 7, Aydin) to 45,7-46,1 g (Amazon, Setti 14). A stable mass of 1000 grains was in the triticale.

The height of the plants in the experiment was 52,8 cm (Aydin) - 95,7 cm (Saratovskaya 7).

With the use of resource-saving technology with the sowing of SKP-2.1 crops in comparison with Wintersteiger, the density of productive crops increased by 41,9 pcs/m^2, the number of grains in the ear was increased by 0,8 pcs, and the weight of 1000 grains decreased by 1,2 g Varying the number of productive stems was from 120,3-189,0 pcs/m^2 (Ema, Amazon) to 433,3-481,7 pcs/m^2 (Saratovskaya 90, Lutescens 72, Bezenchukskaya 380 and Zhemchuzhina Povolzh'ya).

Density of the ear of hard wheat was 21,8-31,5 pcs, soft wheat 25,5-28,8 pcs, barley 28,8 pcs, winter rye 33,1-33,5 pcs, triticale - 32,0-37,5 pcs.

The weight of 1000 grains differed by a slight variation - 33,9-45,3 g. The higher index was for the Setti14, Amazon, Asiada, Kozha, Kyzyl bidai, and the smaller values for varieties Saratovskaya 7, Aydin, Kroha, Saratovskaya 5, Bezenchukskaya 380.

Traditionally, higher rye varieties (102,5-105,9 cm), barley Aydin and hard wheat Kurant had a value of 57,8-60,5 cm.

When calculating the economic efficiency of growing field crops, the prime costs of production, direct production costs, net income and the level of profitability are used.

In 2017, the highest production cost per hectare (KZT thousand) was obtained in the cultivation of soft wheat (170,62-179,36), rye (159,95) and triticale (152,95-159,25). Inferior to them barley Aydin and hard wheat Setti 14 - 71,05-105,75 thousand tenge/ha.

Direct production costs include all costs associated with technology of cultivation, harvesting, transportation and primary processing of grain. They are calculated on the basis of technological maps of cultivation of cultures. Differences between the variants of the experiment are related to harvesting, transportation and additional yield increase, the cost of seeds per 1 hectare. In studies, the greatest costs - 60,26-60,72 thousand tenge were in the cultivation of soft wheat and rye Saratovskaya 7.

The cost price is the sum of costs for the production and marketing of a unit of output. It depends mainly on direct production costs and crop yields. It is necessary to strive to reduce costs and increase crop yields. In studies, the minimum cost of 1 cent of grain - 1,29-1,32 thousand tengewas obtained with the cultivation of soft wheat Zhemchuzhina Povolzh'ya (1,29 thousand tenge), Saratovskaya 90 and Saratovskaya 7 rye (1,32 thousand tenge).

Conditionally pure income is a part of the profit, remaining at the disposal of production after deduction of direct production costs. The largest conditionally-pure income in research - 110,36-118,64 was obtained when growing soft wheat.

The level of profitability is an indicator representing the ratio of profit to the amount of production costs. The best indicators in the experiment were obtained in soft wheat Zhemchuzhina Povolzh'ya 195,4%, which is 8,8-12,3% more than in Saratovskaya 90 and Arap and by 30,7-31,7% than in Saratovskaya 7 rye and triticale of Balausa 8.

CONCLUSION

Based on research of the biological potential of new winter crops for food and feed purposes, the following conclusions can be drawn:

1 Weather conditions during the years of research and analysis of meteorological data over the last 50 years make it promising to search for new winter crops and varieties that ensure the realization of the bioclimatic potential of the territory in conditions of increasing winter temperature.

2 More resistant to wintering, along with winter rye, soft wheat Zhemchuzhina Povolzh'ya, Kyzyl Biday, Lutescens 72, Bezenchukskaya and Triticale Kroha, Balausa 8 and Asiada.

3 The conditions favorable for humidification during the years of growing winter crops provided high yields of Saratovskaya 7 rye and soft wheat, among which the Zhemchuzhina Povolzh'ya, Kyzyl Biday and Arap were distinguished.

4 Under favorable conditions of moistening with high yield, the cultivation of all winter crops was profitable. The main indicators of economic efficiency were soft wheat Zhemchuzhina Povolzh'ya, Saratovskaya 90, Arap, winter rye Saratovskaya 7 and winter triticale Balausa 8.

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ТҮЙІН

Күздік дақылдар өсіру жылдарында ылғалдандыру бойынша қолайлы жағдайлар Саратов 7 қара бидайы және Жемчужина Поволжье, Қызыл Бидай, Арап жұмсақ бидайының жоғары өнімділіктерін қамтамасыз етті. Экономикалық тиімділіктің негізгі көрсеткіштері бойынша жұмсақ бидай Жемчужина Поволжье, Саратов 90, Арап, қара бидай Саратов 7 және тритикале Балауса 8 ерекшеленді.

РЕЗЮМЕ

Благоприятные по увлажнению условия в годы выращивания озимых культур обеспечили высокую урожайность ржи Саратовская 7 и мягкой пшеницы Жемчужина Поволжья, Кызыл бидай и Арап. По основным показателям экономической эффективности выделялись мягкая пшеница Жемчужина Поволжья, Саратовская 90, Арап, рожь Саратовская 7 и тритикале Балауса 8.