РЕЗЮМЕ

В статье приведены сравнительные результаты внедрения органического сельского хозяйства в мире и Республике Казахстан на примере Костанайской области.

Органическое сельское хозяйство направлено на формирование систем производства, которое улучшает и поддерживает состояние почв, ориентированное на повышение здоровья людей, сохранение экосистем, при этом используя инновации и научные достижения с пользой для окружающей среды. При внедрении органического сельского хозяйства в этот процесс будут вовлечены все субъекты сельской местности и не только, данная органическая система берет за основу экологические процессы, которые не имеют пагубных последствий и учитывают местные климатические условия. Результатом органического земледелия, как одного из факторов устойчивого развития, будет создание экологических продуктов (биопродукты, органическая продукция), категория товаров, которые производятся с учетом всех необходимых норм и ориентированы на человека и окружающую среду.

В мире 172 страны занимаются и развивают органическое земледелие, обеспечивая устойчивое развитие своих территорий и экономики, вкладывая средства в органическое производство данные страны развивают человеческий потенциал. В Костанайской области крупными предприятиями занимающиеся производством органической продукции являются в основном хозяйства из Федоровского района: ТОО «Жарколь 007», ТОО «Галант», КХ «Кварта», КХ «Бексеитов», КХ «Метелица», КХ «Коврижных», которые заняты в перерабатывающей и растениеводческой отрасли, занимаются возделыванием зерновых и масличных культур.

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NEW VARIETIES OF MILLET UNDER IRRIGATION IN AKTOBE REGION, KAZAKHSTAN

Abstract

The article presents the results of studies on responsiveness to additional irrigation of samples and varieties of millet of different ripeness groups compared with the zoned variety - Start. The tasks of the region are reflected, the need to study forms of millet at irrigation at the present stage, since changes in temperature and soil conditions are noticeable now, various economic entities have been formed, which makes scientists look for new ways to increase productivity, quality indicators of crops, in particular millet, which is the leading cereal crop in the Aktobe region. The varieties of millet bred and transferred to the State Agricultural Institute have many advantages, but they should also be flexible under various changes in cultivation conditions, including irrigation. In this regard, we consider the study of the above question relevant and timely. The experiments showed a positive effect of irrigation in arid conditions. A noticeable increase in all indicators (weight of 1000 grains, the number of grains in a panicle, and also the yield of all studied varieties and forms by ripeness and by comparison with the standard and by year. Highly responsive numbers were identified and conclusions were drawn. The results of the study will be used to develop recommendations for technologies for cultivation of millet for irrigation in arid conditions of Aktobe region.

***Keywords**: irrigation, period, grain, soil, variety, millet, forms.*

Introduction. At the present stage, the urgent task is to provide the ever-growing needs of the population with food, especially crop production. In solving this problem, a significant role is played by an increase in crop yields. It is known that irrigation contributes to high yields.

In the Aktobe region for 2018-2020, the task was set - in the region it is necessary to increase the irrigation area for vegetables and other crops, including cereals, in particular millet.

Millet is characterized by increased drought tolerance and tolerates a lack of moisture better than other crops. However, despite its high resistance to drought and the ability to economically consume moisture, it responds very well to additional moisture and significantly increases the yield. This is confirmed by numerous scientific and industrial experiments of scientific institutions [1].

At different periods of its development, millet requires an unequal amount of water. In the first third of life, when the ground mass is still poorly developed, it consumes from the soil about 27%, in the second third of the growing season up to 40% and before ripening 33% of the total amount of water.

Many researchers note that millet has three critical periods of moisture consumption: the first from seedlings to tillering, the second from tillering to basting, and the third 20 days after troweling a panicle when grain is formed and poured [2]. According to A.A. Kornilova (1960), N.P. Agafonova (1980) millet during the tillering - sweeping period forms a panicle and generative organs. With good moisture supply during this period, plants develop a powerful root system and leaf surface, lays large multi-grain panicles. High demand for millet in water and nutrients is noted in the grain filling phase. Some researchers, emphasizing the importance of irrigation, emphasize that to produce one ton of grain with a yield of 30-35 c / ha, transpiration and evaporation consumes 700 or more cubic meters of water in a drought environment, proper irrigation prevents grain fouling (capture) [3]. According to V.N. Lysova (1968) when watering at different phases of development, irrigation contributes to an increase in the nature of grain, elements of productivity and yield of millet. Many researchers in various areas of the country have studied the positive effects of irrigation on the growth, development and productivity of millet [4-6].

The soil and climatic conditions of the Aktobe region make it possible to obtain high yields of millet. Confirmation of this is the achievement of the world record of Ch. Bersiev who, with his link in 1943, set a world record for the harvest of millet - from 4 hectares he collected 201 kg / ha, and his link 80 kg / ha from 32 ha.

Relevance. At this stage, there is a revival of forgotten crops, including the region’s main cereal crop, millet. To replenish stocks, as well as for imports in the future, there was a need to increase cultivated areas and yield of millet. In recent years, a number of new varieties of millet have been transferred for regionalization in the regions. area under irrigation is set to increase.

In this regard, our task is to study the responsiveness of varieties and samples of millet of various ecological and geographical groups for additional moisture. For this purpose, we have taken, previously identified by productivity and quality, millet forms from early ripening, mid-ripening and late-ripening groups.

Research material and methodology. In the study were 10 samples and lines of various ecological and geographical origin. For the study, early ripening (Mongol-Buryat), mid-ripening (Kazakhstan steppe), and late-ripening (Prityanshan) millet forms of various ecological and geographical groups were used in comparison with the standard. The millet-Start variety is taken as a standard [7.8].

The studies were carried out in 2016-2018 in accordance with the methods, guidelines, recommendations and instructions adopted in agronomy, vegetable growing, soil science and agro chemistry: agrochemical methods for the study of soils (M., 1975), B. Dospekhov. The technique of field experience (M., 1985).

The site where our studies were carried out is located in the zone of moderately arid steppes, the soil is dark chestnut, medium loamy, slightly saline. The thickness of the humus horizon is 25–40 cm. The humus content is 3.1%. The predecessor of potatoes, the plot area of 2 square meters. During the growing season, 3 irrigation was carried out: the first - in the tillering phase, the second in the phase - in the sweeping phase, the third - in the grain filling phase.

Aktobe region refers to areas of insufficient moisture, which are characterized by a small amount of precipitation and large amounts of evaporation. According to the weather station of Aktyubinsk, the average annual rainfall is 297 mm., with fluctuations in years of 150-450 mm.

During the study on the combination of hydrothermal factors, comparatively, arid 2016 and 2018, favorable 2017. The amount of precipitation in June-September amounted to 98 mm in 2017, 78.4 mm in 2016, and 69 mm in 2018, with an average long-term data of 96.3 mm, respectively. The temperature during the development of millet varied from 15.3 to 22.5 °C in 2017, from 18.4 to 26.6 °C in 2018, against long-term average data of 18.2 - 23.8 °C.

Research results. The results of the experimental data indicate a noticeable effect of irrigation on the duration of the growing season in all studied samples and the standard. Additional moistening contributed to an increase in the length of the growing season by 4–12 days; the longest growing season was observed in late-ripening groups (92 on irrigation of 102 days). In the samples of mid-ripening groups of millet, the growing season was at the standard level. With the Start standard, on a dry land, the growing season was 81 days, and on watering an average of three years, with fluctuations of 87 -91 days.

As observations and surveys showed, irrigation had a positive effect on the overall development of millet plants. Increased moisture supply contributed to enhanced plant growth. So the height of plants and the length of the panicle of the standard on irrigation compared to without irrigation averaged 75 cm and 18 cm for three years. According to the studied forms of millet, these indicators looked like this: in early-growing groups, respectively, 98.8 centimeters and 18.9 centimeters in mid-ripening groups on irrigation 114.5 and 24.8 centimeters in late-ripening -128.4 and 38.9 centimeters. There is an increase in all morphological indicators with additional moisture. Analysis of the data showed that the leaf area and the accumulation of air-dry mass of millet increased from 1.2 times in early-ripening forms to 1.6 times in late-ripening groups of millet.

Our studies showed that the productivity of millet panicle in samples of various ecological and geographical groups under irrigation conditions increased significantly compared to rainfed control. On average, over three years, the highest productivity of panicle on irrigation was noted for samples of Prytyanshanskaya - 7.61 g, Kazakhstan steppe - 6.31 g, exceeding the control by 123.5-134.0%. A smaller increase in grain mass from the panicle was obtained for millet forms of the Mongol-Buryat group, although it was significantly higher compared to the standard.

One of the important indicators determining the productivity of millet is the mass of 1000 grains. Irrigation contributed to an increase in this indicator in all studied forms of millet. So, the Start standard variety over the years of study on the Bogar had a mass of 1000 grains on average 6.6 g, and during irrigation - 7.2 g. The average value of this indicator in the non-irrigated area was 5.2-7.0, and on irrigation - 6.1-7.6 g. The mass of 1000 grains in all studied forms of millet fluctuated significantly depending on environmental groups, weather conditions and irrigation in (table 1).

Table 1 - The mass of 1000 grains of the studied forms of millet for irrigation 2016-2018.

Millet forms	Mass of 1000 grains, g				
	2016	2017	2018	Average on watering	Medium without watering
Start	7,1	6,9	7,7	7,2	6,6
Early ripening	5,9	5,8	6,5	6,1	5,2
Bright 1(mid-season)	7,6	7,5	7,8	7,5	6,9
Wil white (late ripening)	7,7	7,5	7,82	7,6	7,0

Under irrigation conditions, many forms of millet respond positively to additional nutrition, increasing the mass of 1000 grains. Especially in their responsiveness to moisture, late-ripening groups differ, which had a larger grain in comparison with the standard and other millet groups.

The number of grains in the studied samples during irrigation increased markedly, which is associated with improved growing conditions, providing the lower parts of the panicle with moisture. Under conditions of additional wetting, an increase in the number of grains in the panicle is observed in all groups of millet ripeness by 10-15%. So the standard for the number of grains over the years of research without irrigation averaged 541 grains, at irrigation 633, with fluctuations of 576-673 pieces. The tendency to increase the number of grains in the panicle is observed for all forms of ripeness and for all years of the study shown in (table 2).

Table 2- The number of grains in a panicle for the studied forms of millet on irrigation, 2016-2018

Millet forms	Mass of 1000 grains, g					Increase %
	Average without watering	2016	2017	2018	Average on watering	
Start	541	651	576	673	633	108,5
Early ripening	294	342	329	367	346	107,9
Bright 1(mid-season)	676	701	641	728	690	109,7
Wil white (late ripening)	728	798	784	841	807	109,2

The largest number of grains in the panicle was obtained from late-ripening groups of millet with additional moisture. It should be noted that these forms of millet usually form a large number of grains, but with insufficient moisture, most of the lower grains are underdeveloped or puny. Therefore, grazing decreases. In our experiments, an increase in the number of millet grains in the panicle of various ecological and geographical groups is observed under irrigation from 7.9% to 9.7%.

Our studies showed that the studied new varieties of millet of various ecological and geographical groups for three years gave the highest yield during irrigation. Thus, the productivity of the Start standard for an average of three years amounted to 152.4 g / sq.m., and with irrigation 243.8 g / sq.m. or an increase of 59% (table 3).

Irrigation contributed to an increase in the yield of millet varieties of all groups by an average of 59-76.4%. At Start, the yield on irrigation in the dry year 2016 amounted to 186.8 g / sq.m, in favorable years there was a significant increase in productivity per unit area with additional wetting, so in a favorable wetting year 2017, a yield of 258.0 g was obtained. / sq.m which amounted to 159% in comparison with the indicators without irrigation. This pattern is observed in all studied varieties of millet.

Table 3- Harvest millet for irrigation (2016-2018), g/sq.

Millet forms	Productivity, g / sq.m					Increase %
	2016	2017	2018	Average on watering	Average without watering	
Start	258,0	186,8	286,6	243,8	152,4	159
Early ripening	142,5	128,0	151,5	140,5	92,2	162,8
Bright 1(mid-season)	330,0	213,7	366,5	283,4	164,8	172,5
Wil white (late ripening)	302,9	237,4	338,0	293,1	168,5	176,4

In all the studied varieties of millet for irrigation, productivity indicators and its components were significantly higher compared to the plot without irrigation. Highly responsive to irrigation in arid conditions turned out to be millet varieties of mid-ripening (Kazakhstan steppe) and late-ripening (Pritsyanshansky) ecological-geographical groups in which the average yield was 72.5-76.4% higher than the control.

Conclusion.

1. The studied varieties of millet, as well as the standard Start on irrigation, have an increase in the duration of the growing season by 5-12 days

2. A study of millet varieties of various forms of ripeness showed that additional moisture creates favorable conditions for the growth and development of the plant, significantly increases productivity and its elements.

3. On irrigation, all studied varieties of millet show a marked increase in both productive and quality indicators, which ultimately affected the yield and their components.

4. It was found that millet varieties of Aktobe selection are generally positively responsive to additional moisture., but a noticeable response to irrigation was found in the Bright 1 variety.,which exceeded the standard by 72.5%.

5. The increase in grain yield in all studied forms of millet was 59-76,4%.

6.The results of the study will be used in the development of recommendations for the technology of millet cultivation on irrigation in arid conditions of the Aktobe region for specialists, agricultural enterprises and other forms of management.

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ТҮЙІН

Бұл ғылыми мақалада аудандастырылған «Старт» сортымен салыстырғанда әр түрлі пісетін топтардың тары үлгілері мен сорттарын қосымша суаруға бейімділігі туралы зерттеулер нәтижелері келтірілген. Сондай-ақ бұл мақалада қазіргі таңдағы өңірдің басты міндеттері мен тары нысанының зерттеу қажеттілігі көрініс тапқан, себебі бүгінгі таңда топырақ пен климаттың өзгеруіне байланысты бұл салада қызмет ететін зерттеушілерге тарының өнім көлемін көбейту және келешектегі табиғаттың жаңа өзгерістеріне қарсы тұра алатын тарының жаңа түрлерін шығарту мақсатында жаңа зертеу дамыту сондай-ақ өндеу жолдарын таба юілу қажет болып тұр. Сонымен қатар бұл зерртеу жұмысында Ақтөбе облысы бойынша авторлармен жүргізген тәжірибелік күйде есептеулер мен эксперименттердің қорытынды жұмыстары нақтыланып анықталған және ресімделген.

РЕЗЮМЕ

В статье приведены результаты проведенных исследований по отзывчивости на дополнительное орошение образцов и сортов проса различных групп спелости по сравнению с районированным сортом - Старт. Отражены задачи региона, необходимость изучения форм проса на орошении на современном этапе, так как сейчас заметны изменения температурных и почвенных условий, образованы различные хозяйствующие формирования что, заставляет ученых искать новые пути повышения урожайности, качественных показателей сельскохозяйственных культур, в частности проса, которая является ведущей крупяной культурой в Актюбинской области. Выведенные и переданные в ГСИ сорта проса имеют много преимуществ, но они должны также быть гибкими при различных измененииях условий возделывания, в том числе и при орошении. В связи с этим изучение вышеназванного вопроса считаем актуальной и своевременным. Опыты показали положительное влияние полива в засушливых условиях. Заметно увеличение всех показателей (масса 1000 зерен, числа зерен в метелке, а также урожайности всех изучаемых сортов и форм по видам спелости и по сравнению со стандартом и по годам. Выявлены высоко отзывчивые номера и сделаны соответствующие выводы. Результаты исследовании будут использованы при разработке рекомендации по технологии возделывания проса на орошении в засушливых условиях Актюбинской области.