UDC 631.53.04; 633.2(574.1)
DOI: 10.12345/22266070_2021_1_35

FORMATION OF AGRICULTURAL LANDSCAPES OF SAFLOR (*Cárthamus tinctórius)* IN THE SYSTEM OF BIOLOGIZED CROP

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Field experiments to study the biologized technology of safflower cultivation were carried out in the spring and summer periods in the dry steppe zone of Western Kazakhstan. In the course of the research, traditional technology and technology with the use of biologic drugs and biofertilizers were studied. The area of the plots is 50 m^2, the repetition is three times, the location of the plots is random. The results of scientific research have shown that under the conditions of 2020, the highest oil collection of 2.29 c / ha was obtained with the combined use of the biological product Biodux, biofungicide Orgamica S and biofertilizers Organit N, Organit P (biologized technology) by seed treatment and treatment during the growing season. The use of traditional technology along with biological yield reduces the oil yield by 0.57 c / ha or by 33.13%. As a result of comparative studies of safflower oil content, an increase in oil content up to 30.0% was revealed when using biologized technology.
Keywords: safflower, biologized technology, growth and development, productivity, oil content

БИОЛОГИЯЛАНДЫРЫЛҒАН ӨСІМДІК ШАРУАШЫЛЫҒЫНДА МАҚСАРЫНЫҢ АГРОЛАНДШАФТТАРЫН ҚАЛЫПТАСТЫРУ

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Мақсары өсірудің биологиялық технологиясын зерттеу бойынша далалық тәжірибелер Батыс Қазақстанның құрғақ далалы аймағында көктем-жаз кезеңдерінде жүргізілді. Зерттеу барысында дәстүрлі технология мен биологиялық препараттар мен био тыңайтқыштарды қолдану технологиясы зерттелді. Мөлдектердің ауданы 50 м^2, қайталануы үш рет, мөлдектердің орналасуы кездейсоқ. Ғылыми зерттеулердің нәтижелері көрсеткендей, 2020 жылдың жағдайында Биодукс биопрепаратын, Orgamica S биофунгицидін және Organit N, Organit P биотыңайтқыштарын (биологиялық технология) тұқымды дәрілеу және өсімдіктерді вегетация кезеңінде бүрку арқылы бірге қолдану 2,29 ц/га деңгейінде мақсарының жоғары өнімі алынды. Дәстүрлі технологияны қолдану мақсарының биологиялық өнімділігін 0,57 ц/га немесе 33,13%-ға төмендетті. Мақсары майының салыстырмалы зерттеулері нәтижесінде биологиялық технологияны қолдану кезінде майдың 30,0% -ға дейін жоғарылағаны анықталды.
Түйінді сөздер: мақсары, биологиялық технология, өсу және даму, өнімділік, май құрамы

ФОРМИРОВАНИЯ АГРОЛАНДШАФТОВ САФЛОРА В СИСТЕМЕ БИОЛОГИЗИРОВАННОГО РАСТЕНИЕВОДСТВА

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Полевые опыты по изучению биологизированной технологии возделывания сафлора проводились в весенне-летний периоды в сухостепной зоне Западного Казахстана. В ходе исследований изучались традиционная технология и технология с применением ьиологических препаратов и биоудобрений. Площадь делянок 50 м^2, повторение - трехкратное, расположение делянок - случайное. Результаты научных исследований показали, что в условиях 2020 года наиболее высокий сбор масла 2,29 ц/га получен при совместном использований биопрепарата Biodux, биофунгицида Orgamica S и биоудобрений Organit N, Organit P (биологизированная технология) протравливанием семян и обработкой в период вегетации. Использование традиционной

технологии наряду биологической урожайностью снижает выход масла на 0,57 ц/га или на 33,13%. В результате сравнительных исследований масличности сафлора выявлено повышение масличности до 30,0% при применении биологизированной технологии.

Ключевые слова: сафлор, биологизированная технология, рост и развитие, урожайность, масличность

In our opinion, safflower in the region can occupy a certain niche in the formation of biologized agricultural landscapes. The role of safflower in increasing the production of vegetable protein and oilseeds is significant. Its cultivation makes it possible to more efficiently use the potential of the lands of arid areas with a reduction in the cost of producing oilseeds [1, p. 4, 2, p. 355, 3, p. 48, 4, p. 183, 5, p.41, 6, p.482].

Safflower seeds and their processed products play an important role in the country's food complex. The level of the gross seed harvest depends not only on the satisfaction of the population's needs for edible vegetable oil, but also to a large extent on the provision of animal husbandry with full-fledged feed. The cultivation of safflower is also relevant in the climatic conditions of Western Kazakhstan, which are characterized by high heat supply and a long growing season. If earlier safflower was sown more in the East Kazakhstan and Almaty regions, now it is increasingly produced in the north, in the western regions and in the south. There is a very strong demand for safflower, it is dismantled by all the nearby countries, it goes very well to China.

In the West Kazakhstan region, safflower crops do not exceed 29 thousand hectares, the yield of oilseeds remains low (7.0-8.5 c/ha). An important reserve for increasing productivity and expanding acreage is the improvement of safflower cultivation technologies using biologized technology, which is becoming a real trend in the Republic of Kazakhstan.

Biologization of agriculture, aimed at the predominant use of biological, rather than chemical and technical factors to increase the economic efficiency of agricultural production, is becoming the main factor in increasing soil fertility, obtaining high yields of agricultural crops, It is also important that climate changes occurring over the past years, as well as the creation of new varieties of safflower, characterized by adaptability, resistance to adverse environmental factors and having high productivity require the development of technology for the use of biological products, which, being in the optimum, most contribute to increasing the productivity of the crop. In agronomic science, there are studies on the study of biological preparations on oilseed crops [7, p.52, 8, p.163, 9, p.4955]. However, these studies are focused on other soil and climatic conditions.

The purpose of the research is to study and evaluate biologized technologies of safflower cultivation in Western Kazakhstan to provide vegetable oil producers with high-quality raw materials in the system of diversified crop production.

According to the morphological features of the genetic horizons of the profile and agrochemical indicators of the arable layer, the soil of the experimental site is characteristic of the dry-steppe zone of Western Kazakhstan.

In the experiments, the safflower variety "Ahram"is used. The seeding rate is recommended for zone 1 of the WKO. The system of tillage adopted in the 1st zone of the West Kazakhstan region.

The repetition of the experiment, the size and location of plots when laying, the organization of observations of the onset of phenological phases, accounting for the growth and development of safflower were carried out according to generally accepted methods [10, p. 55].

Statistical processing of research results by the method of variance analysis using computer programs [11, p.78].

In the system of biologized agriculture, recommended and available on the market microbiological preparations and bio-organic fertilizers were used for the study in order to carry out pre-sowing treatment of seed material and spraying during the growing season of the studied crops: microbiological preparation Biodux, biofungicide Orgamica S, Organit N biofertilizers, Organit P biofertilizers.

The growth and development of safflower was significantly influenced by the prevailing weather conditions of the growing season. In the conditions of 2020, during the periods of germination, initial and active growth of safflower in May, 7.6 mm of precipitation fell at a multi-year level of 27.0 mm, in June, 56.1 mm of precipitation fell, which is more than the multi-year level of 25.1 mm. In May and June, the air temperature was approximately at the level of the average annual temperature.

In the future, prolonged dry weather in July (5.8 mm of precipitation fell against 41.0 mm of long-term level) significantly reduced the productivity of safflower. In July, the average monthly air temperature was 26.20 C with a long-term average of 22.40 C.

In August, with an average monthly air temperature of 19.90 C, precipitation fell 17.1 mm or less from the long-term average of 7.9 mm.

In general, the agrometeorological conditions of the 2020 agricultural year were not favorable for the growth, development and formation of safflower yields.

One of the most important structural elements that determine the productivity of safflower is the density of standing plants in crops, which should be determined for different natural and climatic zones of its

cultivation. Science and practice show that only with the optimal number of plants per unit area of the field, the best use of environmental factors by crops is ensured.

Water, light, temperature, soil fertility are the most important factors that determine the formation of the density of standing plants in agricultural crops. These factors have a significant impact on the germination of seeds, the emergence of seedlings and, first of all, on such an important production indicator as field germination.

In the phase of full seedlings of safflower and before harvesting, we determined the field germination of seeds and took into account the density of standing plants, respectively. Due to the fact that sparse crops can not guarantee a good harvest, high field germination is the most important indicator in order to achieve this. As our studies have shown, safflower is characterized by a fairly high field germination of seeds. In the 2020 studies, the field germination rate of safflower, depending on the cultivation technology, was 91.5-92.8%. At the same time, the highest completeness of seedlings is provided when seeds are treated with biological preparations.

Cultivation technologies had a significant impact on the safety of safflower plants by the end of the growing season. In studies 2020 when sharing Biodux biopesticide, fungicide Orgamica S and bio-fertilizers Organit N, Organit P (biologichna technology) by etching of seeds and treatment during vegetation safflower (foliar feeding of plants in phase 3-6 leaves) are marked in the safety of crops safflower harvesting in comparison with conventional technology of cultivation (control). If with the biologized technology, by the time of harvesting, 88.04% or 408.5 thousand pieces/m2 were preserved out of 464.0 thousand pieces/m2 of sprouted plants, then 384.5 thousand pieces/m2 or 84.04% were preserved in the control of 457.5 thousand pieces/m2. Before harvesting, 24.0 thousand pcs/m2 more plants were preserved in the sowing field using the biologized technology compared to the control.

Results of phenological observations. In the conditions of 2020, the development of safflower plants depended on the cultivation technology. When sowing on April 27, in the 2 studied variants of the cultivation technology, safflower seedlings appeared on May 10, i.e. 13 days after sowing. Starting from the budding phase, there was a difference in the rate of development of safflower, depending on the experience options. With traditional technology, the budding phase occurred on July 1, or 51 days after the emergence of seedlings. In the application of bio-technology, ie. when you share a biological preparation Biodux, fungicide Orgamica S and bio-fertilizers Organit N, Organit P (biologichna technology) by etching of seeds and treatment during vegetation safflower (foliar feeding of plants in phase 3-6 leaves) marked the early onset of budding 2 days compared to safflower plants of the control variant.

In this variant, the budding phase occurred on June 28 or 49 days after the appearance of full shoots. This trend in the development of safflower in the 2nd variants persists in the flowering phase. According to the variants of the experiment, safflower entered the flowering phase on July 16 and 18. At the same time, in the variant of the biologized technology, the flowering phase occurred earlier by 2 days compared to the control. The flowering was friendly and lasted 34 days in the biologized technology version. When using traditional technology, the duration of the flowering period-maturation lasted 37 days, that is, 3 days longer than in the variant of using biological preparations. Full maturation in 2020 on the control came-on August 25, with the total duration of the growing season was 107 days. The use of biological preparations (biological product Biodux, biofungicide Orgamica S and biofertilizers Organit N, Organit P (biologized technology) reduced the duration of the growing season of safflower in the conditions of zone 1 of Western Kazakhstan in comparison with traditional technology by 3 days. With the studied biologized technology, the duration of the growing season of safflower was 104 days.

At the same time, it is necessary to note the importance of reducing the duration of the growing season and the friendly maturation of safflower for the timely and high-quality organization of harvesting operations.

Dynamics of growth of safflower plants. One of the indicators that characterize the state of agrocenosis is the height of plants. Observations of the dynamics of linear growth of safflower showed that the height of the plants depended on the weather conditions of the growing season and the cultivation technology.

The analysis showed that at the beginning of the growing season, safflower has a low growth rate in height. At the same time, the most intensive growth of plants in height was observed in the period from stemming to the beginning of flowering. Then the growth rate decreased and by the phase of the beginning of maturation of the plant on the studied variants had the highest height.

In the 2020 studies from the stemming phase, the difference in the growth of safflower plants was noted, depending on the cultivation technology. In the phase of stooling the plant height of the control group was 20 cm, and in applications of bio-technology plants had a height of 24 cm or the difference between the height of the plants studied options amounted to 4 cm.

In the budding phase, the height of safflower plants according to the experimental variants was in the range of 39-44 cm, and by the flowering phase, safflower plants had a height of 50-56 cm. At the same time, the combined use of the biological product Biodux, the biofungicide Orgamica S and the biofertilizers Organit N, Organit P (biologized technology) provided the maximum growth of safflower plants in comparison with

the control (traditional technology). By the maturation period of the safflower plant in the biologized version of the technology reached 61 cm. Before harvesting, the height of the plants of the control variant was 54 cm or the plants of this variant were left from the plants of the biologized technology variant by 7 cm.

When grown in different soil and climatic conditions, agricultural crops show noticeable features of the formation of crop productivity elements. The safflower among these parameters is necessary to allocate such important to create crop, as the stand density of plants surviving to harvest (pieces/m2), the number of baskets 1 plant (EA), number of filled seeds per 1 plant (pieces), the number of seeds in 1 basket (PCs), weight of seeds from one inflorescence (g), seed weight per plant (g).

Elements of the technology significantly affect the yield of any crop. Incorrectly selected technology parameters can lead to the formation of low productivity indicators of safflower crops, which in turn can affect the yield of oilseeds.

In the 2020 studies, the best indicators of the elements of the crop structure and the yield of safflower were established using biologized cultivation technology (Table 1).

Table 1 - Structure of safflower yield elements depending on the cultivation technology in 2020 in the conditions of Zone 1 of the West Kazakhstan Region

Options	Number of plants per 1 m^2, pcs	Number of productive baskets per 1 plant, pcs	The dia-meter of the baskets for 1 plant, see	Number of seeds per 1 plant, pcs	Macca 1000 семян, г	Biological yield, c/ha
Traditional technology, control	38,45	15,00	2,18	24,40	42,70	6,00
Biologized technology	40,85	17,00	2,41	25,50	43,15	7,64
LSD_{05} – c/ha						1,19

Thus, the combined use of the biological product Biodux, the biofungicide Orgamica S and the biofertilizers Organit N, Organit P (biologized technology) by seed treatment and treatment during the growing season provided the number of productive baskets in safflower plants compared to the control variant to 17.0 pcs per 1 plant.

With an average basket diameter (2.18-2.41 cm), when using biologized technology, the number of seeds per 1 basket was 1.1 more than in the control. The use of biological preparations also contributed to an increase in the weight of 1000 seeds from 42.70 to 43.15 g.

From the research data, it can be seen that in the conditions of 2020, the highest yield of 7.64 c / ha was obtained with the joint use of the biological product Biodux, the biofungicide Orgamica S and the biofertilizers Organit N, Organit P (biologized technology) by seed etching and processing during the growing season. The use of traditional technology reduces the biological yield of safflower by 1.64 c / ha or by 27.33%.

Seed huskiness is an indicator of quality that needs to be reduced. In the 2020 studies, huskiness increased with traditional cultivation technology to 33.6%. The lowest indicator of seed huskiness was observed when using biologized technology – 32.3%.

The oil content of safflower seeds, as shown by studies, varies under the influence of environmental conditions prevailing during the growing season and elements of cultivation technology. In studies, the fat content in the seeds was reduced by 28.8% when using traditional technology.

In 2020, as a result of comparative studies of the oil content of safflower, an increase in the oil content of up to 30.0% was revealed when using biologized technology.

From the research data, it can be seen that in the conditions of 2020, the highest oil yield of 2.29 c / ha was obtained by the joint use of the biological product Biodux, the biofungicide Orgamica S and the biofertilizers Organit N, Organit P (biologized technology) by seed etching and treatment during the growing season. The use of traditional technology along with biological yield reduces the oil yield by 0.57 c / ha or by 33.13%.

Conclusions.

Pre-sowing treatment of seeds and the use of biological products and biofertilizers during the growing season contributes to the activation of a number of growth, physiological and biochemical processes of plants, which leads to an increase in the yield of safflower.

With the combined use of the biological product Biodux, the biofungicide Orgamica S and the biofertilizers Organit N, Organit P (biologized technology), the maximum indicators of productivity and quality of safflower were obtained. As a result of comparative studies of the oil content of safflower, an increase in the oil content of up to 30.0% was revealed when using biologized technology. In the conditions of 2020, the highest oil yield of 2.29 c / ha was obtained with the joint use of the biological product Biodux, the biofungicide Orgamica S and the biofertilizers Organit N, Organit P (biologized technology) by seed etching

and treatment during the growing season. The use of traditional technology, along with biological yield, reduces the oil yield by 0.57 c / ha or by 33.13%.

Acknowledgments: “This research has been/was/is funded by the Science Committee of the Ministry of Education and Science of the Republic of Kazakhstan AP05130172 “Development of adaptive technologies for the cultivation of fodder and oilseeds in relation to the conditions of West Kazakhstan".

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