

SUMMARY

of the dissertation work of Dukeeva Aida Kalikanovna on the topic "Study of sunflower cultivation methods in the conditions of Kostanay region" submitted for the degree of Doctor of Philosophy (PhD) in the specialty 8D08100 - "Agronomy"

Relevance of the research topic.

In recent years, in connection with the diversification of agricultural industry, agricultural formations and farmers have actively begun to grow oilseeds, including sunflower. In 2023, in the Republic of Kazakhstan, sunflower sown areas increased to 1 million hectares, and in 2022, farmers harvested about 1.2 million tons of sunflower seeds.

Sunflower also plays a strategic role in addressing the issue of the country's food security.

The volume of sunflower oil production in the Republic of Kazakhstan is at the level of 352.3 thousand tons.

The production of oilseeds has the prospect of growth in all regions of the Republic of Kazakhstan. The areas of the northern region have the greatest potential. The average sunflower yield in Kostanay region is 5.8-7.8 c/ha.

Practice shows that in recent years, despite the active expansion of the sunflower area, the crop yield is still not at a high level. So, in 2022, 46.3 thousand hectares of sunflower were cultivated in Kostanay region with a yield of 7.0 c/ha. In this regard, the development of sunflower cultivation techniques is undoubtedly relevant and is of significant scientific and practical significance.

To increase the yield of sunflower in Kostanay region, it is necessary to make a scientifically based selection of optimal hybrids adapted to soil and climatic conditions of the region.

To date, there is a need to study the use of mineral fertilizers (rates and terms of application) for sunflower crops to increase the productive potential of this crop.

In recent years, in the world practice and science, in connection with the expansion of the use of "green" technologies, along with other agricultural crops, the technology of sunflower cultivation according to "No-till" system is being actively introduced. In the future, this direction may become a priority in many areas of steppe and forest-steppe of Kazakhstan. In this regard, the study of sunflower cultivation technology according to "No-till" system in Kostanay region is relevant.

In this regard, our research was aimed at studying the methods of sunflower cultivation - selection of hybrids, study of rate and timing of mineral fertilizers application and methods of basic tillage in different systems (tillage, "No-till").

The purpose of the dissertation research.

To study sunflower cultivation techniques to increase the productive potential and quality of the crop in the conditions of Kostanay region.

Research objectives.

1. Selection of sunflower hybrids productive in terms of yield and oil content;
2. To study the effect of mineral fertilizers on the productivity and oil content of sunflower;
3. To study the influence of main tillage methods on the yield and quality of sunflower;
4. To evaluate economic efficiency of the studied methods of sunflower cultivation.

Research methods.

To achieve the set goal in 2020-2022 in LLP “Agricultural experimental station “Zarechnoye” (Republic of Kazakhstan, Kostanay region, Kostanay district, Zarechnoye village) carried out field research according to the accepted methodology.

In the experiments, phenological observations, biometric measurements and laboratory analyzes for determining the quality of sunflower crop were carried out according to the accepted modern methods.

The structure of sunflower crop was determined by disassembling 10 plants from the plot into its component parts.

The biological yield of sunflower was determined by counting the number of surviving plants for harvesting, the number of grains in the anther and the weight of 1000 seeds.

The oil content of sunflower was determined by the extraction method by extracting crude fat from seeds with an appropriate solvent in a Soxhlet apparatus according to State Standard 10857-64.

On field experiment 3 to study the methods of basic processing, the density and moisture content of soil were determined.

Agricultural technology in the experience adopted for Kostanay region. The predecessor is wheat. In autumn, plowing was carried out with a PLN 5-35 plow to a depth of 27-30 cm.

During the growing season of sunflower, as weeds overgrown, 1 chemical weeding was carried out with the herbicide Acetal Pro, e.c. at the rate of 0.01 l/ha and 2 inter-row cultivation by a cultivator. The first cultivation was carried out with the formation of one or two pairs of leaves. The depth is 6-8 cm. The second cultivation was carried out with the mass appearance of weeds, a week after the first, to a depth of 8-10 cm.

Seed dressing was carried out with fungicide Scarlet e.c. at the rate of 0.4 l/t. Sowing was carried out with SUPN-8 seeder with a row spacing of 70 cm, at the optimum time. The sowing rate of hybrids is 50 thousand viable seeds per 1 ha. The depth of laying seeds is 6-8 cm.

Of the mineral fertilizers, NH_4NO_3 and $\text{Ca}(\text{H}_2\text{PO}_4)_2$ were used. In experiments 1 and 3, mineral fertilizers were applied at a dose of $\text{N}_{40}\text{P}_{40}$ in autumn for the main treatment and $\text{N}_{20}\text{P}_{20}$ in spring when sowing.

In experiment 2, mineral fertilizers were applied in the norms and terms indicated in the experiment scheme. Root top dressing of sunflower in option 4 was carried out in the phase of 5-8 sunflower leaves with KF-1.4 cultivator. The sunflower hybrid Pioneer was studied with a seeding rate of 50 thousand viable seeds per 1 ha.

In experiment 3, on control, plowing was carried out in autumn with PLN 5-35 plow to a depth of 27-30 cm. In the variant of direct sowing of sunflower for the previous wheat, mechanical tillage was not carried out, before direct sowing, soil glyphosate-containing herbicide Roundup was used (2 l/ha). In both variants of the experiment, the crops were chemically weeded with the herbicide Acetal Pro, e.c. (0.01 l/ha). The sunflower hybrid Pioneer was studied with a seeding rate of 50 thousand viable seeds per 1 ha. Sowing was done with HORSH Agro Soyuz seeder.

Accounting for the yield of sunflower was carried out by the method of continuous threshing with Sampo 130 combine. The yield was reduced to standard moisture content (10%) and purity (100%).

The economic evaluation was carried out using flow charts at prices at the time of the studies.

The yield results were subjected to statistical processing by the method of one-way analysis of variance, using computer programs.

In experiment 1, high-yielding hybrids Sumatra, Sumiko Suzuko, Tristan and Pioneer (control) were used as objects of study. These hybrids belong to the mid-season ripeness group with a growing season of 108 to 115 days.

The main provisions submitted for defense (proven scientific hypotheses and other conclusions that are new knowledge).

- Comparative productivity and oil content of various sunflower hybrids in the conditions of Kostanay region;
- Optimal norms and terms of application of mineral fertilizers in the conditions of the southern black soils of Kostanay region;
- Optimization of main tillage for sunflower crops in Kostanay region;
- Economic efficiency of sunflower cultivation methods in Kostanay region.

Description of the main results of the study.

The duration of the growing season of the studied sunflower hybrids was at the level of a standard hybrid, which confirms the possibility of their adaptation to local soil and climatic conditions for cultivation in the conditions of Kostanay region. In terms of field germination and safety of plants for harvesting, the best results were obtained for Suzuka hybrids - 35.99 thousand pieces/ha and Sumikr - 36.51 thousand pieces/ha, which in percentage terms amounted to 81.41-82.12%. In all phases of growth, the maximum average plant height was observed in

Sumiko and Suzuka hybrids. The best performance in terms of yield was shown by Sumiko hybrid 14.58 c/ha (26.56% more compared to the control), as well as Suzuka hybrid - 13.97 c/ha (21.27% more than the control). Hybrids Sumiko and Suzuka differed in oil yield (7.13; 6.80 c/ha) with high oil content (48.88; 48.66%). The best indicators of economic efficiency are also found in Sumiko and Suzuka hybrids. The level of profitability of production when cultivating Sumiko hybrid was 230.11, which is 70.23% higher compared to the control, and when using Suzuka hybrid, the profitability indicators were 215.91%, which is 56.03% higher compared to the control variant (Pioneer hybrid).

Application of scheme $N_{40}P_{40}$ background autumn + $N_{20}P_{20}$ in spring during sowing + $N_{10}P_{10}$ top dressing and schemes $N_{40}P_{40}$ background autumn + $N_{30}P_{30}$ in spring during sowing can reduce the growing season in sunflower hybrids, which is associated with the intensity of plant nutrition both during the period of germination and seed formation. When studying the state of sunflower agrocenosis, depending on various norms of mineral fertilizers, the average number of sprouted plants in all variants of the experiment was almost the same and amounted to 43.35-43.73 pcs/ha. When analyzing the effect of mineral fertilizers on the growth processes of sunflower, the presented fertilizer application schemes show that sunflower at all stages of development is responsive to the application of mineral fertilizers. Scheme $N_{40}P_{40}$ background autumn + $N_{20}P_{20}$ in spring when sowing + $N_{10}P_{10}$ top dressing showed the highest result in terms of sunflower yield - 13.37 c/ha, which is 3.17 c/ha higher compared to the control. In this variant of the use of mineral fertilizers, the best levels of oil content (48.6%) and oil collection (6.50 cha) were determined with high economic efficiency rates (net income of 84,068 tenge/ha with a profitability of 169.38%).

The use of main tillage according to “No-till” system contributes to a better preservation of sunflower crops. In terms of plants preserved for harvesting, the indicator with zero technology amounted to 35.51 thousand pieces/ha, while during plowing this indicator was at the level of 34.33 thousand pieces/ha or the safety of plants was 79.74% and 78.57% , at plowing and zero technology, respectively. Zero technology significantly positively affects the yield and quality of sunflower. In the studies, the highest yield (13.08 c/ha), high oil yield (6.35 c/ha) with an oil content of 48.49% were obtained when sunflower was cultivated using the “No-till” system. On average, for 2020-2022, in the conditions of black soils of Kostanay region, sunflower cultivation using zero technology showed 195.70% profitability, which is 33.79% higher compared to traditional tillage (plowing).

Substantiation of the novelty and importance of the results obtained.

- for the first time, the selection of sunflower hybrids optimal in terms of productivity and oil content for the conditions of Kostanay region was carried out;

- for the first time, the norms and terms of applying mineral fertilizers were studied to increase the yield and quality of sunflower in the conditions of the southern black soils of Kostanay region;

- For the first time, the possibility of using the method of basic tillage according to "No-till" system was studied to increase the yield and harvest oil in Kostanay region.

The research results were implemented in the conditions of LLP "TPK Kaz Agros" of Kostanay district in Kostanay region on an area of 150 hectares.

Compliance with the directions of scientific development or state programs.

The work was carried out as part of scientific research on the implementation of the Cooperation Agreement between NJSC "Zhangir Khan West Kazakhstan Agrarian Technical University" and Dulatov Engineering and Economic University in Kostanay. Priority direction of science: "Sustainable development of agro-industrial complex and safety of agricultural products".

Description of post-graduate's contribution to the preparation of each publication.

During the dissertation work, the post-graduate student was distinguished by great responsibility and personal contribution to the development of the research program and methodology, the establishing and conducting of experiments. She has completed the tasks of research work with great interest. With the correct use of specific methods of observation, accounting, analysis in solving the tasks, the intended results were achieved. The author personally participated in the experimental studies, mastered the method of establishing field and production experiments, as well as methodological requirements for research on agricultural science. All the results and conclusions presented in the dissertation were obtained and formulated with the direct participation of the applicant in accordance with the research results.

The author actively participated in the discussion and publication of the work results in scientific publications, in the preparation and presentation of abstracts for international scientific and practical conferences. Based on the results of scientific research, 9 scientific papers were published, including 4 articles in scientific publications recommended by the Committee for Control in the Sphere of Education and Science of the Ministry of Science and Higher Education RK, 1 article in a scientific journal included in the information and abstract fund of the Scopus base, 4 articles in the collections of international scientific and practical conferences.

Scope and structure of the thesis.

The dissertation work is presented in 160 pages, consists of an introduction, literature review, research results, and conclusions, contains 18 figures, 20 tables, 6 applications. The list of references includes 190 titles, including 103 foreign authors.