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БАЯНДАМАЛАРЫ

ДОКЛАДЫ

НАЦИОНАЛЬНОЙ АКАДЕМИИ НАУК
РЕСПУБЛИКИ КАЗАХСТАН

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ҚАЗАҚСТАН РЕСПУБЛИКАСЫ
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БАЯНДАМАЛАРЫ **2021 • 1**

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EFFECTIVE METHODS OF CARE FOR SUNFLOWER CROPS

Abstract. Sunflower cultivation is relevant in the climatic conditions of Western Kazakhstan, characterized by high heat supply and a long growing season. In order to obtain a high yield of sunflower in the system of adaptive technologies, proper pre-sowing preparation of the soil and optimal sowing times are important. Weeds cause great damage to the sunflower crop. Having a powerful underground and aboveground mass, sunflower competes with weeds better than many other field crops. As the accounting data showed, in our studies of 2018-2020, the greatest contamination of sunflower crops was in the variants without the use of herbicides. So, on average for 3 years in the phase 2 of real leaves, when using the harrowing + pre-sowing cultivation (control) technology, there were 10.67 weeds per 1 m^2 with a raw mass of 31.22 g/m^2. According to research data, on average for 2018-2020, the highest oil harvest is set for the harrowing + pre-sowing cultivation option with roundup (2 l/ha) – 9.57 c/ha. When using 1 and 2 inter-row treatments combined with harrowing and pre-sowing cultivation, the oil harvest increased to 7.16-7.95 c/ha, which is more than the control by 0.92-1.71 c/ha.

Keywords: sunflower, weeds, cultivation, herbicides, yield, oil content.

Introduction An important factor in increasing the efficiency of crop diversification in West Kazakhstan and reducing the dependence of crop productivity on weather conditions is the expansion of crops most adapted to unsustainable humidification of plants such as chickpeas, Sudan grass, sorghum, corn and sunflower. Abroad, diversification of agriculture is considered one of the most important goals of greening European agricultural policy [1, 2, 3, 4, 5].

Sunflower cultivation is relevant in the climate of West Kazakhstan, characterized by high heat supply and a long growing season. In this regard, the development of adaptive technologies for sunflower cultivation is important in order to increase productivity and expand sown areas. In order to obtain a high sunflower crop in the system of adaptive technologies, the correct pre-sowing preparation of soil and optimal sowing time are important. The literature provides data on the possibility of cultivating sunflower without introduction or use of herbicides during the pre-season and during vegetation on sunflower, combating weeds by intensifying agricultural techniques [6, 7, 8].

Research methods. The research is carried out on the experimental field of Zhangir Khan West Kazakhstan Agricultural and Technical University. (Republic of Kazakhstan, Uralsk).

The research is carried out within the framework of the grant financing program of the Science Committee of the Ministry of Science of Kazakhstan on the project AP05130172 "Development of adaptive technologies for the cultivation of fodder and oilseeds in relation to the conditions of West Kazakhstan" and on the topic of PhD thesis "Formation of Sudane grass harvest in fodder lands of West Kazakhstan region".

The area of plots during cultivation of sunflower is 90 m^2, repetition is three times, location of plots is rendomized.

According to the morphological characteristics of the genetic horizons of the profile and agrochemical parameters of the arable layer, the soil of the experimental site is characteristic of dry steppe zone of West

Kazakhstan. The experiments used a hybrid of the Avangard sunflower. Seeding rate recommended for zone 1 of West Kazakhstan. Tillage system adopted in the 1st zone of West Kazakhstan region.

When conducting research on the study of sunflower, nitrogen and phosphorus mineral fertilizers were used in the recommended doses for the region.

The repetition of the experiment, the size and location of plots when setting up, organization of observations of the onset of phenological phases, the counts of the growth and development of sunflower were carried out according to generally accepted methods [9]. Statistical processing of research results by the method of variance, analysis using computer programs [10].

Results and discussion. One of the important elements of the adaptive technology of sunflower cultivation is the system of pre-soil tillage, which is aimed at maximizing destruction of seedlings and seedlings of weeds, preserving the accumulated stock of soil moisture and creating optimal conditions for seed germination.

Experiments have shown that the studied options for the care of crops did not have a significant impact on the duration of the phases of sunflower plants development. In the years of research (2018-2020), the timing of the appearance of full seedlings for all experiment options was the same. On average for 3 years, the duration of the vegetation period from sowing to seedlings on all experiment options was 10-15 days. During the years of research, the most favorable conditions for the development of sunflower in the initial period developed in 2019. In 2018 and 2020, the growth of sunflower plants at the beginning of vegetation was influenced by the return of cold. In 2018, hot weather settled in the 1st decade of May, which had an impact on the intensity of friendly germination of sunflower plants. The growth and development of sunflower from the phase of 2 real leaves (May 24) to the end of the phase of 7-8 leaves (June 5) took place with a change in ambient temperature to 15-18 degrees and in the absence of precipitation. This factor influenced the growth processes of sunflower. Further, during all the years of research, at the beginning of anthode formation phase, favorable (up to 28-32 degrees) weather settled, accompanied by short-term precipitation. During the research years, the duration of "germination-anthode formation" period on all versions of the experiment was 38-45 days. The interfacial period of anthode-flowering took place against the background of variable temperatures with short rains. 13-18 days after anthode formation phase, the flowering phase occurred. In different years, sunflower plants from the time of sowing reached the flowering phase in 67-73 days. In 2018, the phase of sunflower flowering was noted on July 18, in 2019 on July 3, and in 2020 on July 8. The flowering phase of sunflower also took place under conditions of variable temperatures (25-32 degrees) and accompanied by atmospheric precipitation. During the growth phase of sunflower seeds (July 22), against the background of air temperature of 25-30 degrees, summer rains took place, sometimes heavy rain. During the research years (2018-2020), the total duration of sunflower vegetation period, depending on the techniques of crop care, was 112-122 days.

Observations of crops during the harvesting period showed different degrees of preservation of sunflower depending on care techniques. So, on average for 3 years (2018-2020) in the research, the highest preservation is 89.97% or 40.82 thousand plants per 1 ha out of 45.37 thousand ha. was indicated on the variant harrowing + prescheduled cultivation with introduction of Roundup herbicide (2 l/ha), and the smallest number of preserved sunflower plants 36.37 thousand hectares or 82.34% were determined on the control variant of harrowing + prescheduled cultivation. Application of 1 inter-row treatment combined with harrow and pre-harvest cultivation ensures preservation of plants at the level of 84.48%. Here, on average, in 2018-2020, during the harvesting period, 37.68 thousand plants per 1 ha were determined. Application of 2 inter-row treatments combined with harrowing and pre-sowing cultivation increases the safety of sunflower plants up to 86.66% (or 38.65 thousand hectares).

Weed plants cause great damage to the sunflower crop. Possessing a powerful underground and above-ground mass, sunflower competes with weeds better than many other field crops. Nevertheless, in weed-grown fields, its crop, according to VNIIMK, decreases by 2.5 c/ha [11, 12].

As accounting data showed, in our research of 2018-2020, the greatest impurity of sunflower crops was on options without the use of herbicides. So, on average, for 3 years in the phase of 2 real leaves, when using the technology, harrowing + pre-sowing cultivation (control) on 1 m^2, there were 10.67 weeds with a raw weight of 31.22 g/m^2. In options 3 and 4 harrowing + pre-harvesting + 1 interdivisional processing and harrowing + pre-harvesting + 2 interdivisional processing, the impurity of crops was 10.33 pieces with a raw weight of 31.87 g/m^2 and 10 pieces per 1 m^2 with a weight of 30.86 g/m^2, respectively.

When using Roundap herbicide with the combination of harrowing and pre-sowing cultivation on sunflower crops in the phase of 2 real leaves, weed plants were not found. Weeds presented in the experiment: caseweed, wild spin, black bindweed, pigweed, wild radish, cocksfoot panicum, field bindweed, canada thistle.

On average for 2018-2020, in the flowering phase, the greatest impurity of sunflower crops was determined under control. Here, 44 weed plants with a raw weight of 207.33 g/m^2 were recorded per 1 m^2. In the applications of 1 and 2 inter-row treatments, the number of weeds was 24 and 17.67 pieces with a weight of 139.0 and 114 g/m^2, respectively (table 1).

Table 1 – Impact of care techniques on sunflower crops impurity, average for 2018-2020

Impurity indicators	Options for crop care			
	Harrowing + pre-harvesting (control)	Harrowing + pre-sowing cultivation with Roundup (2 l/ha)	Harrowing + pre-sowing cultivation + 1 interrow cultivation	Harrowing + pre-sowing cultivation + 2 interrow cultivations
Phase of 2 real leaves				
Number of weeds, pcs/m^2	10,67	0	10,33	10
Weight of raw weight of weeds, g/m^2	31,22	0	31,87	30,86
Flowering period				
Number of weeds, pcs/m^2	44	10	24	17,67
Weight of raw weight of weeds, g/m^2	207,33	57,33	139,0	114,00
Before harvesting				
Number of weeds, pcs/m^2	47,67	12	27,33	20,33
Weight of raw weight of weeds, g/m^2	233,33	69,33	165,33	136,0

In the flowering phase, we also determined impurity of crops of Roundup herbicide application option. In this version an average of 10 weed plants with a total crude weight of 57.33 g/m^2 were found over 3 years of research. In all the years, rains in the period of sunflower flowering and plumpness contributed to the growth and development of weed plants, which was especially seen in the conditions of 2019.

On average, in 3 years during the period of harvesting under control (harrow + pre-sowing cultivation), compared with the flowering phase, the number of weed plants increased by 7.67 pieces and impurity in this version was at the level of 47.67 pcs/m^2. The weight of raw weights was 233.33 g/m^2.

Under control, the increase in the number of weeds during the ripening period compared to the phase of 2 real leaves was 37 pcs/m^2. When using Roundup herbicide with the combination of harrowing and pre-sowing cultivation during the ripening of sunflower, weed plants of 12 pcs per 1 m^2 with a raw weight of 69.33 g/m^2 were found.

The intermediate impurity position is occupied by options using 1 and 2 inter-row treatments. In these versions, by the ripening period, 27.33 and 20.33 weed plants with a raw weight of 165.33 and 136.0 g/m^2 were found on sunflower crops. On versions 3 and 4 harrowing + pre-sowing cultivation + 1 interrow cultivation and harrowing + pre-sowing cultivation + 2 interrow cultivation during the ripening period compared to the initial stage of development, the growth of weeds amounted to 17 and 10.33 pieces per 1 m^2.

One of the most important indicators of sunflower productivity is the height of plants, photosynthetic potential and the dynamics of leaf surface formation.

In the conditions of 2018-2020, in the flowering phase, the highest indicators of sunflower leaves area, we determined when using the technology of harrowing + pre-sowing cultivation with the introduction of Roundup herbicide (2 l/ha) - 13.77 thousand m^2/ha.

According to biometric data, in the research of 2018-2020, sunflower plants were the highest in growth when used along with harrowing and pre-harvesting of Roundup herbicide. In this option, the height of sunflower plants was 131.30 cm for harvesting. Sunflower plants in the control version (110.38 cm) differed in the lowest growth. Before harvesting, the height of sunflower when taking care including 1 and 2 inter-row cultivations, along with spring harrowing and pre-harvest cultivation, was 119.02 and 124.38 cm.

In the research of 2018-2020, the effectiveness of sunflower photosynthesis depended on techniques of crop care. So, on average for 3 years in the flowering phase, if the photosynthetic potential was 0.70 million m^2/day ha, then the addition to the traditional technology of cultivation techniques with the introduction of Roundup herbicide at a dose of 2 l/ha ensured the growth of photosynthetic potential to 0.96 million m^2/day ha.

On the options of harrowing and cultivation of crops combined with 1 and 2 interdivisional treatments, the values of sunflower photosynthetic potential were 0.79 and 0.86 million m^2/day ha, respectively.

When Roundup herbicide is added to sunflower crops, the field surface is equalized and microbiological processes are improved due to the decompression of topsoil. All this has a positive impact on sunflower productivity.

In the research on average for 2018-2020, the highest collection of sunflower seeds is provided for the use of Roundup herbicide and soil harrows with pre-sowing cultivation of 21.03 c/ha.

On average for 3 years under control, the yield of sunflower seeds was 14.02 c/ha. When using harrowing in combination with pre-sowing cultivation and 1 interrow treatment, the yield of sunflower compared to the control increased by 2.19 c/ha and amounted to 16.21 c/ha. When included in the number of sunflower crop care operations, an additional second inter-row treatment, the yield of sunflower seeds was 18.25 c/ha, which is 4.23 c/ha more compared to the control.

On average for 3 years, the mass of 1000 seeds on the option with one inter-row treatment was 34.40 g, when conducting two inter-row treatments with the combination of harrowing and pre-harvest cultivation - 38.99 g.

When introducing Roundup under pre-sowing cultivation and harrowing, the mass of seeds increased by 6.72 g, respectively, compared to the control. On average in 2018-2020, the huskness of seeds when conducting one cultivation is 22.92%, when applying Roundup herbicide for pre-sowing cultivation with harrowing.

Sunflower oiliness for an average of 3 years under control was 49.59%. In the experiments, the highest raw fat content was determined on Roundap herbicide application option - 50.67%. When using 1 and 2 inter-row treatments, sunflower seed oiliness was at the level of 49.17-48.23%.

According to the research data, on average for 2018-2020, the highest oil collection was determined on the option of harrowing + pre-sowing cultivation with the application of Roundup (2 l/ha) - 9.57 c/ha.

When applying 1 and 2 interdivisional treatments combined with harrowing and pre-sowing cultivation, oil collection increased to 7.16-7.95 c/ha, which is more than the control by 0.92-1.71 c/ha (table 2, figure 1).

Table 2 – Quality of seeds and biological yield of sunflower depending on techniques of crop care, average for 2018-2020

Indication	Options for crop care			
	Harrowing + pre-sowing cultivation (control)	Harrowing + pre-sowing cultivation with Roundup (2 l/ha)	Harrowing + pre-sowing cultivation + 1 inter-row processing	Harrowing + pre-sowing cultivation + 2 inter-row processing
Mass of 1000 seeds, g	34,40	41,12	36,88	38,99
Huskness, %	24,07	22,92	23,52	23,04
Oiliness, %	49,59	50,67	49,17	48,23
Biological yield, c/ha	14,02	21,03	16,21	18,25
Oil yield, c/ha	6,24	9,57	7,16	7,95

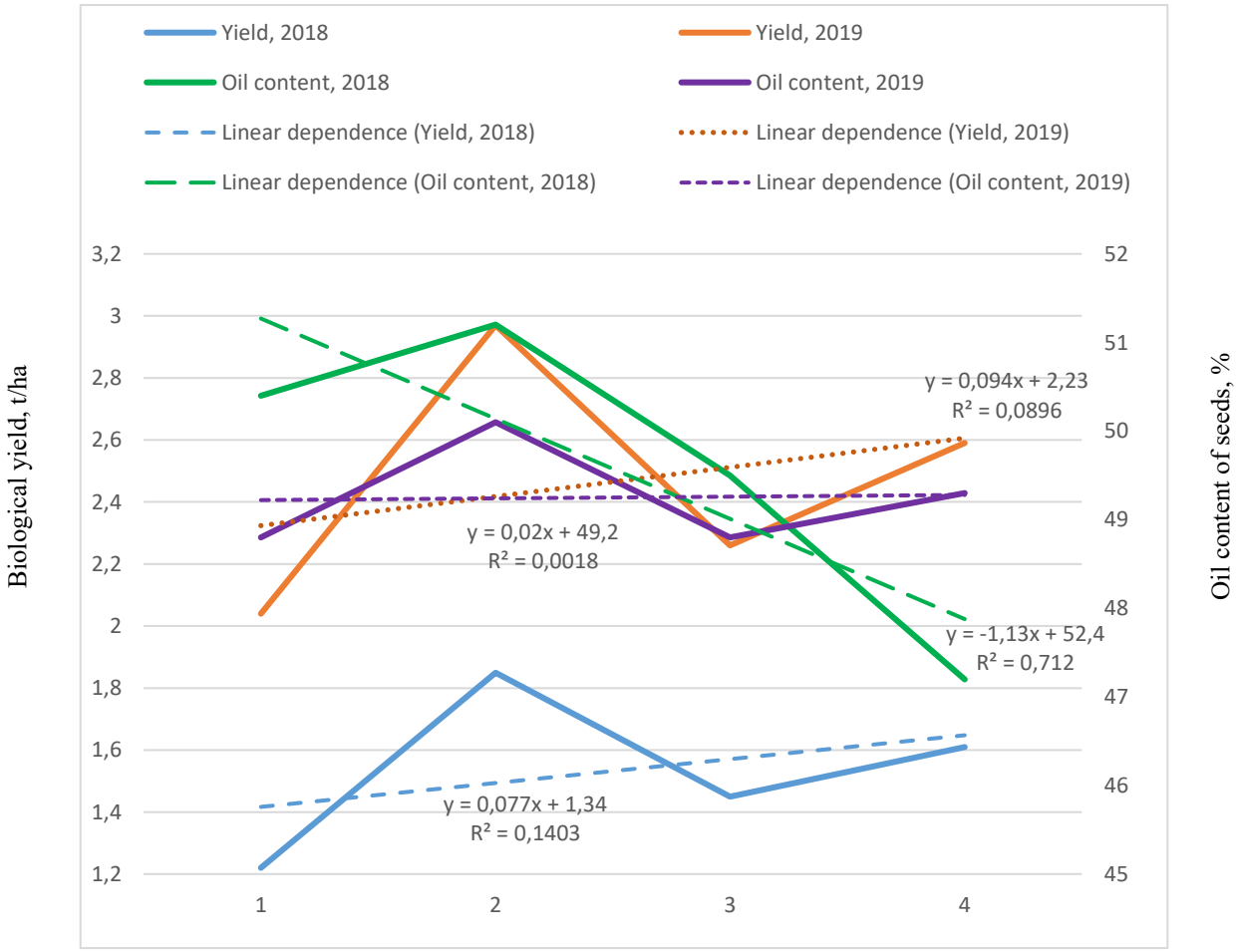

Figure 1 – Yield (t / ha) and oil content of seeds (%) depending on the methods of care for sunflower crops:
1 – Harrowing + pre-sowing cultivation (control); 2 – Harrowing + pre-sowing cultivation with Roundup (2 l/ha);
3 – Harrowing + pre-sowing cultivation + 1 inter-row processing;
4 – Harrowing + pre-sowing cultivation + 2 inter-row processing

Conclusion. One of the important elements of adaptive technology of sunflower cultivation in 1 dry-steppe zone of West Kazakhstan region is the fight against weed vegetation, which is achieved by selection of optimal methods of crop care. The research of 2018-2020 determined the feasibility in the fight against weed vegetation on sunflower crops of using Roundup herbicide in a dose of 2 l/ha. On average for 3 years, the highest collection of sunflower seeds (21.03 c/ha) and oil collection (9.57 c/ga) is provided when using Roundup herbicide and soil harrows with pre-sowing of. In the dry-steppe zone of West Kazakhstan region, the inclusion of adaptive technology in the system along with harrowing and pre-sowing cultivation, the treatment of crops with Roundup herbicide (2l/ha) significantly increases the yield and quality of seeds, as well as sunflower oil collection compared to the traditional technology.

Б.Н. Насиев

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КҮНБАҒЫС ЕГІСІН КҮТУДІҢ ТИІМДІ ТӘСІЛДЕРІ

Аннотация. Батыс Қазақстан климаты жағдайында күнбағыс өсіру жылумен жақсы қамтылатындықтан әрі вегетация мерзімінің ұзақтығына байланысты аса тиімді саналады. Бейімделгіш технологиялар жүйесінде топырақты егіс алдында дұрыс дайындау мен егіс егудің оңтайлы мерзімі айтарлықтай маңызды.

Күнбағыс түсіміне арамшөпті өсімдіктер ірі залал келтіреді. Жерасты және жерүсті массасы қуатты болатындықтан, күнбағыс басқа егіс дақылына қарағанда арамшөпке қарсы күресе алады. Дегенмен БМДҒЗИ мәліметтері бойынша бүлінген алқаптағы түсімі 2,5 ц/га-ға төмендейді [48, 49, 50].

Есеп деректері көрсеткендей, 2018-2020 жылдардағы зерттеулерімізде күнбағыс дақылының көбірек ластануы гербицидтер қолданылмаған нұсқада анықталды. Орташа есеппен 3 жыл ішінде 2 нақты жапырақ фазасында тырмалау + егу алдындағы қопсыту (бақылау) технологиясын қолданған кезде 1 м^2 жерде шикі салмағы 31,22 г/м^2 болатын 10,67 арамшөп есептелді.

2018-2020 жылдардағы зерттеуде орташа есеппен күнбағыс тұқымының ең жоғары түсімі Раундап гербициді қолданылғанда және 21,03 ц/га егіс алдында қопсыту жүргізу арқылы топырақты тырмалау кезінде қамтамасыз етілді.

2018-2020 жылдардағы зерттеуді қолданған кезде орташа алғанда ең жоғары май жинау Раундап (2 л/га) енгізе отырып тырмалау + себу алдында культивациялау нұсқасында белгіленген – 9,57 ц/га. тырмалау және себу алдында культивациялау арқылы біріктірілген 1 және 2 қатараралық өңдеуді қолданған кезде май жинау 7,16-7,95 ц/га дейін өсті, бұл бақылаумен салыстырғанда 0,92-1,71 ц/га-ға артық.

Түйін сөздер: күнбағыс, арам шөптер, отау, гербицидтер, өнімділік, майлы дақылдар.

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ЭФФЕКТИВНЫЕ ПРИЕМЫ УХОДА ЗА ПОСЕВАМИ ПОДСОЛНЕЧНИКА

Аннотация. Возделывание подсолнечника актуально в климатических условиях Западного Казахстана, характеризующихся высокой теплообеспеченностью и продолжительным вегетационным периодом. Для получения высокого урожая подсолнечника в системе адаптивных технологий важное значение имеет правильная предпосевная подготовка почвы и оптимальные сроки посева.

Большой урон урожаю подсолнечника наносят сорные растения. Обладая мощной подземной и надземной массой, подсолнечник конкурирует с сорняками лучше многих других полевых культур. Тем не менее, на засоренных полях его урожайность, по данным ВНИИМК, снижается на 2,5 ц/га [48, 49, 50].

Как показали данные учета, в наших исследованиях 2018-2020 годов наибольшая засоренность посевов подсолнечника была на вариантах без применения гербицидов. Так, в среднем за 3 года в фазу 2-х настоящих листьев при применении технологии боронование + предпосевная культивация (контроль) на 1 м^2 насчитывался 10,67 сорных растений с сырой массой 31,22 г/м^2.

Как показали данные исследований, в среднем за 2018-2020 годы наиболее высокий сбор масла установлен на варианте боронование + предпосевная культивация с внесением Раундап (2 л/га) – 9,57 ц/га. При применении 1 и 2-х междурядных обработок, совмещенных боронованием и предпосевной культивацией, сбор масла вырос до 7,16-7,95 ц/га, что больше по сравнению с контролем на 0,92-1,71 ц/га.

Ключевые слова: подсолнечник, сорные растения, культивация, гербициды, урожайность, масличность.

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