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YIELD AND QUALITY OF SPRING CAMELINA SEEDS IN THE CONDITIONS OF NORTHERN KAZAKHSTAN

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Annotation

The results of the studies on the effect of the use of biological and chemical preparations sown against the background of different sowing dates on the structure of the crop and the quality of seeds of camelina are reflected. The studies were carried out in 2018-2020 on the experimental plot of NJSC " S. Seifullin Kazakh Agrotechnical University" in Akmola region. As a result of the research, it was found that the highest in terms of yield structure were options with a sowing date of May 25-30. The maximum number of pods on average was noted in the late sowing options, both with the insecticidal (75.2 pcs/plant) and fungicidal (74.7 pcs/plant) treatment of crops sown with Extrasol treated seeds. The number of seeds in the pod did not depend on the combined use of the biological and chemical preparations, but had a slight increase in that indicator when sown at a later date (by 8.6 - 1.1%). The yield of spring camelina slightly changed depending on the use of each preparation separately and exceeded the control by 0.11-0.34 t/ha when sown on May 15-20 and by 0.54-0.76 t/ha when sown on May 25-30. Variants using Extrasol + Piktor significantly increased the yield of camelina seeds. According to the oil content, there was a slight increase in the fat content in the variants treated with the drugs, compared with the control. However, the use of the Extrasol + Piktor complex increased the oil content to 39.74 - 40.05%, which was higher than in the control and

in the variant of the combined use of Extrasol with an insecticide and separately. The same pattern was noted for the protein content in the seeds.

Key words: camelina; fungicides; disinfectants; crop structure; oil content; sowing time; extrasol.

Introduction

Vegetable fats along with the animal fats are of great nutritional importance, as they are high in calories. They are widely used for food, in the canning, confectionery, baking industry, in the manufacture of margarine. They are used in paint and varnish, textile, medical and other industries. When oilseeds are processed for oil, cakes and meal (fat-free cake) with a protein content of up to 40% remain. Cake is a valuable concentrated feed.

The need for vegetable oil is increasing all the time [1]. Diversification of crop production in a market economy implies flexibility in determining not only the contingent of cultivated crops, but also their areas in the certain regions and zones, expanding drought-resistant crops, species and varieties of traditional oilseeds and relatively new crops [2]. A very valuable oil plant for arid regions is a non-traditional and promising crop - camelina (Camelina sativa (L.) Crantz) [3].

In Kazakhstan, sunflower, flax, safflower, rapeseed were traditionally grown from oilseeds, from the seeds of which oils were produced. Unfortunately, ginger was not widely used. Although it has a number of advantages for cultivation in the north of Kazakhstan, it relatively easily tolerates drought, especially in the first period of growth and development,

Camelina is considered a multi-use culture. Camelina oil can be used in the food industry and as a dietary one. As a technical oil it is used - for the manufacture of drying oil, biodiesel, in medicine and perfumery. Camelina seed oil is of interest in foreign countries, primarily as a source of biodiesel [4,5,6]. The agronomic value of spring camelina lies in the fact that the culture is undemanding to temperatures, tolerates frosts during the germination period up to 8-10 ° C, at the same time, during the growing season, it tolerates the lack of moisture and high temperatures well, which makes it possible to cultivate it in a wide range of soil and soil climatic conditions [7,8,9,10]. O.A. Serdyuk , I.I. Pluzhnikova and others. [11, 12] found that, in comparison with the other cultures of the cruciferous family, this culture was resistant to diseases. Camelina has a higher resistance to harmful objects compared to rapeseed and mustard. In practice, this leads to the significant savings in crop protection costs.

since at this time the root system grows and penetrates into the depth; works well on sandy and slightly saline soils; the growing season of spring camelina is 65-90 days and as a plant of a long day, when moving north, it shortens the growing season [13]. Spring camelina in Northern Kazakhstan is not a traditional crop, and the expansion of their sown areas is hampered by the

lack of a seed production system, developed recommendations on the technology of its cultivation. This is the basis of our research. In this regard, studies aimed at studying the basic techniques of spring camelina cultivation technology in order to increase its productivity are relevant.

The purpose of our research: To develop a technology for the cultivation of camelina for oilseeds, providing a significant increase in productivity and sustainable production of high quality oilseeds.

The objectives of the research were to study the effect of sowing dates and the various preparations on the structure of the crop,the quality of seeds of camelina sowing in the conditions of Northern Kazakhstan.

Materials and methods

Research methods are to achieve the set goal and objectives included determining the yield structure and seed quality using generally accepted methods [14, 15].

The object of research was Isilkulets camelina variety. The influence of the combined use of biological and chemical preparations (treatment of seeds before sowing - Extrasol, and for vegetation - Proteus insecticide and Piktor fungicide) sown against the background of different sowing dates (May 15-20; May 25-30) on the structure of the crop and seed quality of camelina sowing was studied.The variant without the use of drugs was used as a control. Sowing method - ordinary with a seeding rate of 6.0 million viable seeds per 1 ha. Harvesting was carried out in the phase of economic full ripeness, by direct combining.

The subzone of southern humus, on which the studies were carried out, covered the entire northern part of Sandyktau region. These humus were characterized by a small thickness of the humus horizon (A + B1) - 45-47 cm. Horizon A contains 3-5% humus.

The hydrothermal coefficient during the years of research ranged from 0.75 in 2020 to 1.4 in 2018, the sum of positive temperatures above +100C is 2295^{0}C.

Results

The entire territory of Northern Kazakhstan is characterized by a good supply of cultivated plants with heat. The sum of active temperatures (above 10ºC) in the region ranges from 2000 to 2550ºC. The average annual amount of atmospheric precipitation in Northern Kazakhstan varies from 200 to 350 mm, and during the warm period, an average of 180-230 mm falls, with a gradual increase towards the middle of summer. In general, the climate of Northern Kazakhstan is characterized by aridity, frequent repetition of droughts, which requires that when zoning field crops, their drought

resistance, the ability to use precipitation in the second half of summer, as well as the moisture of autumn, winter and spring precipitation, be taken into account.

The experimental plot is located in a moderately arid and moderately warm agro-climatic region of Akmola region, characterized by a sharply continental climate, where there is a large amplitude of air temperature fluctuations, dryness and a small amount of precipitation. The sum of temperatures above 10ºC does not exceed 2100ºC. During the warm period, up to 190 mm of precipitation falls here. The average long-term moisture supply of wheat is 60% of the optimal one. The duration of the growing season is about 135 days. According to the calculations of the hydrothermal coefficient, 2018 is characterized as a slightly dry year and this indicator was 1.4, and in 2019 and 2020 it was dry (HTC - 0.77 and 0.75, respectively).

The formation of a biological crop due to a larger number of pods per plant and a relatively high content of seeds per pod with an average weight of 1000 seeds of 1.1-1.4 g occurred in our studies.

It was revealed that when sowing on May 25-30, camelina plants formed the higher indicators of the crop structure elements (Table 1). It was found that of all indicators, the most susceptible to changing environmental conditions was the number of pods per plant. A higher value of this indicator, on average, was noted in the late sowing options, both with insecticidal (75.2 pcs/plant) and fungicidal (74.7 pcs/plant) treatment of crops sown with the treated Extrasol seeds. The maximum number of pods was noted in 2018 (HTC 1.4) on variants with the use of the microbiological preparation Extrasol (101.5 pieces per plant). According to our long-term studies, it was found that the grain content of the camelina fruit did not significantly depend on the combined use of biological and chemical preparations, but had a slight increase in this indicator by 8.6 - 1.1% when sown late. (Table 1). An increase in the above indicators was noted in the fields sown with "Extrasol" seeds treated and where the crops were sprayed with the "Piktor" preparation. In the variants with only Extrasol seed treatment, the increase in yield was insignificant.

In our studies, it was found that the actual and biological yield of camelina seeds changed slightly when using the preparations separately and exceeded the control by 0.11-0.34 t/ha when sown on May 15-20 and by 0.54-0.76 t/ha. ha when sown on May 25-30

Table 1 - Elements of camelina sowing structure yield (average for 3 years)

	Number of plants,	Number of pods per 1	Number of seeds in 1	Weight of 1000 seeds,	Biological yield, t/ha

Variants	pcs/m2	plant, pcs	pod, pcs	ha	
Sowing date May 15-20					
Control	130	55,1	10,8	1,06	0,83
Extrasol	132	63,1	11,6	1,16	1,11
Extrasol + Piktor	133	63,7	11,7	1,20	1,17
Extrasol + Proteus	131	59,8	10,9	1,12	0,94
Sowing date May 25-30					
Control	131	56,0	9,9	1,16	0,86
Extrasol	134	75,1	11,1	1,22	1,40
Extrasol + Piktor	134	74,7	11,7	1,35	1,62
Extrasol + Proteus	132	75,2	11,3	1,29	1,51

According to our data, there was a slight increase in the oil content in camelina seeds on crops treated with preparations, compared with the variant without treatment. At the same time, it was found that the complex use of "Extrasol + Piktor" increases the oil content of the seeds to 39.74 - 40.05%, which is higher than in the control and in the variant of the combined use of "Extrasol + Proteus" and separately. The same pattern was noted for the protein content in the seeds. In the course of our analysis, it was found that later sowing dates contributed to an increase in the oil content of seeds and the accumulation of protein in them (table 2).

Table. 2. Influence of the use of different preparations and sowing dates on the yield and quality of camelina seeds for 2018-2020

Sowing term	Preparations	Yield, c/ha	Oil content, %	Protein content, %
15-20 May	Control	7,9	37,6	25,39
	Extrasol	10,5	38,22	28,64
	Extrasol + Piktor	11,5	39,74	31,56
	Extrasol + Proteus	9,1	38,71	28,33
HCP_{05}		*0,52*		
25-30 May	Control	8,3	38,4	26,09

	Extrasol	13,7	38,92	29,08
	Extrasol + Piktor	16,0	40,05	31,93
	Extrasol + Proteus	14,8	39,08	29,01
HCP_{05}		*0,54*		

Discussion

Analysis of the grain crop structure is not only theoretical, but also of great practical interest - this is agrobiological control in agricultural technology. From the available literature data, it is known that the elements of the crop structure depend on varietal characteristics and environmental conditions [16].

The advantage of biologized systems is to increase their environmental safety by reducing the chemical load on crops and reducing the stress phytotoxicity of fungicides [17].

In the conditions of insufficient moisture supply of the growing camelina season, in which, due to the shortening of the growing season, the plants do not fully realize their potential oil content [18]. Back in the 30s of the last century, scientists noted that the amount of oil in seeds largely depends on the biological characteristics of the crop, and also depends on the type of crop, variety, conditions of filling and ripening, harvesting and storage of seeds. In dry hot weather, the accumulation of fat also decreases [19]. Yu.A. Belokurova, M.L. Zolotavina note that the mass fraction of crude protein in cereal seeds and processed products practically does not change, and in oilseeds it increases by 5% [20].

Based on the above data, when developing a technology for the cultivation of camelina sowing in the conditions of Northern Kazakhstan, it is necessary to sow seeds at the optimal time using chemical and biological measures to combat diseases.

Conclusions

1. As a result of experimental studies, it was found that the optimal time for camelina sowing for the conditions of Northern Kazakhstan was May 25-30.

2. The yield level, depending on the use of a microbiological preparation - as a seed disinfectant separately and the joint use of treated seeds and spraying of crops with drugs against diseases and pests - varies from 7.9 to 16.0 q/ha.

3. The productivity of spring camelina was significantly affected by the number of pods per 1 plant and the number of seeds per pod with an average weight of 1000 seeds of 1.1-1.4 g.

4. The use of the Extrasol + Piktor complex increased the oil content and protein content in the seeds to 39.74 - 40.05%, compared with the control and the variant of the combined use of Extrasol and insecticide.

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СОЛТҮСТІК ҚАЗАҚСТАН ЖАҒДАЙЫНДА ЖАЗДЫҚ АРЫШ ТҰҚЫМЫНЫҢ САПАСЫ МЕН ӨНІМ

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Түйін

Әртүрлі себу мерзімдері аясында себілген егістік арыштың өнім құрылымына және тұқымының сапасына биологиялық және химиялық препараттарды қолданудың әсері туралы зерттеулердің нәтижелері көрсетілген. Зерттеулер 2018-2020 жж. «С.Сейфуллин атындағы Қазақ агротехникалық университеті» КеАҚ тәжірибелік учаскесінде Ақмола облысында жүргізілген. Зерттеулер нәтижесінде өнімнің құрылым элементтері бойынша 25-30 мамырдағы себілгенде ең жоғары көрсеткіштер екені анықталды. Орташа есеппен алғанда ең көп бүршіктер саны кеш себу нұсқаларында Экстрасолмен өңделген тұқымдармен егілген дақылдарды инсектицидтік (75,2 дана/өсімдік) және фунгицидтік (74,7 дана/өсімдік) өңдеу кезінде белгіленді. Бұршаққында тұқымдарының саны биологиялық және химиялық препараттарды біріктіріп қолдануға байланысты емес, бірақ кешірек себілген кезде бұл көрсеткіштің аздап өскені байқалды (8,6 - 1,1%). Жаздық арыш тұқымының өнімділігі әр препаратты бөлек қолданғанда аздап өзгерді және бақылаудан 15-20 мамырда себілгенде 0,11-0,34 ц/га, ал 25-30 мамырда себілгенде 0,54-0,76 ц/га артты. Extrasol + Piktor қолданылған танапта арыш тұқымының өнімділігін айтарлықтай арттырды. Майлылығы бойынша бақылаумен салыстырғанда препараттармен өңделген нұсқаларда майдың мөлшері аздап жоғарылауы байқалды. Дегенмен, кешенде Экстрасол + Пикторды қолдану дәннің майлылығын 39,74 - 40,05% дейін арттырды, бұл бақылаудағыдан және Экстрасолды инсектицидпен және бөлек біріктіріп қолдану нұсқасындағыдан жоғары. Дәл осындай заңдылық тұқымдардағы ақуыздың мөлшері бойынша да байқалды.

Кілт сөздер: арыш; фунгицид; дәрілеуіш; өнімділік құрылымы; майдың құрамы; себу мерзімі; экстрасол.

УРОЖАЙ И КАЧЕСТВО СЕМЯН ЯРОВОГО РЫЖИКА В УСЛОВИЯХ СЕВЕРНОГО КАЗАХСТАНА

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Аннотация

Отражены результаты исследований по влиянию применения биологических и химических препаратов, посеянных на фоне разных сроков посева на структуру урожая и качество семян рыжика посевного. Исследования проводились в 2018-2020 гг. на экспериментальном участке НАО «Казахский агротехнический университет им. С.Сейфуллина» в Акмолинской области. В результате исследований было установлено, что наиболее высокими по показателям структуры урожая являлись варианты со сроком посева 25-30 мая. Максимальное количество стручков в среднем отмечено на вариантах позднего срока посева, как с инсектицидной (75,2 шт/раст.), так и с фунгицидной (74,7 шт/раст.) обработкой посевов, посеянных обработанными семенами препаратом Экстрасол. Количество семян в стручке не зависело от совместного применения биологических и химических препаратов, но имел незначительное повышение этого показателя при посеве в более поздние сроки (на 8,6 – 1,1%). Урожайность ярового рыжика несущественно изменялась в зависимости от применения каждого препарата в отдельности и превышала контроль на 0,11-0,34 т/га при посеве 15-20 мая и на 0,54-0,76 т/га при посеве 25-30 мая. Достоверно повышали урожайность семян рыжика варианты с применением Экстрасол + Пиктор. По масличности наблюдалось некоторое повышение содержание жира в вариантах, обработанных препаратами, по сравнению с контролем. Однако применение в комплексе Экстрасол + Пиктор повышало масличность до 39,74 – 40,05%, что выше, чем на контроле и на варианте совместного использования Экстрасола с инсектицидом и в отдельности. Такая же закономерность отмечена и по содержанию белка в семенах.

Ключевые слова: рыжик; фунгициды; протравители; структура урожая; содержание масла; сроки посева; экстрасол.