

умов утримання корів на параметри мікроклімату повітря у тваринницьких приміщеннях та отримання додаткових енергоносіїв. Зб.наук.праць

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## INFLUENCE OF ANTI-STRESSANTS ON THE FORMATION OF WINTER RAPE YIELD CAPACITY

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## ВПЛИВ АНТИСТРЕСАНТІВ НА ФОРМУВАННЯ ВРОЖАЙНОСТІ РІПАКУ ОЗИМОГО

**Abstract.** The results of the 2015–2018 research under the conditions of the forest-steppe of Ukraine for finding ways to improve the performance of winter rape based on establishing the features of growth, development, and production process depending on the use of anti-stressants under the conditions of the forest-steppe of Ukraine.

The object of the research is the process of optimizing the formation of winter rape performance, depending on the varietal characteristics, the studied elements of technology. The subject of the research is winter rape varieties and hybrids; anti-stressants (Kelpak, 2 l / ha; Atonik Plus, 0.2 l / ha; Megafol, 1.5 l / ha; Vuksal Aminoplant, 1 l / ha; X-cyte, 0.75 l / ha; Bioforge, 0, 75 l / ha).

The research has revealed that the mechanism of action of anti-stressants is provided by reducing the level of elimination from the sowing of weakened plants and increasing the number of fruits per unit area. A statistically significant increase in the yield capacity for most genotypes in all the years of the research was noted only for the application of the drugs of Atonik Plus, Vuksal Aminoplant, and Bioforge. The average annual increase in the plots with their use was 0.13, 0.7 and 0.12 t / ha, respectively.

According to the level of response to the use of Atonik Plus, Bioforge and Vuksal Aminoplant, winter rape hybrids are ranked in the following order: NK Technik (+ 0.15 t / ha to control); Lexer (+.14 t / ha); PR46B20 (+0.10 t / ha); hybrid of Executive and the variety of Senator Lux (+0.08 t / ha).

**Анотація.** Представлені результати досліджень 2015–2018 рр. з пошуку шляхів підвищення продуктивності рослин ріпаку озимого на основі встановлення особливостей росту, розвитку, проходження продукційного процесу, залежно від застосування антистресантів в умовах Лісостепу України.

Об'єкт дослідження – процес оптимізації формування продуктивності ріпаку озимого залежно від сортових особливостей, досліджуваних елементів технології. Предмет досліджень – сорти та гібриди ріпаку озимого; антистресанти (Келпак, 2 л/га; Атонік Плюс, 0,2 л/га; Мегафол, 1,5 л/га; Вуксал Аміноплант, 1 л/га; X-сyte, 0,75 л/га; Біофордз, 0,75 л/га).

Виявлено, що механізм дії антистресантів забезпечується за рахунок зниження рівня елімінації із посіву ослаблених рослин та збільшення кількості плодів на одиниці площі. Статистично достовірна прибавка урожайності для більшості генотипів за усі роки дослідження була відмічена лише для препаратів Атонік Плюс, Вуксал Аміноплант та Біофордз. Середньорічна прибавка на ділянках із їх використанням складала відповідно 0,13; 0,7 та 0,12 т/га.

За рівнем відгуку на застосування препаратів Атонік Плюс, Біофордз та Вуксал Аміноплант гібриди ріпаку озимого ранжуються у такому порядку: НК Технік (+ 0,15 т/га до контролю); Лексер (+0,14 т/га); PR46B20 (+0,10 т/га); гібрид Екзекутив і Сорт Сенатор Люкс (+0,08 т/га).

**Keywords:** *rape, foliar feeding, growth regulators, anti-stressants, yield capacity.*

**Ключові слова:** *ріпак, позакореневе підживлення, регулятори росту, антистресанти, урожайність.*

**The relevance of the research.** In recent decades, rape has strengthened its position in the international market for oils and fats. In Europe, rapeseed oil is the biggest asset in biodiesel production and is in high demand. EU directives on the large-scale use of renewable energy sources stimulate the development of production systems inside and outside the EU, in particular, in Ukraine [1].

The science has accumulated many experimental data that clearly show that rape can be grown in almost all areas of Ukraine. However, its area is limited and the production of its seeds and oils is not always efficient. The main reason for this is possible death due to adverse conditions and low seed yield capacity of this crop. Therefore, there is an urgent need to select adapted varieties and hybrids of winter rape with high genetic potential, able to reach this potential under the conditions of the zone [2].

Under current changes in climatic conditions, which are accompanied by an increase in the number and range of stressors, there is a production need to study the influence of growth regulators with anti-stress effect on the development of plants and the formation of productivity of the winter rape [3–4]. Therefore, the need for research in this area is obvious.

**The purpose of the research** is to find ways to improve the performance of winter rape plants based on the establishment of features of their growth, development, and production process depending on the use of anti-stressants in the forest-steppe Ukraine.

The object of the research is the process of optimizing the formation of winter rape performance, depending on the varietal characteristics, the studied elements of technology. The subject of the research is winter rape varieties and hybrids.

**Materials and methods, research results, and discussions.** The researches were conducted on the fields of the Sumy NAU Training Research and Production Complex (TRPC) (Latitude: N50 \* 52.980, Longitude: E34 \* 45.834) during 2015–2018. The soil

of the study area is black soil, typical deep medium humus coarse-silt middle-loamy on forest species. The method of sowing is the row (15 cm), the rate of sowing seeds is 0,6 million pcs / ha. Harvesting and accounting were performed by threshing each plot. The yield capacity was determined up to standard humidity (10%) and 100% purity. The oil content was determined using SupNir 2700 infrared analyzer [5].

The scheme of the experiment: Factor A is winter rape varieties: Senator Lux, Executive, PR46B20, Technik, and Lexer. Factor B is the application of growth regulators with anti-stress effect: control (without regulators), Kelpak, 2 l / ha; Atonik Plus, 0.2 l / ha; Megafol, 1.5 l / ha; Vuksal Aminoplant, 1 l / ha; X-cyte, 0.75 l / ha; Bioforge, 0.75 l / ha.

The parameters of the experiment are  $l_a = 5$ ,  $l_b = 7$ ;  $n = 4$ , an accounting area is 15 m<sup>2</sup>. Placement of plots is the four-tier repetitions, randomized variants.

Treatment with anti-stressants was carried out in the phase of shooting – beginning of budding, which corresponds to 32–52 of the macro stage according to BBCH [6].

**Results.** The main task of using anti-stressants is to reduce the impact of adverse environmental conditions on individual plants and restore the self-regulation process. In the technological process, stress factors include the action of chemical plant protection agents, increased competition, and other conditions that cause a decrease in growth processes, initiate the death of the lower tiers of leaves, and weaken the level of nutrients to the generative organs [7].

For most crops, the action of anti-stressants (complex mineral fertilizers and retriggering substances) is considered as a factor in equalizing the plant to its initial (optimal for these agroclimatic conditions) and therefore does not have clearly quantified and qualitative features. In each case, the direction and effectiveness of the action are determined by the level of deviation from the optimal sowing condition under the influence of the stress factor [8].

The critical period for the development of rape plants is the onset of the restoration of spring vegetation, which is confirmed by the results of other scientists (M. Rapacz, A. Markowski, 1999; A. Anurag, J. Conner, J. Stinchcombe, 2004 [9–10].

The timing and conditions of the use of anti-stressants are determined based on sowing conditions and temperature dynamics. Considering the factor of surface contact with the plant, the increase in leaf area increases the concentration of the drug in the tissues and promotes a more optimal distribution of the active substance between the individual organs of plants in a

satisfactory state. At the same time, the prolonged action of drugs starting from the earliest stage of development better ensures the restoration of damaged tissues, the survival of weakened plants and the formation of a sufficient level of their competitiveness.

Studies on the structure of experimental plots with the use of anti-stress drugs, the formation of plant performance and yield capacity in 2015-2018 revealed the deviation from the values of control over indicators such as the number of plants and the subsequent formation of rapeseed yield capacity (table 1).

Table 1

**Sampling density of winter rape depending on the use of anti-stressants, thousand plants/ha, (2015-2018)**

Variety (factor A)	Control	Anti-stressants (factor B)					
		Kelpak, 21/ha x 2	Atonik Plus, 0.21/ha x 2	Megafoł, 1.51/ha x 2	Vuksal Aminoplant, 11/ha x 2	X-cyte, 0.751/ha x 2	Bioforge, 0.751/ha x 2
Senator Lux	388,21	-1,37	4,75	1,35	4,47	5,43	7,41
Executive	360,18	3,75	8,93	1,88	6,09	1,88	5,82
PR46B20	399,53	2,25	7,74	0	4,59	0	4,58
NK Technik	410,72	3,29	10,08	2,2	8,69	2,2	8,44
Lexer	364,41	0	8,36	4,37	6,46	1,09	6,99
X average		1,58	7,97	1,96	6,06	2,12	6,65
HIP <sub>0,05</sub>		A = 3,31; B = 3,52; AB = 5,96.					

The average elimination rate of weakened plants on the control plots (for the period after the restoration of vegetation before the maturation of the seeds) was 21.24% for the variety of Senator Lux; 8.23, 30.32, 31.94%, and 28.97% for the hybrids of Executive, PR46B20, NK Technik, and Lexer, respectively.

Duplicity in the use of anti-stress drugs allows combining a prolonged effect aimed at the gradual restoration of damaged parts, especially the root, and ensure the restoration of growth processes of the aboveground part. The data in Table 1 indicate that the effect from the use of drugs was manifested primarily in the reduction of the proportion of plants eliminated from sowing (increasing survival rates in populations). Regardless of the hybrid, such changes were observed on the plots using Atonik Plus, Vuksal Aminoplant, and Bioforge.

On the variants using Kelpak, Megafoł, and X-cyte, changes in the number of plants before harvesting were below the statistically significant level. In absolute values, the highest rates of plant conservation compared to controls were observed when using Atonik and Vuksal Aminoplant on the hybrid of NK Technik – plus 10.8 and plus 8.7 thousand pcs plants/ha. The second direction, namely an improvement in reaching

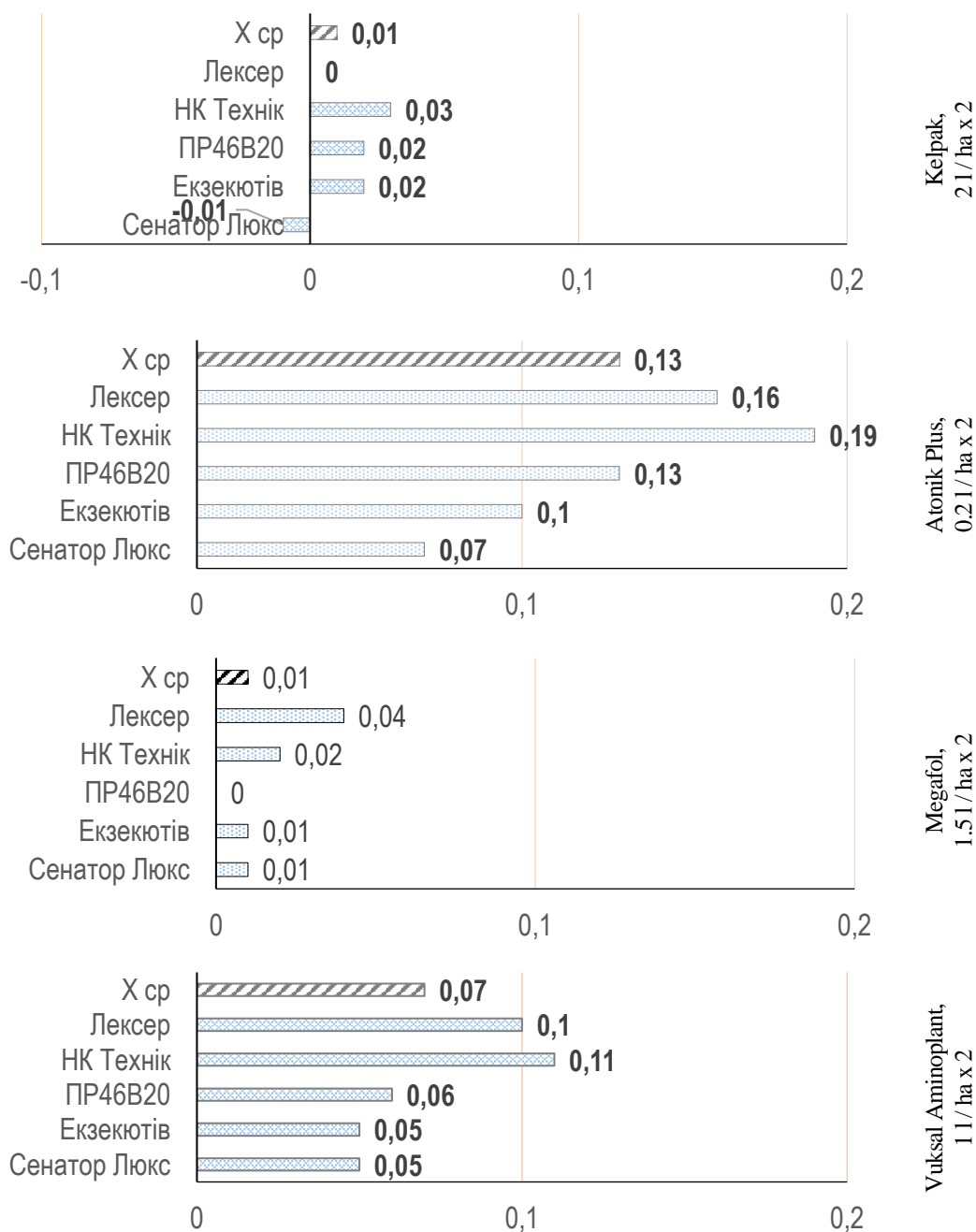
the generative potential, was manifested when using the drug of Bioforge. At close indicators of plant density increase, namely + 6.06 – 6.65 thousand pcs / ha, the latter drug provided almost twice the increase of the average number of pods per unit area, namely + 235.41 versus 140.1 pcs / m<sup>2</sup>. In general, with the increase in the survival rate, Atonik Plus (+ 2.07% to control) provided the best result; the effect of Vuksal and Bioforge was approximately 1.58 and 1.73%, respectively.

The yield capacity is the main criterion for determining the effectiveness of drug use [11–12]. On average, over three years, the yield capacity in the control plots was 3.04 t / ha. The difference between the average yield capacities over the last years was 65.09% (Fig. 1). A statistically significant increase in the yield capacity for most genotypes in all the years of the research was noted only for Atonik Plus, Vuksal Aminoplant, and Bioforge. The average annual increase in the plots with their use was 0.13, 0.7, and 0.12 t / ha, respectively. The highest level of increase in all cases was observed in 2017, the least favorable year for the yield capacity formation. The highest average annual yield increase of 0.19 t / ha (or 5.4%) was observed on the variant of the NK Technik hybrid

treated with the Atonik Plus drug. As mentioned above, this result was achieved mainly at the expense of 21.1% (from 2.64 on the control up to 3.2 t / ha on the variant of the experiment) yield capacity increase in 2017.

Close to Atonik plus, the average annual crop yield capacity was provided by Bioforge. Slightly

lower is Vuksal Aminoplant. In the latter case, the low values of the indicator were the result of the absence (for most genotypes) of the enhancing effect in 2017, a year favorable for the yield capacity formation.



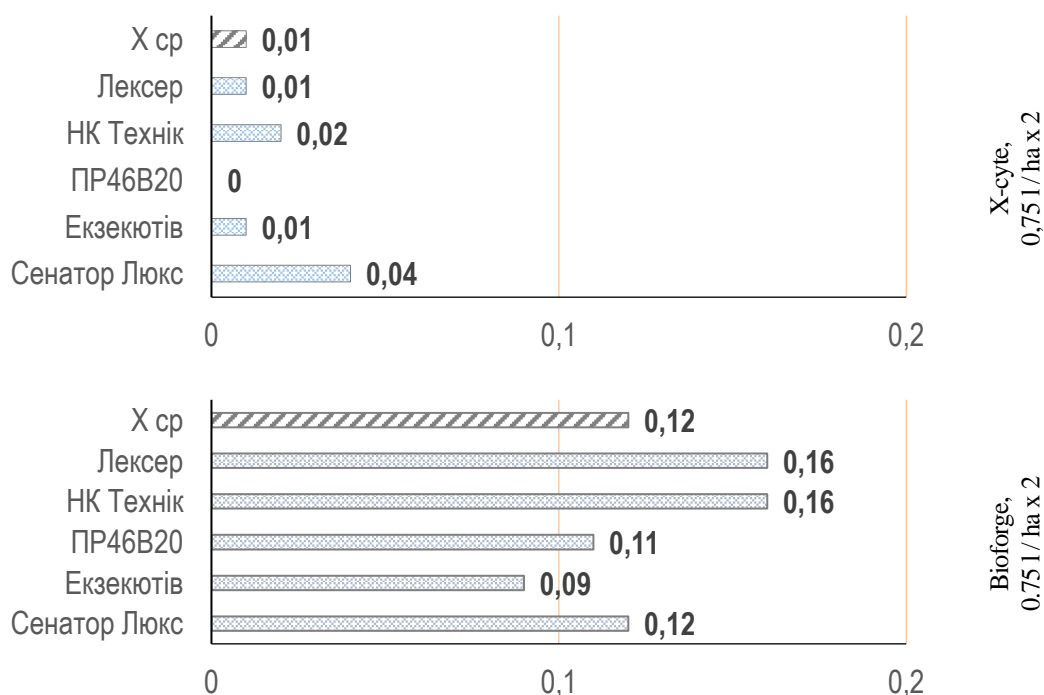


Fig. 1. Yield capacity increase (up to control) when using growth regulators on winter rape hybrids, t / ha (2015-2018)  
H<sub>IP</sub> 0.05 = 0.03

**Conclusions.** The mechanism of action of anti-stressants is provided by reducing the level of elimination from the sowing of weakened plants and increasing the number of fruits per unit area. Complex action is noted in the effect of Atonik and Bioforge. The action of the drug Vuksal is provided mainly by increasing the survival rate of plants in the crops.

According to the level of response to the application of Atonik Plus, Bioforge, and Vuksal Aminoplant, winter rape hybrids are ranked in the following order: NK Technik (+ 0.15 t / ha up to control); Lexer (+.14 t / ha); PR 46B20 (+0.10 t / ha); the hybrid of Executive and the variety of Senator Lux (+0.08 t / ha).

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## ОСНОВНЫЕ ПУТИ КАЧЕСТВЕННОЙ СТРИЖКИ И ПОВЫШЕНИЯ ПРОИЗВОДИТЕЛЬНОСТИ СТРИГАЛЕЙ

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## THE MAIN WAYS FOR A QUALITY HAIRCUT AND INCREASING PRODUCTIVITY OF CUTTERS

**Аннотация.** Стрижка овец относится к наиболее трудоемким видам сельскохозяйственных работ и от своевременной, качественной стрижки во многом зависит, результаты многомесячного труда фермеров по производству шерсти. Одним из важных мероприятий по улучшению качества шерсти, повышению производительности труда стригалей и уменьшению потери шерсти (перестриг, сечка, порезы и т.д.) в овцеводстве является предварительная подготовка овец к основной стрижке и своевременное проведение подстрижки овец. Путем хронометражных наблюдений работы стригалей установлено, что упитанность животных резко влияет на качество стрижки, почти полностью ликвидирует порчу шерсти, снижая порезы кожи, перестрижки, сечку и т.д. и повышает ее качество. Стригали высокой квалификации используют в среднем 90% ширины режущей пары, средней – 80%, а стригали низкой квалификации только 64%. Разрыв руна на клочки допускали стригали низкой квалификации, когда из каждого руна выделяли от 4-х до 7 кусков шерсти. Перестриг шерсти происходит на высоте штапеля до 1 см (12,5...54,2% и от 1,1 до 2 см (6,2...38,4%). Стригаль независимо от квалификации, в среднем делает на каждой овце от 1,5 до 6,7 порезов кожи.

Кроме повышения производительности труда работа высококвалифицированного стригалья позволяет увеличить настриг шерсти благодаря более низкому и равномерному срезу, без сечки шерсти и недостриженной шерсти на овце. В результате низкого и равномерного среза шерсти (не более 0,5...0,6 см) настриг с каждой овцы повышается на 5...7%.

**Annotation.** Sheep shearing belongs to the most labor-intensive types of agricultural work and on time, high-quality haircut depends, the results of many months of work of farmers in the production of wool. One of the important measures to improve the quality of wool, improve the productivity of haircuts and reduce the loss of wool (cuts, etc.) in sheep farming is the pre-preparation of sheep for the main haircut and timely holding a shearing of sheep. By timekeeping observations of the work of haircuts it is established that the fatness of animals dramatically affects the quality of the haircut, almost completely eliminates the damage of wool, reducing cuts of the skin, re-haircut, slash, etc. and increases its quality. High-skilled haircuts use on average 90% of the width of the cutting pair, the average - 80%, and the haircut of low qualification only 64%. The rupture of the rune to pieces allowed to cut low qualification, when from each rune allocated from 4 to 7 pieces of wool. The hair cut occurs at the height of the staple up to 1 cm (12.5...54.2% and from 1.1 to 2 cm (6.2...38.4%).

In addition to increasing productivity, the work of a high-skilled-official haircut allows you to increase the hair cut thanks to a lower and even cut, without a slash of wool and uncut wool on the sheep. As a result of a low and even cut of wool (no more than 0.5...0.6 cm) cut from each sheep increases by 5...7%.