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4.1.1. Общее земледелие и растениеводство  
(биологические науки, сельскохозяйственные  
науки)

### **ВРЕДНОСТЬ НЕЦЕЛЕВЫХ ОБЪЕКТОВ В ПОСАДКАХ ТОМАТОВ И ПУТИ ЕЕ СНИЖЕНИЯ**

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Цель исследования – оценка возможности применения регуляторов роста растений на основе природных гуминовых веществ в целях повышения конкурентоспособности растений томатов в условиях лесостепной зоны Чеченской Республики. Исследования проводились в 2025 году. Применение регулятора роста позволило значительно сократить видовое разнообразие нецелевых объектов в посадках томатов сортов Любимец Кубани и Мадлена. Растения томатов, сорт Мадлена отличаются большей чувствительностью к препаратам на основе производных гуминовых веществ. Можно сделать вывод как о внутривидовой, так и о межвидовой конкуренции в агроценозе томатов. Установлено положительное влияние на повышение конкурентоспособности предпосевной обработки семян томатов раствором регулятора роста. Отмечено сокращение разнообразия нецелевых объектов в агроценозе, что можно считать косвенным признаком повышения конкурентоспособности. На контроле без сорняков, урожайность томатов сорт Любимец Кубани - 31,00 т/га. На фоне максимальной засоренности - 17,9 т/га или 41,9%. Применение Гумат+7 позволило сократить потери урожая до 28,7% при максимальной засоренности. Потери урожая томатов, сорт Мадлена были меньшими. Урожайность на контроле – 29,00 т/га, при максимальной засоренности -17,80 т/га или 38,0%. Предпосевная обработка семян 0,1% Гумат+7 обеспечила сокращение потерь урожая до 26,0%.

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4.1.1. General agriculture and plant growing  
(biological sciences, agricultural sciences)

### **HARMFULNESS OF NON-TARGET OBJECTS IN TOMATO PLANTS AND WAYS TO REDUCE IT**

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The research focused on assessing the feasibility of using plant growth regulators based on natural humic substances to improve the competitiveness of tomato plants in the forest-steppe zone of the Chechen Republic. The research was conducted in 2025. The use of a growth regulator significantly reduced the species diversity of non-target species in the Lyubimets Kubani and Madlena tomato varieties. Madlena tomato plants are more sensitive to humic derivative-based products. This suggests both intraspecific and interspecific competition in the tomato agrocenosis. It was established. Pre-sowing treatment of tomato seeds with a growth regulator solution has a positive effect on increasing competitiveness. A reduction in the diversity of non-target species in the agrocenosis was observed, which can be considered an indirect indicator of increased competitiveness. In a weed-free control, the Lyubimets Kubani tomato yield was 31.00 t/ha. With maximum weed infestation, it was 17.9 t/ha, or 41.9%. The use of Humate+7 reduced yield losses to 28.7% with maximum weed infestation. Yield losses for the Madlena tomato variety were less. The yield in the control was 29.00 t/ha, while with maximum weed infestation, it was 17.80 t/ha, or 38.0%. Pre-sowing seed treatment with 0.1% Humate+7 reduced yield losses to 26.0%

Ключевые слова: ТОМАТЫ, АГРОЦЕНОЗ, РЕГУЛЯТОРЫ РОСТА, НЕЦЕЛЕВЫЕ ОБЪЕКТЫ, КОНКУРЕНТОСПОСОБНОСТЬ, УРОЖАЙНОСТЬ, ПОТЕРИ УРОЖАЯ

Keywords: TOMATOES, AGROCENOSIS, GROWTH REGULATORS, NON-TARGET OBJECTS, COMPETITIVENESS, PRODUCTIVITY, CROP LOSS

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**Introduction.** Open-field tomato cultivation is highly relevant today. This is due to a complex set of factors. First and foremost, these are economic: increased yields rely on the use of regionalized domestic varieties and hybrids resistant to pests and diseases in specific climatic conditions. For example, mid-season varieties with a growing season of up to 115 days are suitable for the North Caucasus region. The availability of fresh produce over a long period is facilitated by the availability of hybrids with a slow ripening period and the possibility of their transportation. The introduction of resource-saving technologies, in particular the use of growth regulators, is also crucial [1, 3, 8]

Environmental factors include increased resistance to adverse conditions, such as elevated air and soil temperatures in the second half of the growing season, which is successfully achieved with the use of biological products. A shorter growing season is achieved by increasing the assimilative surface area of leaves. Increased resistance to non-target agrocenosis pests allows for the harvest of the bulk of the crop before infection spreads. Social – meeting the population's needs for fresh vegetables grown in open ground conditions; tomatoes are a source of vitamins, organic acids and mineral salts; vegetables grown in open ground conditions have a wide range of uses (both for fresh consumption and for canning), etc.; additional jobs in the summer [4, 9, 10].

Based on the above, the relevance of the research topic is beyond doubt.

**Purpose of the study**– assessment of the possibility of using plant growth regulators based on natural humic substances in order to increase the competitiveness of tomato plants in the forest-steppe zone of the Chechen Republic.

<http://ej.kubagro.ru/2026/02/pdf/19.pdf>

To achieve this goal, it was necessary to solve the following problems:

- assessment of the influence of the growth regulator on the species diversity of non-target objects;
- determination of the dynamics of pigment content in tomato leaves;
- assessment of crop yield and crop losses depending on the number of weeds per unit area.

**Place, conditions and methods of the study.** The research was conducted in 2025 in the Gudermes district. Due to production requirements, potatoes were the precursor crop. Climatic conditions during the research period were close to the long-term average. The experiment was based on the Guidelines for the Study of Economic Thresholds and Critical Periods of Weed Harmfulness in Agricultural Crops (1985) and the Guidelines for Conducting Herbicide Experiments. For the first time in the Chechen Republic, a model field experiment was conducted on tomato plantings in open ground conditions, where the weed infestation increased exponentially. Thus, in treatment 1, there were no weeds, while in treatment 8, there were 256 weeds per square meter. Weed numbers were adjusted every two weeks by trimming the above-ground parts of excess plants with scissors. Analysis of variance (Statistica software) was used to assess the reliability of the study results.

**Object of study.** The experiment involved domestic mid-season tomato varieties, Lyubimets Kubani and Madlena, zoned for the Chechen Republic. The growth regulator used was Humate+7, a humic derivative-based product.

The growth regulator was used for pre-sowing soaking of seeds at a concentration of (0.1%) or at a rate of 1 g of the preparation per 1 liter of water.

The remaining elements of tomato cultivation technology (variety, predecessor, soil cultivation system, fertilizers, planting dates, care methods, protection from non-target objects) are in accordance with recommendations for the forest-steppe zone of the North Caucasus [5, 6].

**Results and discussion.** The floristic composition of non-target objects of tomato plantings in open ground conditions has been clarified.

Powdery mildew was detected on the Lyubimets Kubani tomato variety in almost all experimental variants, with a slightly lower incidence of *Alternaria* and late blight. This is explained by the climatic conditions of the year in which the study was conducted - relatively high daytime temperatures and precipitation occurring primarily at night, resulting in increased humidity in the morning. The use of a growth regulator for pre-sowing seed treatment increased the competitiveness of the tomato plants and, consequently, reduced the spread of pathogens.

During the study period, aphids, whiteflies, and Colorado potato beetles became widespread in the tomato agrocenosis, which can be explained by an unfavorable choice of predecessor.

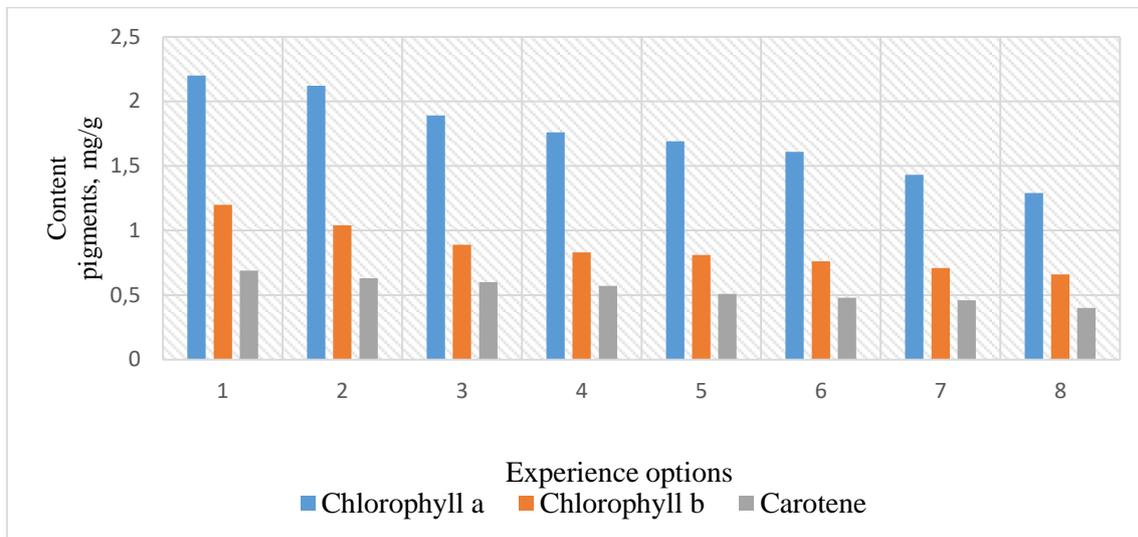
When assessing the floristic composition of weed vegetation, a predominance of late spring weeds was established, which is explained by the biological characteristics of both the studied crop and the predecessor [2, 7, 11].

Powdery mildew was also detected on the Madlena tomato variety in all experimental conditions, with a slightly lower incidence of late blight and early blight. This variety of tomato plants proved more responsive to the application of a growth regulator. Disease incidence was significantly lower than that of the Lyubimets Kubani variety.

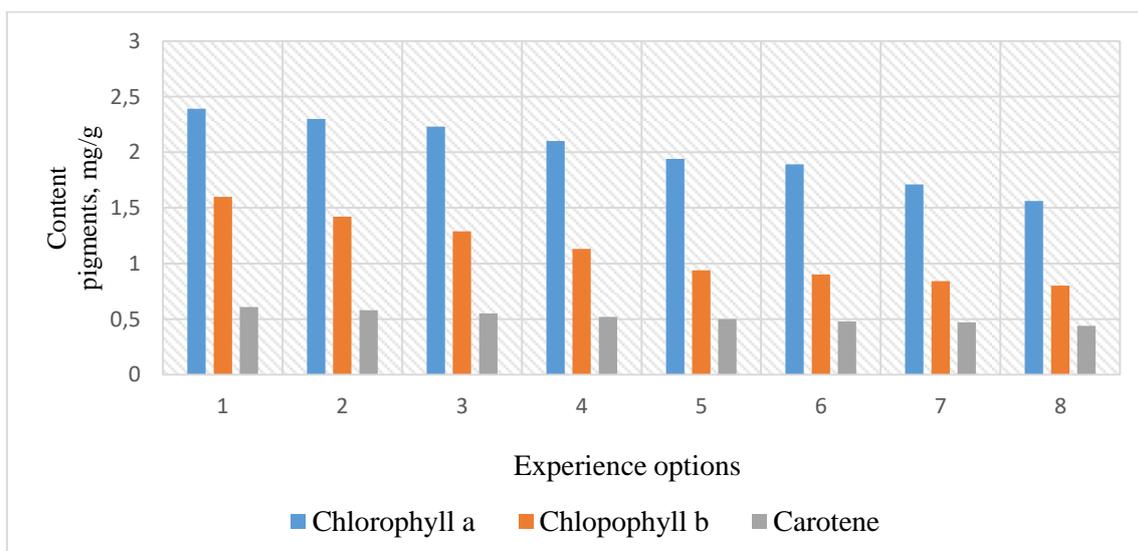
During the study period, aphids, whiteflies, and Colorado potato beetles also became prevalent in the Madlena tomato community. Spider mites were also observed on some varieties.

The use of a growth regulator has significantly reduced the species diversity of non-target species in the plantings of the Lyubimets Kubani and Madlena tomato varieties.

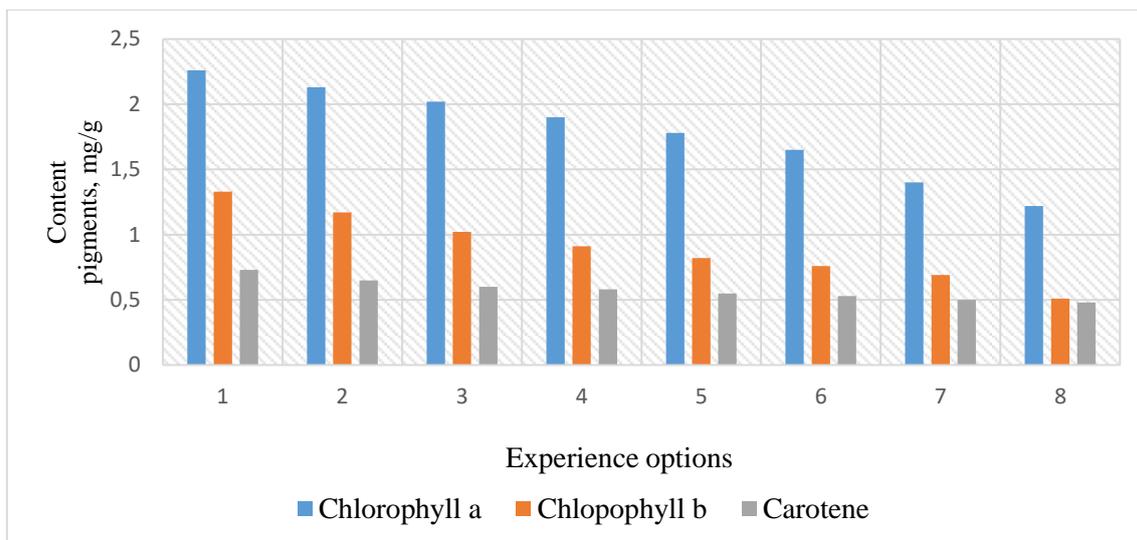
The next step was to determine the pigment content in tomato leaves. Pigments were determined photometrically. Alcohol 96<sup>0</sup> was used as a solvent (Fig. 1).



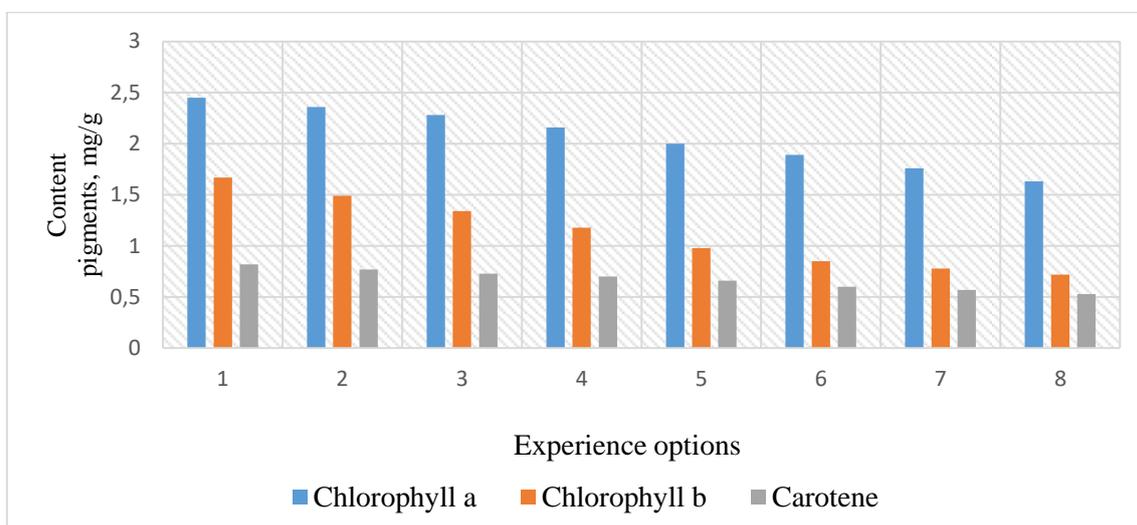
Tomatoes, variety Lyubimets Kubany



Tomatoes, variety Lyubimets Kubani (pre-sowing seed treatment with plant growth regulator)



Tomatoes, Madlena variety



Tomatoes, Madlena variety (pre-sowing seed treatment with plant growth regulator)

Options: 1 - 0 pcs/m<sup>2</sup>; 2 - 4 pcs/m<sup>2</sup>; 3 - 8 pcs/m<sup>2</sup>; 4 - 16 pcs/m<sup>2</sup>;

5 - 32 pcs/m<sup>2</sup>; 6 - 64 pcs/m<sup>2</sup>; 7 - 128 pcs/m<sup>2</sup>; 8 - 256 pcs/m<sup>2</sup>

**Figure 1. Pigment content in tomato leaves (mg/g) depending on the amount of weeds in tomato plantings (2025)**

As Figure 1 shows, as weed numbers increased, pigment content in tomato leaves (Lyubimets Kubani variety) decreased. Compared to minimal weed infestation, pigment content in a field with 256 weeds per square meter decreased as follows: chlorophyll a by 1.7 times, chlorophyll b by 1.8 times, and carotene by 1.6 times.

The use of a plant growth regulator helped reduce the rate of pigment loss in the leaves of tomato plants of the Lyubimets Kubani variety. This decline occurred with increasing weed density per square meter. Compared to the weed-free control, pigment content decreased by an average of 1.5 times with increasing weed density to 256 weeds/square meter.

The pigment content in the leaves of the mid-season tomato variety "Madlena" was slightly higher than that of the "Lyubimets Kubani" variety. For example, in the weed-free control, the chlorophyll a content was 1.8 times higher than in the weed-infested variant; chlorophyll b was 2.6 times higher; and carotene was 2.0 times higher.

Pre-sowing treatment of tomato seeds of the Madlena variety with a natural growth regulator increased pigment content in plant leaves. Compared to a weed-free control with maximum weed infestation (256 seeds/m<sup>2</sup>), chlorophyll a content decreased by 1.6 times, chlorophyll b by 2.3 times, and carotene by 1.5 times, which is slightly lower than the control without the growth regulator.

Tomato plants of the Madeleine variety are more sensitive to growth regulators, in particular to preparations based on humic derivatives.

The influence of the number of weeds per 1 m<sup>2</sup> on the accumulation of their biomass is shown in Table 3.

**Table 3. - The influence of the number of weeds on the development and accumulation of their biomass in tomato plantings (2025)**

Number of weeds in sowing, pcs/m <sup>2</sup> (artificial background)	Weight of 1 weed, g/piece	Reduced masses weeds, %	Δ from min blockage, %
Variety Favorite of Kuban			
4	17.64/16.00	100.00	-/-
8	16.55/15.23	93.82/95.18	6.18/4.82
16	15.48/14.89	87.75/93.06	12.25/6.94
32	14.90/14.25	84.46/89.06	15.54/10.94
64	12.60/12.00	71.42/75.00	28.58/25.00
128	10.45/9.75	59.24/60.93	40.76/39.07
256	8.78/7.90	49.77/49.37	50.23/50.63
Madlena variety			
4	16.20/15.17	100.00	-/-
8	15.27/14.17	94.23/93.45	5.77/6.55
16	14.40/13.18	88.88/86.88	11.12/13.12
32	13.59/12.57	83.88/82.90	16.12/17.10
64	12.05/10.80	74.38/71.19	25.62/28.81
128	9.30/8.58	57.40/56.55	42.60/43.45
256	7.13/6.40	44.00/42.18	56.00/57.82

Note: the numerator is the mass of weeds in the plantings without the growth regulator; the denominator is the mass of weeds with the growth regulator Humate+7.

As can be seen from Table 3, the weight of one specimen of a weed growing in tomato plantings, the Lyubimets Kubani variety, with minimal infestation (4 pcs/m<sup>2</sup>) is 17.64 g. With an increase in the number of weeds to 256 pcs/m<sup>2</sup>, this figure decreases to 8.78 g or by 50.23%.

The use of a growth regulator for pre-sowing treatment of tomato seeds made it possible to reduce the weight of one specimen to 7.90 g, which amounted to 49.37% compared to the minimum (4 pcs/m<sup>2</sup>) infestation.

The mass of one weed plant with minimal weed infestation in tomato plantings of the Madlena variety was 16.20 g. With maximum simulated weed infestation, the mass decreased to 7.13 g or by 56.00%.

The use of a growth regulator reduced the weight of each weed to 15.17 g at minimum infestation and 6.40 g at maximum infestation. The weight reduction per plant was 44.00% and 42.18%, respectively.

Thus, we can conclude that there is intraspecific and interspecific competition in the tomato agrocenosis. An inverse correlation was established between the weight of a single weed plant and the number of weeds per square meter. The reduction in the weight of a single weed plant in the Madlena tomato agrocenosis was more pronounced, suggesting an advantage for the variety in specific climatic conditions.

The final stage of the study involved determining yield losses for the tomato varieties studied. Yield losses for the Lyubimets Kubani tomato variety were more significant. For example, in a weed-free control, yield was 31.00 t/ha. With maximum weed infestation, the yield dropped to 17.9 t/ha, or a yield loss of 41.9%.

The use of Humate+7 allowed to reduce crop losses to 28.7% (24.17 t/ha) with maximum weed infestation (256 pcs/m<sup>2</sup>). The yield of tomatoes under control (without weeds) is 33.90 t/ha.

Yield losses for the Madlena tomato variety were lower. Yield in the weed-free control was 29.00 t/ha, while with maximum weed infestation, it was 17.80 t/ha, or a yield loss of 38.0%. Pre-sowing seed treatment with 0.1% Humate+7 reduced yield loss by 26.0% (23.76 t/ha).

A correlation was found between the weed population per unit area of the Lyubimets Kubani tomato variety and yield losses. The correlation coefficient

was 0.8715, with a strong inverse correlation ( $r > 0.7$ ). The regression equation was:  $Y = 0.0135x + 1.5425$ .

The correlation coefficient between the weed population per unit area of the Madlena tomato variety and yield losses was 0.8921, with a strong inverse correlation ( $r > 0.7$ ). The regression equation was:  $Y = 0.0141x + 1.6315$ .

The Madlena tomato variety is more competitive with weeds than the Lyubimets Kubani variety. It also responds better to the use of growth regulators, particularly humic derivatives, in cultivation.

The research conducted confirmed the version of Russian scientists (Kaysanova G.B., Sokolovskaya G.B.) on the anti-stress mechanism of action of growth regulators, in particular derivatives of humic substances [4, 10].

**Conclusion.** The study demonstrated a positive effect on the competitiveness of pre-sowing tomato seed treatment with a 0.1% solution of the humic-based growth regulator, Humate+7. A reduction in the diversity of non-target species in the agrocenosis was observed, which can be considered an indirect indicator of increased tomato plant competitiveness.

The use of a plant growth regulator for pre-sowing seed treatment reduced yield losses in the tomato varieties studied. Lower yield losses were observed for the mid-season tomato variety Madlena compared to the Lyubimets Kubani variety.

Based on the above, the advisability of using growth regulators based on natural humic substances, Gumat+7, for pre-sowing treatment of tomato seeds is beyond doubt.

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