

## THE POTATO YIELD DEPENDING ON APPLICATION OF THE PLANT GROWTH REGULATORS

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*The factors of the formation of the crop capacity of early ripened potato on the podzolized black soil, that created during the cultivation of tubers with the plant growth regulators were studied, their influence on the qualitative indices and economic efficiency of this process was established.*

To obtain high, permanent and constant harvest the early ripened potato should be provided with the optimum conditions for growth. With this purpose in literature recommended to activate the process of growth and development with the help of the regulators of growth under the influence of which increase the green mass and root system. That is why nutrients of soil and fertilizers are used more actively. Protective properties of the plants, their resistance to diseases, high and low temperatures and drought increase. As a result the productivity of vegetable plants increases, the quality of the products improves. The application of growth regulators allows us to realize better the potential abilities of the plants laid by nature and selection [1, 3, 4].

The growth regulators of new generation – Emistim C, Gumifield increase crop capacity by 15 – 20%, increase the nutritional value of the grown products. The plant resistance to diseases increases by 20-30% under the influence of growth regulators. Under the influence of these growth regulators the content of radionuclides and heavy metals in the plants decreases. This was confirmed by the investigations conducted in Chernobyl area [4].

Soaking of the tubers in the solutions of the growth regulators before planting or spraying the vegetating plants promotes better assimilation of nitrates and reduces their accumulation in plants [1, 2].

As we see from the given data, now the early ripened potato should be fertilized carefully. That is why we used new plant growth regulators to increase the yield. All these questions need more detailed research under the conditions of the Forest-Steppe of Ukraine.

*The purpose* of the research was to study the ways of improving the productivity of the early ripened potato by cultivation of tubers with plant growth regulators and to develop technological measures of increasing its productivity under conditions of Forest-Steppe of Ukraine.

*The subject* of the research is the main technological activities in the production of the early ripened potatoes under the conditions of the Forest-Steppe of Ukraine.

**The methods of investigation.** The results obtained using the conventional field and laboratory methods on the basis of the field experiment and biochemical laboratory analysis using mathematical methods of analysis of variance, which confirm the accuracy of the results of the investigation.

The investigation was conducted on the experimental field of the Department of vegetable growing, which is situated on The Educational and Scientific Industrial

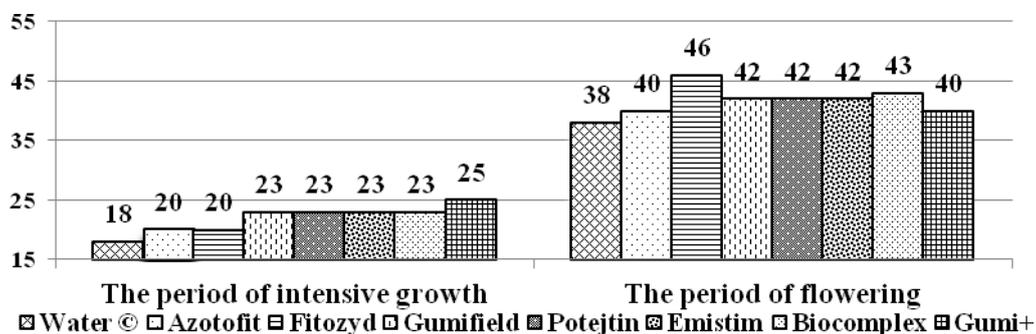
Department of Uman National University of Horticulture. The investigated area is 40 m<sup>2</sup>, including accounted one – 20 m<sup>2</sup>. The soil of the investigated field is podzolized heavy loamy black soil with well-developed humus horizon, with thickness 40 – 45 cm.

A variety of the early ripened potato Red Scarlet was used in the investigation. We used such growth regulators as Emistim C, Gumi+, Gumifield, Azotofit, Fitocyd, Potaitin and Biocomplex for cultivation of potatoes before planting.

In the investigation we conducted biometric observations, namely: defined in the dynamics the area of the leaf using the method of «die-cutting» in cm<sup>2</sup> and the area of leaf surface in thousand m<sup>2</sup>/ha; defined the weight of tubers using «area-weighted» method, was evaluated the quality of the products according to the State Standard of Ukraine ISO 2165-2002.

**The results of the investigation.** In our research, we sought to account the factors of influence on potato plants and identify plant growth regulators, which can lead to higher growth and accelerate the development of plants under the conditions of open soil, and, consequently higher crop capacity. The indicators of plant growth were the subjects of thorough study. These indicators are mainly quantitative – the area of the leaf, the number of leaves and the size of leaves of the plants per area unit. We defined the area of leaf and the size of the surface of leaves in the period of intensive growth of plants and at the beginning of flowering. According to these indicators, we estimated the productivity of plants.

Height of plants is important for defining the growth parameters. Increasing of the plants height in the process of growth is shown in pic. 1.



The period of intensive growth 2011. HIP<sub>05</sub> – 1,1

The period of intensive growth 2012. HIP<sub>05</sub> – 1,3

The period of flowering 2011. HIP<sub>05</sub> – 2,2

The period of flowering 2012. HIP<sub>05</sub> – 2,6

**Pict. 1. Dynamics of the potato plants height depending on the influence of the regulators of growth (2011-2012), cm**

Measurement of the height of the plants in the period of intensive growth in the first decade of June showed that the plants were higher using Emistim C and Gumi+. Their height reached 23 – 25 cm, which means a reliable difference with control 5 – 7 cm. The height of plants using growth regulators of a natural origin Fitocyd, Biocomplex and Gumifield was at the same level – 23 cm, which means a reliable difference with control – 4 cm.

Biometric indicators of potato plants are presented in table 1.

## 1. Biometric indicators of potato depending on the influence of the regulators of growth in the period of flowering in 2011-2012

| Variant of the investigation | Number of stalks, pcs./plant | Number of leaves, pcs./plant | Area of leaf, cm <sup>2</sup> | Area of the leaves, thousand m <sup>2</sup> /ha |
|------------------------------|------------------------------|------------------------------|-------------------------------|---|
| Water (C)*                   | 4,7                          | 33,5                         | 79,3                          | 10,8  |
| Azotofit                     | 6,0                          | 44,8                         | 82,3                          | 15,0  |
| Fitocyd                      | 6,6                          | 39,3                         | 83,7                          | 13,5  |
| Gumifield                    | 5,3                          | 66,7                         | 101,5                         | 28,0  |
| Potaitin                     | 5,0                          | 46,4                         | 91,3                          | 17,5  |
| Emistim C                    | 5,6                          | 55,2                         | 89,9                          | 21,0  |
| Biocomplex                   | 5,1                          | 58,9                         | 97,5                          | 23,8  |
| Gumi +                       | 5,6                          | 57,1                         | 80,9                          | 19,5  |

\*(C) control

The investigations showed that a significantly bigger amount of shoots per one bush had the potato plants cultivated before planting with Azotofit and Fitocyd – from 6,0 to 6,6 pcs/plant. The lowest indicator was under control 4,7 pcs/plant. The plants cultivated with Emistim C, Gumifield and Gumi + had the average number of shoots per one bush, namely 5,3 – 5,6 pcs/plant.

In potato plants increased the number of leaves per plant and the area of one leaf using the plant growth regulators for the handling of tubers before planting. So, during usage of Gumifield corresponding indicators were 66,7 pcs/plant, Gumi + and Biocomplex – 57,1 – 58,9 pcs./plant. During application of Emistim C the number of leaves was 55,2 pcs/plant, which is the average indicator in the investigation. The other plant growth regulators showed lower results.

When such growth regulators as Biocomplex and Gumifield were applied the area of the leaf was 97,5 – 101,5 cm<sup>2</sup> and it increased in comparison with control to 18 – 22 cm<sup>2</sup>. In other variants of the investigation, where the growth regulators were used, the area of the leaf was 81 – 90 cm<sup>2</sup>. This indicator is on 2 – 11 cm<sup>2</sup> higher than control.

Improvement of the conditions of growing of potato plants, even under adverse weather conditions in the years of researches, allowed to receive more vegetative mass and consequently increased the crop capacity. So, the area of leaves per one hectare was significantly higher than the control was in the variants where Gumifield was used – 28,0 thousand m<sup>2</sup>/ha. The processing of tubers with Biocomplex, Gumi + and Emistim C helped to get the area of the leaves on the level of 19,5 – 23,8 thousand m<sup>2</sup>/ha.

The use of Azotofit and Fitocyd helped to reach the total area of leaves 13,5 – 15,0 thousand m<sup>2</sup>/ha and exceeded control.

It was investigated that the yield of potatoes changed according to the influence of weather conditions in the years of research and applied plant growth regulators. The results demonstrated that the pre-sowing processing of tubers with growth regulators had a different influence on the yield of potatoes (table 2).

## 2. The potato yield depending on application of the plant growth regulators, tons/ha

| Variant of the investigation | 2011       | 2012       | The average for two years | ± before control |
|------------------------------|------------|------------|---------------------------|------------------|
| Water (control)              | 21,7       | 22,3       | 22,0                      | 0                |
| Azotofit                     | 26,1       | 24,3       | 25,2                      | + 3,2            |
| Fitozyd                      | 27,6       | 18,8       | 23,2                      | + 1,2            |
| Gumifield                    | 24,9       | 23,6       | 24,3                      | + 2,3            |
| Potejtin                     | 25,0       | 22,2       | 23,6                      | + 1,6            |
| Emistim C                    | 25,6       | 23,1       | 24,4                      | + 2,4            |
| Biocomplex                   | 24,8       | 23,3       | 24,1                      | + 2,1            |
| Gumi +                       | 26,1       | 24,7       | 25,4                      | + 3,4            |
| <i>HIP<sub>05</sub></i>      | <i>0,9</i> | <i>1,0</i> |                           | –                |

So, the data in Table 2 show that increasing of the yield is obtained in the variants where the seeds were processed with Azotofit and Gumi +. These measures increase the yield to 3,2 – 3,4 tons/ha. The use of Biocomplex, Gumifield and Emistim C for potato plants also gave us the positive result. In this case, the yield increased to 2,1 – 2,4 tons/ha. We received the lowest yield in the variant where the seeds were processed with the solution of Fitocyd and Potaitin – 23,2 – 23,6 tons/ha.

**Conclusions.** Relying on the results of the investigations under the conditions of the Forest-Steppe of Ukraine we recommend to grow potatoes processing the tubers with the plant growth regulators Gumi + and Azotofit. These measures give an opportunity to get 3,2 – 3,4 tons/ha additionally.

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**Воробьева Н.В.**

**Урожайность картофеля раннеспелого в зависимости от применения регуляторов роста растений**

Для получения высоких, устойчивых и качественных урожаев картофеля раннеспелого в литературе рекомендуют для активизации роста и развития применять регуляторы роста растений. Целью исследований предполагалось изучить пути повышения продуктивности картофеля раннеспелого при обработке клубней регуляторами роста растений и разработать технологические меры для повышения ее урожайности. Объектом исследований являются основные технологические приемы в производстве картофеля раннеспелого в условиях Лесостепи Украины.

Результаты получены с помощью общепринятых полевых и лабораторных методов на основе полевого эксперимента и биохимических лабораторных анализов. Установлено, что урожайность картофеля раннеспелого изменялась соответственно к воздействию погодных условий в годы исследований и примененных регуляторов роста растений. По результатам исследований в условиях Правобережной Лесостепи Украины рекомендуем выращивать картофель раннеспелую сорта Ред Скарлет с обработкой клубней регуляторами роста растений Эмистим С, Гумифилд и Гуми +, которая позволяет получить дополнительно 2,1 – 3,4 т / га.

**Ключевые слова:** картофель раннеспелый, регуляторы роста растений, высота растений, количество стеблей, урожайность.

**Vorobyova N.V.**

**Yield of early ripened potato depending on the application of plant growth regulators**

To obtain high, sustainable and qualitative early ripened potato yields in the literature recommended to use the plant growth regulators for enhancing the growth and development. The aim of research was to study ways of improving the efficiency of the processing of an early potato tubers and plant growth regulators to develop technological measures to improve its productivity. The object of research is the main technological methods in early ripened potato production in the conditions of Forest-steppe of Ukraine.

Results obtained using the conventional field and laboratory methods on the basis of the field experiment and biochemical laboratory analyzes. Found that early ripened potato yields changed accordingly to the weather conditions in the years of research and application of plant growth regulators. According to the results of research in the conditions of Right-Bank Forest-Steppe of Ukraine we recommend to grow early ripened potato of the variety Red Scarlet with the treatment of tubers by plant growth regulators Emistim C, Gumifild and Gumi +, which allows you to get additionally 2,1 – 3,4 t/ha.

**Key words:** early ripened potato, plant growth regulators, plant height, number of stems, yields.