У той же час відмічалась більш висока вусоутворююча здатність у рослин, оброблених гібереліном. У дослідному варіанті (III декада серпня) у маточних рослинах було сформовано майже в два рази більше повноцінних розеток, ні на контрольному варіанті.

В наших дослідженнях підтвердились багаточисельні дані про вплив цієї групи фітогормонів на стимуляцію процесів формування вегетативних органів, у тому числі і на ріст бокових пагонів. Таким чином, виходячи із отриманих результатів можна зробити висновок, що використання препарату гібереліну на плодоносних насадженях суниці недоцільно, так як він призводить до значного зниженню кількості і середньої маси ягід, що суттєво відображається на зниженні врожайності. Однак, враховуючи вплив препарату на процеси формування вегетативних органів, вирогідно, гіберелін з успіхом може бути використаний для вирощування маточників суниці і отримані посадкового матеріалу.

**Abstract.** The use of the gibberellin drug on commercial strawberry plantations is inappropriate, as it leads to a significant decrease in the number and average weight of berries, which is significantly reflected in the decrease in yield. At the same time, the drug can be successfully used on mother plantations, on which planting material is grown.

**Keywords:** Strawberry, berries, rosettes, gibberellin, use, performens.

УДК 631.8:635.1: 631.674.6

## THE EFFECT OF PLANT GROWTH REGULATORS ON THE PRODUCTİVİTY OF ZUCCHİNİ UNDER DRİP İRRİGATİON CONDİTİONS İN THE SOUTH OF UKRAİNE

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**Abstract.** One of the most affordable and highly profitable ways to increase yields and improve the quality of vegetable products is the use of plant growth regulators in growing technologies containing a balanced complex of growth-regulating and biologically active substances and microelements.

Field studies to study the effect of plant growth regulators on the yield and quality of zucchini fruits under drip irrigation were carried out in 2021 on the southern chernozem at the agricultural firm «Klenove» (Nikolaev region, Ukraine). An early ripening zucchini hybrid Happy Man F1 (Libra Seeds, Italy) was grown in the experiment. The experiment scheme included 6 options: control (treatment of seeds and crops with water); Vertex; Gulliver Stimulus; Dominant; Ivin; Rival. Crops were processed in the phase of 3–5 leaves.

**Keywords:** zucchini, early-maturing hybrid, plant growth regulators, yield, fruit quality.

An urgent problem of modern vegetable growing is an increase in the production of early vegetable products while improving soil fertility. An important way to solve this problem is to increase the production of zucchini, a valuable vegetable crop rich in nutrients and vitamins. Zucchini occupies an important place in the human diet. Its fruits contain carbohydrates, proteins, fats, fiber, enzymes and a number of other substances. It is a source of many vitamins, without which the human body cannot develop and function normally. Zucchini contains carotene – provitamin A, the benefits of which are well known. Zucchini carbohydrates are easily absorbed by the human body, so zucchini is widely used in baby food [1, 2]. One of the most affordable and highly profitable ways to increase yields and improve the quality of vegetable products, including zucchini, is the use of plant growth regulators in growing technologies containing a balanced complex of growth-regulating and biologically active substances and microelements. Modern plant growth regulators use the internal potential of cultivated crops, stimulate their growth and development, increase productivity and economic efficiency of production [3–5]. Insufficient knowledge of the effect of plant growth regulators in the cultivation of zucchini under irrigation conditions in the south of Ukraine led to our scientific research.

Field studies to study the influence of plant growth regulators on the yield and quality of zucchini fruits were conducted during 2021 on the black soil of the southern agricultural firm «Klenove», located in the village of Pavlo-Maryanivka of the Sniguriv district of the Mykolaiv region. In the experiment under drip irrigation conditions, an early ripe zucchini hybrid Happy Man F1 (Libra Seeds, Italy) was grown. The experimental design included 6 options:

1. Control (treatment of seeds and crops with water);
2. Vertex – 0.2 l/t + 0.2 l/ha in the phase of 3–5 leaves;
3. Gulliver Stimulus – 0.5 l/t + 0.5 l/ha in the phase of 3–5 leaves;
4. Dominant – 0.4 l/t + 0.4 l/ha in the phase of 3–5 leaves;
5. Ivin – 0.3 l/t + 0.3 l/ha in the phase of 3–5 leaves;
6. Rival – 0.5 l/t + 0.5 l/ha in the phase of 3–5 leaves.

The minimum level of productivity of marketable zucchini fruits in our experiment was provided by the control variant with pre-sowing treatment of seeds and sowing with water – 86.8 t/ha (Tab. 1).

**Table 1.** Commercial yield of zucchini fruits depending on the action re-regulating drugs

| Plant growth regulators | Yield of commercial products, t/ha | Growth to control | |
|---|---|---|---|
| | | t/ha | % |
| Treatment with water (control) | 86.8 | – | – |
| Vertex | 90.3 | 3.5 | 4.0 |
| Gulliver Stimulus | 88.7 | 1.9 | 2.2 |
| Dominant | 93.8 | 7.0 | 8.1 |
| Ivin | 91.3 | 4.5 | 5.2 |
| Rival | 97.5 | 10.7 | 12.3 |
| $LSD_{05}$, t/ha | 4.58 | | |

The studied growth-regulating preparations increased the yield of marketable fruits by 1.9–10.7 t/ha or by 2.2–12.3%. Growth regulator Gulliver Stimulus provided the smallest yield increase – 1.9 t/ha or 2.2% with a yield of 88.7 t/ha. A slightly higher efficiency was noted when using the growth regulator Vertex in the technology of growing marrows. The yield in this variant of the experiment was 90.3 t/ha, which is higher than the control by 3.5 t/ha or 4.0%. The maximum yield of marrow fruits in the experiment was provided by plant growth regulators Dominant and Rival – 93.8 and 97.5 t/ha, which is higher than the control by 7.0–10.7 t/ha or 8.1–12.3%. The difference in yield between the variants of growth regulators Dominant and Competitor was within the experimental error ($LSD_{05}$ = 4.58 t/ha with a difference between the options of 3.70 t/ha).

The least number of fruits was formed by the zucchini plants of the control version of the experiment – 21.0 pcs. (Tab. 2). The investigated plant growth regulators contributed to its increase by 0.32.5 pcs. or 1.4–11.9% (Fig. 1). Growth regulators Gulliver Stimulus, Vertex and Ivin had the least effect on the number of fruits from the plant. The maximum increase of this indicator is established by using the Dominant and Rival regulators – 1.8–2.5 pcs. or 8.6–11.9%.

**Table 2.** Biometric indicators of zucchini plants under the action of growth regulators

| Plant growth regulators | Number of fruits | | Weight of one fruit | |
|---|---|---|---|---|
| | piece/plant | ± to control | grams | ± to control |
| Treatment with water (control) | 21.0 | – | 330 | – |
| Vertex | 21.6 | +0.6 | 332 | +2 |
| Gulliver Stimulus | 21.3 | +0.3 | 330 | 0 |
| Dominant | 22.8 | +1.8 | 334 | +4 |
| Ivin | 21.7 | +0.7 | 334 | +4 |
| Rival | 23.5 | +2.5 | 338 | +8 |

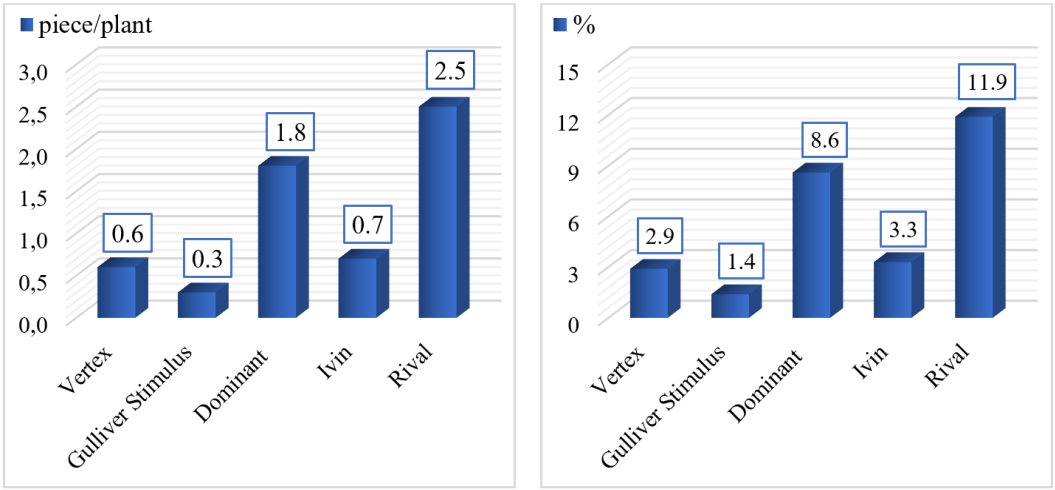


**Figure 1.** An increase in the number of formed fruits on one zucchini plant, compared to the control

An almost similar regularity between the variants of the experiment was also observed for the weight of one formed fruit. In the control, it turned out to be minimal – 330 g. All studied plant growth regulators, with the exception of Gulliver Stimulus, contributed to the increase of this indicator (Fig. 2). The growth regulators Vertex, Ivin and Dominant were characterized by a somewhat higher effect, compared to the control. The maximum value of the mass of one formed fruit was provided by the plant growth regulator Rival – 338 g, which exceeded the control version of the experiment by 8 g or 2.4%.

The diameter of one zucchini fruit showed a much smaller difference between the experimental variants (Fig. 3). In the control, in the variants of Vertex and Gulliver Stimulus, the diameter of one fruit was 5.3 cm. When using the Ivin growth regulator in the cultivation technology, this indicator turned out to be slightly lower – 5.2 cm. Its maximum values were provided by the Dominant and Rival growth regulators – 5.4 cm, which is 0.1 cm or 1.9% more than in the control and Vertex and Gulliver Stimulus variants.

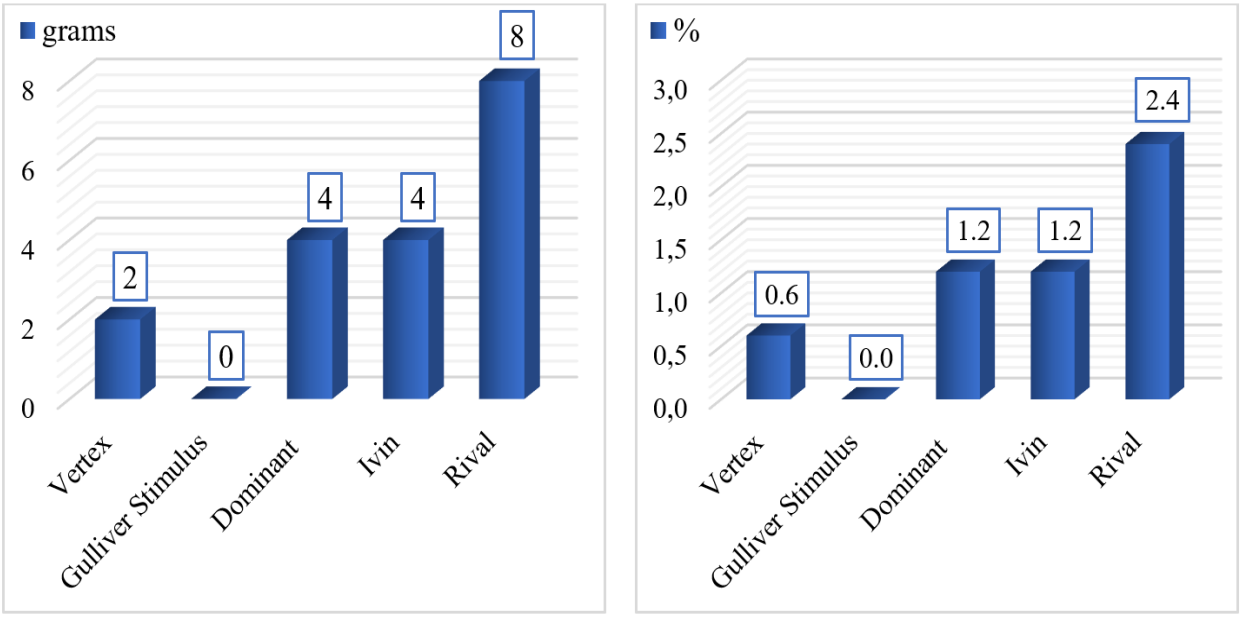


**Figure 2.** An increase in the weight of one zucchini fruit compared to the control

Today, the issue of obtaining not only a high yield of cultivated plant products, but also its high quality is very acute. The pricing policy of the modern market of agricultural products is also mostly based on its quality. The results of our research showed that plant growth regulators Ivin, Dominant and Rival slightly reduced the content of dry matter in zucchini fruits (Tab. 3). So, if in other variants of the experiment, including the control, this indicator was 5.7%, then in the specified variants (Ivin, Dominant, Rival) it was 5.5–5.6%.

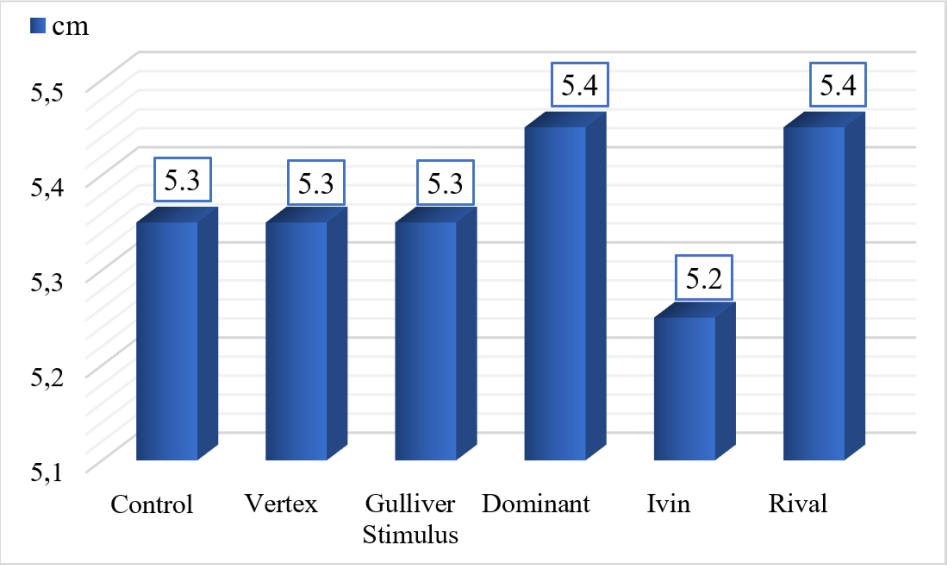


**Figure 3.** The influence of plant growth regulators on the formation of the diameter of one zucchini fruit

**Table 3.** Biochemical indicators of zucchini fruits under the action of growth regulators

| Plant growth regulators | Content in zucchini fruits | | | |
|---|---|---|---|---|
| | dry substances, % | carotene, mg/100 g | sugars, % | nitrates, mg/kg |
| Treatment with water (control) | 5.7 | 0.24 | 2.5 | 168 |
| Vertex | 5.7 | 0.23 | 2.5 | 138 |
| Gulliver Stimulus | 5.7 | 0.24 | 2.5 | 136 |
| Dominant | 5.5 | 0.22 | 2.5 | 132 |
| Ivin | 5.6 | 0.22 | 2.5 | 135 |
| Rival | 5.5 | 0.22 | 2.5 | 129 |

An almost similar situation was observed for the content of carotene. In the control and in the option of using the growth regulator Gulliver Stimulus, the carotene content was 0.24 mg/100 g, when using Vertex – 0.23 mg/100 g, and in the options with the growth regulators Dominant, Ivin and Rival – 0.22 mg/ 100 g. The difference between the variants of the experiment in the content of sugars in the zucchini fruits was not established. This indicator, regardless of the action of growth regulators, was 2.5%. However, the investigated plant growth regulators had a significant effect on the accumulation of nitrates by squash fruits. Their maximum amount was determined in the control – 168 mg/kg. Plant growth regulators contributed to the reduction of the indicator by 30–39 mg/kg or 17.9–23.2% (Fig. 4).

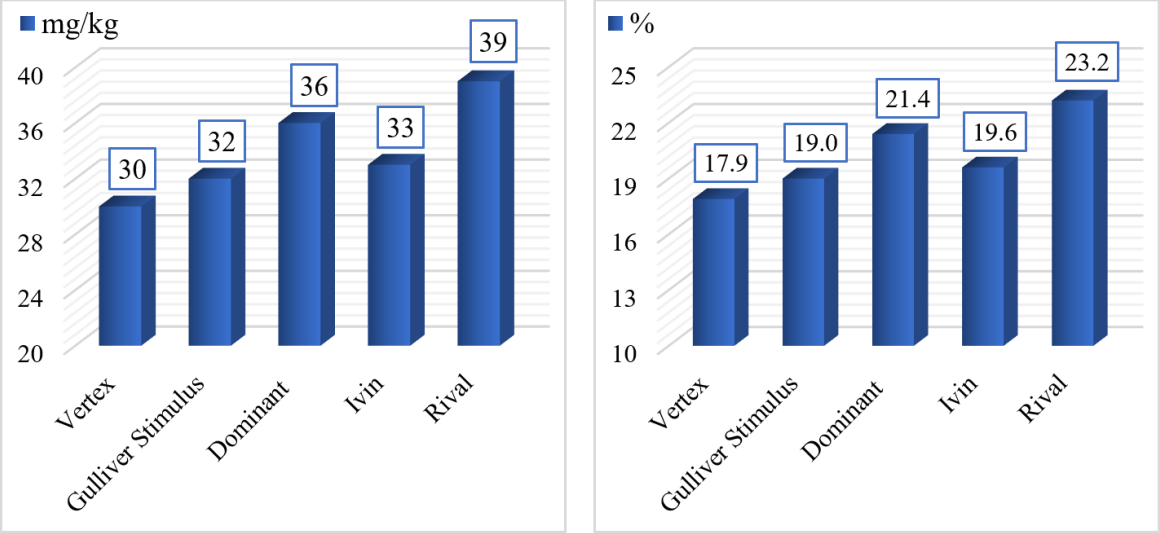


**Figure 4.** Reduction of nitrate content in zucchini fruits, compared to the control

The minimum amount of nitrates was accumulated by zucchini fruits, in the cultivation technology of which plant growth regulators Dominant and Rival were used. At the same time, it should be noted that in all versions of the experiment, the nitrate content did not exceed the maximum permissible amount – 400 mg/kg.

The minimum yield of marketable zucchini fruits was determined in the control with treatment of seeds and sowing in the phase of 3–5 leaves with water – 86.8 t/ha. The use of plant growth regulators in cultivation technology provided an increase in productivity at the level of 1.9–10.7 t/ha or 2.2–12.3%. The Gulliver Stimulus growth regulator had the least effect on the yield of marketable zucchini fruits. The growth regulators Dominant and Rival provided the maximum fruit yield – 93.8 and 97.5 t/ha, respectively, which was 7.0–10.7 t/ha or 8.1–12.3% more than in the control.

The number of fruits on one zucchini plant increased by 0.3–2.5 pcs. due to the effects of plant growth regulators. The growth regulators Dominant and Rival had the greatest effect on this biometric indicator. The number of fruits from one plant in these variants of the experiment was 22.8–23.5 pcs. and exceeded the control by 1.8–2.5 pcs. or 8.6–11.9%.

The weight of one fruit in the experiment ranged from 330 g in the control to 330–338 g in the variants of using plant growth regulators. Gulliver Stimulus did not affect this indicator, under the influence of other growth regulators, the mass of one fruit per plant increased. It reached the maximum values when using the Rival growth regulator – 338 g, which is 8 g or 2.4% more than the control.

The diameter of one zucchini fruit in the experiment under the influence of growth regulators changed insignificantly. Its maximum values were set under the action of plant growth regulators Dominant and Rival – 5.4 cm, which is 0.1 cm or 1.9% more than the control.

The studied plant growth regulators slightly reduced the content of dry matter and carotene in zucchini fruits, they did not affect the sugar content, but significantly reduced the amount of accumulated nitrates. The lowest content of nitrates was determined when using Dominant and Rival growth regulators.

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**Анотація:** Одним із найбільш доступних і високорентабельних шляхів підвищення врожайності та покращення якості овочевої продукції є використання в технології вирощування рослин регуляторів росту, що містять збалансований комплекс рістрегулюючих та біологічно активних речовин і мікроелементів.

Польові дослідження з вивчення впливу регуляторів росту рослин на врожайність та якість плодів кабачків за краплинного зрошення проводили у 2021 р. на чорноземі південному у ФГ «Кленове» (Миколаївська область, Україна). В досліді вирощували ранньостиглий гібрид кабачків Хеппі Мен F1 (Libra Seeds, Італія). Схема досліду включала 6 варіантів: контроль (обробка насіння та посівів водою); Вертекс; Гулівер Стимул; Домінант; Івін; Рівал. Посіви обробляли у фазі 3–5 листків.

**Ключові слова:** кабачок, ранньостиглий гібрид, регулятори росту рослин, урожайність, якість плодів.

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# ГОСПОДАРСЬКО ЦІННІ ОЗНАКИ КОЛЕКЦІЙНИХ ФОРМ НУТУ

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**Анотація.** У Селекційно-генетичному інституті впродовж 1995-2022 рр. оцінили за господарсько цінними ознаками значний набір колекційних сортозразків нуту різного походження. Виділені генотипи, які несуть окремі важливі агрономічні показники, а також такі, у яких поєднані декілька цінних елементів продуктивності та стійкість до абіотичних і біотичних факторів. Виявлено толерантні до недостатньої кількості вологи в ґрунті та підвищених температур повітря генотипи, які являють значну цінність для степової зони України. Шляхом гібридизації створено новий вихідний матеріал для селекції, який характеризується підвищеною врожайністю, стійкістю проти збудників