Use of naphthalencarboxylic acids in gardening

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Abstract. In gardening, in particular when growing apple fruits, the quality of the harvest is important. To do this, it is necessary to carry out a number of agrotechnical measures from the moment the fruit tree blooms until the moment it is harvested. Chemicals are also widely used in these activities. The group of such substances includes phytohormones or their analogues, for example epibrassinolide, sodium salts of gibberellic acid. In this article, in addition to 2-(naphthyl-1)acetic acid, the biological activity of 2-(naphthyl-2)acetic, 3-(naphthyl-1)propionic and 3-(naphthyl-2)propionic acids was investigated.

1 Introduction

The discovery of a special group of substances that regulate the processes of plant growth and development is the main achievement of agriculture, biology and chemistry. In the scientific literature, such substances are known under several names: auxins, growth substances, phytohormones, growth stimulants and growth inhibitors [1].

Phytohormones are low molecular weight substances produced in the plant body and not subject to metabolism. These compounds are effective in small quantities and move from the site of synthesis to the site of action in the plant organism [2].

For a long time, scientists have been working on the creation of chemically synthesized growth regulators with the goal of making crops more beneficial for humans, having a more targeted effect on each crop and improving the characteristics of a certain period of plant development. In particular, the active formation of fruits, improvement of seed germination, allows for rapid or slow ripening of the crop, etc. [3].

Growth regulators are synthetic substances that, in small quantities, slow down, speed up, or otherwise affect physiological processes in the plant. These include all compounds that cause phytohormone-like changes in the plant, including synthetic substances not found in nature. Synthetic growth regulators, like phytohormones, are very different from nutrients and assimilates [4].

The intensive development of fruit growing in modern conditions is aimed at a comprehensive solution to the main problem - the creation of fast-harvesting and regularly bearing seedlings, which allows obtaining the highest quality harvest per unit area. A successful solution to the problem is associated with the use of physiologically active substances - growth regulators when growing fruits [5].

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The use of growth regulators gives a positive effect only against the backdrop of good agrotechnological care, when plants are provided with water, nutrition and all the conditions necessary for growing crops (6).

The high physiological and fungicidal activity of bioregulators of growth, which have anti-stress and immunoprotective properties for plants, is manifested in their low concentrations - in the range of 5...50 mg/ha. They directly enter the metabolism of plants, without having a negative impact on the soil and the environment, and then turn into natural compounds. This group of compounds includes phytohormones or their analogues, such as epibrassinolide and sodium salts of gibberellic acid [7, 12].

In horticulture, growth regulators are used to accelerate plant growth, rooting cuttings, replanting trees, increasing the yield of a number of crops, leaf fall, growth retardation, reducing fruit drop before harvest, chemical thinning of flowers and ovaries, etc. [8, 13].

When growing apples, the main goal is to obtain a high yield and quality fruits. At the same time, attention is paid to regulating the crop load on the tree and improving the quality of the fruit. Apple tree varieties differ in the characteristics of the variety, and if the yield of some varieties is stable over the years, then some varieties exhibit fluctuations. Various agrotechnical measures are carried out to ensure that the harvest is always sufficient and the load on the tree is controlled. These activities begin when the trees bloom and continue until the harvest. When the apples bear fruit, if the harvest is larger than expected, the excess ovaries are thinned out. On the contrary, if there are fewer fruit flowers, their fall should be prevented. Flowers may fall before fruiting or ovaries may fall, and crops may fall before harvest when the crop is ripe.

At the same time, when growing apple fruits, their color is considered an important feature that determines the quality of the product. In particular, apple varieties such as Alexander Boyko, Golden Delicious, Jonathan, Red Delicious must be in a unique and standard condition at the time of coloring the peel and pulp. And in the varieties Renet Simirenko and White Rosemary, fruit drop is observed even before all the fruits on the tree ripen.

Phytohormones such as auxin are used to solve the above problems associated with growing apples. The most famous of them is 2-(naphthyl-1) acetic acid. This substance reduces the physiological activity of ethylene in the fruit bunch, prevents fruit shedding and improves product quality. Treating trees by spraying with a solution of the drug during flowering and fruiting also prevents the falling of fruit flowers and helps preserve the harvest. In this study, the biological activities of 2-(naphthyl-2)acetic acid, 3-(naphthyl-1)propionic acid and 3-(naphthyl-2)propionic acid were investigated together with 2-(naphthyl-1)-acetic acid. Experimental work was carried out in gardens belonging to the farms “Bahromjon, Solijon, Nodirjon” in the Chartak district and “Khojimukhammad Ibrat”, “Kaiki Hamkor Service” in the Uchkurgan district of the Namangan region. In order to improve the solubility of these acids in water and enhance their beneficial effect on plants, they were transferred to potassium salts and their solutions were prepared. Because potassium is important for apple trees. Potassium is necessary not only for the growth and development of trees, but also for improving the size and quality of fruits. The apple tree's need for potassium changes with the development of phenological phases of the growing season. The greatest need for potassium in apples occurs during fruit ripening.

2 Materials and methods

1. a) a solution prepared by reacting 100 g of 2-(naphthyl-1)acetic acid with 1 liter of 10% potassium hydroxide;
   b) a solution prepared by reacting 100 g of 2-(naphthyl-2)acetic acid with 1 liter of 10% potassium hydroxide;
c) a solution prepared by reacting 100 g of 3-(naphthyl-1)propionic acid with 1 liter of 10% potassium hydroxide;

e) a solution prepared by reacting 100 g of 3-(naphthyl-2)propionic acid, prepared by reacting with 1 liter of 10% potassium hydroxide;

2. Active ingredients: potassium salts of 2-(naphthyl-1)acetic, 2-(naphthyl-2)acetic, 3-(naphthyl-1)propionic and 3-(naphthyl-2)propionic acids.

3. Purpose of application: preventing the shedding of fruit crops and improving the quality of fruits;


5. Place of the experiment: farms “Bahromjon, Solijon, Nodirjon” in the Chartak district, “Khojimukhammad Ibrat” and “Kaiki Hamkor Service” in the Uchkurgan district;

6. Type of tree: apple trees of different varieties;

7. Concentration of working solution: 0.05%, 0.5%, 1.0%, 1.5%.


3 Results and discussion

Variety Alexander Boyko - trees were treated at least 1 week before harvest, two and three times (interval - 5 days).

- Positive phenological changes were observed in trees treated twice with 0.5% working solutions of varying concentrations. In particular, it was found that the amount of coloring substances - anthocyanins in the skin of fruits increased, the pulp of ripened fruits became denser (crispy), and the amount of vitamins during storage was higher compared to the control (in the control - 53-55%, in the experiment - 70-75%). During storage, it was found that the pulp density also remained 20% higher than the control;

- Fruit drop decreased by 30-35% compared to control.

Variety Golden Delicious - trees were treated at least 1 week before harvest, two and three times (interval - 5 days).

- Among working solutions of different concentrations, positive phenological changes were observed in trees treated twice with a 0.5% working solution. In particular, the amount of coloring substances - anthocyanins in the skin of the fruits has increased, the pulp of the fruits is dense, the amount of vitamins during storage is higher than the control (in the control - 53-55%, in the experiment - 70-75%). During storage, it was found that the pulp density also remained 20% higher than the control;

- Fruit drop decreased by 45-50% compared to control.

Variety Jonathan - trees were treated at least 1 week before harvest, two and three times (interval - 5 days).

- Positive phenological changes were observed in trees treated twice with a 0.5% working solution. In particular, the amount of coloring substances - anthocyanins in the peel of the fruit increased, the amount of vitamins during storage was higher than the control (in the control - 35%, in the experiment - 65-70%). It was also found that pulp firmness remained 12% higher than the control;

- Fruit drop decreased by 60-65% compared to control.

Red Delicious variety - trees were treated at least 1 week before harvest, two and three times (interval - 3 days).
Positive phenological changes were observed in trees treated twice with a 0.5% working solution. In particular, it was found that the amount of coloring substances in the peel of the fruit increases after the second treatment with a 0.5% working solution;

Fruit shedding decreased to 40% compared to control.

*Variety Renet Simirenko* - tree treatment was carried out at least 1 week before harvest, two and three times (interval - 5 days).

Positive phenological changes were observed in trees treated twice with a 0.5% working solution. In particular, it was found that the density of the fruit pulp was maintained up to 8% compared to the control;

Fruit drop decreased to 58% compared to control.

### 4 Conclusion

Based on the experiments conducted, it can be concluded that working solutions with concentrations of 0.05%, 0.5%, 1.0%, 1.5% were used in the field. Among them, the best results were recorded with 2 treatments with a 0.5% working solution with an interval of 3-5 days. That is, compared to the control, early fruit shedding decreased by 30-65%, the content of anthocyanins in the skin of the fruit increased, the density of the fruit pulp and other biochemical indicators improved. In general, chemically treated trees strengthened fruit bunches and prevented fruit shedding.

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