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Influence of the Application of Various Preparations on the Quality of Melon Fruits

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Abstract: This article examines the influence of various preparations used for pre-sowing treatment of melon seeds and plant spraying during the growing season on the chemical composition of the fruits. Research results demonstrated that treating melon seeds before sowing with a water-soluble Nanosilicon concentrate (0.1 g/l) and Maxim XL 3.5% (5 ml/kg) at the recommended rate, as well as spraying plants with an iron oxide solution (Fe2O3-1 g/l) before flowering, positively affects the content of water-soluble dry matter, sugars, ascorbic acid, and nitrates in the fruits.

Keywords: melon, seeds, plants, preparations, fruits, ascorbic acid, water-soluble dry matter, total sugar content, nitrates.

Introduction. In 2023, melons were cultivated on an area of 1,092,354 hectares worldwide, with a total production of 29.5 million tons. On a global scale, the volume of melon cultivation in European countries accounted for 6.5%, in the Americas - 13%, in Africa - 4.4%, in Oceania - 0.8%, while Asian countries held the largest share at 75.4% [1]. In 2024, the countries that exported the largest quantities of melons were Kazakhstan (6,200 tons), Kyrgyzstan (7,200 tons), Russia (5,900 tons), Latvia (1,300 tons), and Germany (800 tons). Meanwhile, from January to July 2024, Uzbekistan exported 24,300 tons of melons to foreign countries, valued at 10.8 million US dollars [2].

The dry matter content in melon fruits averages 6-18.5%, including 4.6-15.8% sugar. It lacks starch and contains low amounts of proteins (0.5-1.1%) and fats. Its energy value is 39 kcal or 164 kJ per 100 g. Vitamin C content ranges from 13-29 mg%, and other vitamins are present in small quantities. Among mineral substances, potassium is the most abundant at 118 mg %, while many other macro- and microelements are present in smaller quantities. The highest sugar concentration in melon fruits is found at the top, followed by the center, with the least amount at the base. On the sunny side of the fruit, more sugar accumulates than on the side lying on the ground. Ripe melon fruits surpass watermelon in their total sugar content, but unlike watermelon, melon sugar is represented not by fructose but by less sweet sucrose. The absorbable iron in melons is twice as much as in pumpkin, cucumber, tomatoes, and carrots, and 17 times as much as in milk. Melon contains alkaline salts and valuable organic acids: malic and citric. Vitamin C (50 mg %) is three times more abundant in it than in watermelon. Melon is rich

in inositol (vitamin B_8) - a substance whose properties prevent hair loss, as well as the accumulation of fat and cholesterol in the liver [3].

Research methodology. In 2022-2023, we studied the effects of various preparations on the growth and development of melon plants, yield, and fruit quality in the agrochemical laboratory of the Research Institute of Vegetable, Melon Crops and Potato and in field experiments. Experiments were conducted on the "Kichkintoy" melon variety, which is regionalized in the republic, using 5 variants. The first and second tables of the experiment present the following: Control (seeds soaked in water); Nanosilicon - 0.1 g/l, Maxim XL 3.5% - 5 ml/kg (seeds were treated and plants were sprayed twice on the leaves before flowering); BIO fertilizer - 1 g/l (seeds were treated with Nanosilicon - 0.1 g/l, Maxim XL 3.5% - 5 ml/kg, and plants were fertilized twice with NPK+microelements via foliar application before flowering); MnO_2 - 1 g/l (seeds were treated with Nanosilicon - 0.1 g/l, Maxim XL 3.5% - 5 ml/kg, and plants were fertilized twice with manganese dioxide via foliar application before flowering); Fe_2O_3 - 1 g/l (seeds were treated with Nanosilicon -.1 g/l, Maxim XL 3.5% - 5 ml/kg, and plants were sprayed twice with iron oxide before flowering).

The environmentally friendly Nanosilicon preparation, Maxim XL 3.5% preparation, biofertilizer, and microelement solution were compared with the control (seeds soaked in water), and their effects on the chemical composition of the fruits were studied. The content of water-soluble dry matter in the fruits was determined using a refractometer (%), sugar content was measured by the Bertrand method (%) [3], ascorbic acid (vitamin C) was quantified using the Murri method (mg %), and nitrate content was assessed using the "disulfophenol" method [4].

Research results. In 2022-2023, the biochemical composition of watermelon fruits obtained from seeds treated with the aforementioned preparations was studied at the Agrochemical Laboratory of the Research Institute of Vegetable, Melon Crops and Potato (Tables 1-2).

Laboratory analysis results of melon fruits revealed that treating melon seeds with nano-silicon at a concentration of 0.1 g/l led to an increase in water-soluble dry matter content by 0.3% (9.0%), total sugar by 0.2% (6.9%), and ascorbic acid by an average of 0.5 mg/% (15.8 mg/%). Additionally, the nitrate content decreased by 0.2 mg/kg (17.9 mg/kg) compared to the control (18.1 mg/kg).

Table 1. The effect of various preparations on the biochemical properties of melon fruits of the Kichkintoy variety, 2022-2023

Experience options	Water-soluble dry matter, %	Total sugar content, %	Ascorbic acid, mg/%	$N\text{-}NO_3$ mg/kg
Control (seed soaking in water)	8,7	6,7	15,3	18,1
Nanosilicon 0.1 g/L (seed soaking)	9,0	6,9	15,8	17,9
Nanosilicon 0.1 g/L + BIO-1 fertilizer 1 g/L	9,4	7,3	16,6	17,4
Nanosilicon 0.1 g/L + MnO_2 1 g/L	9,2	7,2	16,0	17,5
Nanosilicon 0.1 g/L + Fe_2O_3 1 g/L	9,9	7,6	17,1	17,0

When treating melon seeds with nano-silicon and spraying the plants twice before flowering with BIO fertilizer - 1 g/l (NPK+microelements) and manganese dioxide (MnO_2 -1 g/l), an increase in the content of water-soluble dry matter in the fruits by 0.5-0.7 % (9.2-9.4%) compared to the control was observed. Additionally, total sugar increased by 0.5-0.6 % (7.2-7.3 %), ascorbic acid by 0.7-1.3 mg/% (16.0-16.6%), while the nitrate content was 0.7-0.6 mg/kg lower (17.4-17.5 mg/kg) compared to the control (Table 1).

The best results in the experiment were achieved by treating melon seeds with Nano-silicon and applying a double foliar spray of iron oxide (Fe_2O_3 - 1 g/l) to plants before flowering. Consequently, compared to the control group, the fruits showed an increase in water-soluble dry matter content by 1.2% (reaching 9.9%), total sugar by 0.9% (reaching 7.6%), and ascorbic acid by 1.8 mg/% (reaching 17.1 mg/%). Additionally, the nitrate content decreased by 1.1 mg/kg (down to 17.0 mg/kg).

Picture 1. The process of analyzing melon fruits in an agrochemical laboratory.

In the variant where melon seeds were treated with Maxim XL at a rate of 3.5%, 5 ml/kg, the water-soluble dry matter content in the fruits increased by 0.1% (to 8.9%), the total sugar content by 0.2% (to 6.5%), the ascorbic acid content by 0.7 mg/% (to 16.6 mg/%), and the nitrate content decreased by 0.3 mg/kg (to 17.3 mg/kg) compared to the control (Table 2).

Table 2. Effects of Various Preparations on the Biochemical Properties of Kichkintoy Melon Variety Fruits, 2022-2023

Experience options	Water-soluble dry matter, %	Total sugar content, %	Ascorbic acid, mg/%	N-NO_3 mg/kg
Control (seed soaking in water)	8,9	6,3	15,9	17,6
Maxim XL 3.5% 5ml/kg (seed soaking)	9,0	6,5	16,6	17,3
Maxim XL 3.5% 5ml/kg + BIO-1 fertilizer g/l	9,3	7,0	17,5	17,0
Maxim XL 3.5% 5ml/kg + MnO_2 - 1 g/l	9,4	6,9	17,3	17,2
Maxim XL 3.5% 5ml/kg + Fe_2O_3 - 1 g/l	9,6	7,2	18,0	16,7

When treating melon seeds with Maxim XL and applying a double foliar spray to plants before flowering using BIO fertilizer at 1 g/l (NPK+microelements), manganese dioxide (MnO_2 at 1 g/l), and iron oxide (Fe_2O_3 at 1 g/l), the following results were observed compared to the control: an increase in water-soluble dry matter content in fruits by 0.4-0.7% (reaching 9.3-9.6%), total sugar content by 0.6-0.9% (reaching 6.9-7.2%), and ascorbic acid content by 1.4-2.1 mg/% (reaching 17.3-18.0 mg/%). Additionally, the nitrate content decreased by 0.6-0.9 mg/kg compared to the control (which had 17.0-16.7 mg/kg).

Conclusions. The application of various preparations for pre-sowing seed treatment and plant spraying during the melon's growing season demonstrated a positive effect on fruit quality. The best results were achieved when treating melon seeds with Nanosilicon (0.1 g/l) and Maxim XL 3.5% (5 ml/kg), as well as by double-spraying plants with iron oxide solution (Fe_2O_3 - 1 g/l) before flowering. It was established that, compared to the control, the content of water-soluble dry matter in the fruits increased by 0.7-1.2%, total sugar content by 0.9%, ascorbic acid by 1.8-2.1 mg/%, while the nitrate content decreased by 0.9-1.1 mg/kg.

LITERATURE

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