

## **THE NANOACITRATES OF BIOGENIC METALS IN FOREST SERICULTURE**

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It is shown that under the influence of nanoacitrates of biogenic metals the productivity and viability of oak silkworm are significantly increased, terms of caterpillars fattening are shortening. The methods of using the compounds of trace elements obtained with the use of nanotechnology to increase the productivity and viability of the oak silkworm are offered.

For the first time found that nanoacitrates of biogenic metals such as Zinc, Magnesium, Manganese, Iron, Copper, Cobalt, Molybdenum, Silver are non-toxic when used at different stages of oak silkworm growth (eggs, caterpillars) and did not cause its death during the growth. It is investigated the bactericidal and fungicidal activity of nanoacitrates of metals relatively to entomopathogenic strains that cause death of the silkworm during the growth. The highest antiseptic properties are inherent to mixture of Ag and Cu nanoacitrates ('Sumerian silver') and complex of Ag, Cu and Mg nanoacitrates. When processing of culling graine with solutions the mortality rate of caterpillars decreased by half, the number of high-quality cocoons significantly increased. Nanoacitrates of metals protect the silkworm caterpillars during the growth from spreading the infection which are transmitted through direct contact or through the feces of infected insects due to the direct biocidal action and increasing immunity. Experimentally found that complex of Ag, Cu and Mg nanoacitrates makes considerably healthier the population of beneficial insects which are weakened by bacteriosis and mycosis, reduces the death of silkworm caterpillars and increases its economically valuable indicators.

The most significant antiseptic and biostimulating properties during the preventive treatment of oak silkworm graine (eggs) have a complex of Silver, Copper, Zinc and Magnesium nanoacitrates. The recommended ratio of the components with water – 1: 1: 1: 1: 2. This gives an opportunity to increase to 25 % total graine revitalization and to 20.0–31.2 % the survival of caterpillars. After processing of graine with solutions of nanoacitrates of biogenic metal pH value, oxidation-reduction potential and biopotential of oak silkworm eggs are changed significantly. By the absolute value the oxygen index is maximal during the processing of feed with Sumerian silver, and the highest value of biopotential – with mixture of nanoacitrates. Due to antiseptic and healing properties of nanoacitrates it is provided the high immune status of insects that received feed enriched by nanoacitrates of metal. The viability of caterpillars of younger age increases by 10–20 %, and seniors – 10–30 %.

The investigated nanoacitrates quickly penetrate into the body of insects and effectively influence the productive parameters of oak silkworm – intensify its

growth, increase weight of caterpillars, improve the quality of cocoons raw materials. It is recommended for feeding caterpillars of oak silkworm to use oak leaf processed with nanoaquacitrates of biogenic metals Mg, Mn, Zn and its mixture. This increases the biomass of caterpillars to 53.7–77.0 %, reduces the duration of caterpillar phase to 3–5 days.

Under the influence of processing feed with nanoaquacitrates the efficiency of conversion feed into own body weight caterpillars at age IV increases by 18.9–21.0 % and at age V – 8.5–23.6 %. Indices of consumption efficiency and use of feed at age V are maximal when mixtures of Mg, Mn, Zn, Fe, Cu, Mo nanoaquacitrates are used in feed. The maximum content of total protein and albumin is observed in the hemolymph of larvae at age V which are given the feed, processed with nanoaquacitrate of Manganese and mixture of nanoaquacitrates. After the formation of cocoons in serum of pupae the total protein and albumin increases twice in variants where feed additives are Mg nanoaquacitrates and mixture of Mg, Mn, Zn, Fe, Cu and Mo nanoaquacitrates. After processing of feed of caterpillars at age V with nanoaquacitrates solutions intensifies the reduction of hemolymph acidity, which indicates the increase in activity of digestive processes in caterpillars due to supply the required amount of important minerals with studied nanoaquacitrates. Nanoaquacitrates of biogenic metals have a significant impact on silk productivity of insects. Silk content in cocoons of all experimental variants exceeds the control. At the same time the mass of chrysalis increases that accompanies increasing of reproductive capacity in insects.