

## The effect of micro- and nanoparticles of silicon on concentration of macro- and microelements and silicon content of strawberry plant in soilless culture conditions

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### Abstract

Silicon is one of the beneficial nutrient elements for most of the plants improving their growth and yield. This element improves the growth and yield of plants. The aim of this study was to evaluate the effect of foliar-spray and root-application of micro- and nano-SiO<sub>2</sub> on concentration of macro- and microelements and content of silicon in the shoots of strawberry plant. Strawberry plants at the 4-5-leaf stage and two weeks later were treated by different concentrations of micro- and nano-silicon (0, 20, 40 and 80 mg/L). After four months, concentrations of nutrient elements in the shoots of the plants were measured and statistically analyzed. Results showed that the application of micro- and nano-silicon at high concentrations reduced the concentration of nitrogen and phosphorus. Application of micro- and nano-silicon significantly increased the concentration of potassium, calcium, magnesium, iron, manganese and silicon in shoots; but didn't have significant effect on the zinc and copper content. Concentration of 60 mg/L nano-SiO<sub>2</sub> in root-application method showed the better results in the most studied traits than the other treatments as well as the control and it can be a good choice to be recommended in the soilless culture of strawberry in greenhouse. Overall, nano-SiO<sub>2</sub> and root-application had the better results than micro-SiO<sub>2</sub> and foliar-spray.

**Keywords:** Nutrient elements, Foliar application, Root application, Microparticles, Nanoparticles.

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