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Effect of Biosimulate Nanomaterials on Yield and Fruit Quality of Mango Trees under Semi-Arid Conditions

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Abstract

Mango is one of the most important fruits in the tropics and subtropics. In Egypt, mango is considered the most popular fruit and occupies the third place in acreage after citrus and grapes. The area of mango orchards reached 77003 ha (323413 feddan) producing about 876,528 tons of fruits in 2012. However, poor fruit set is considered as one of the problems facing mango productivity especially under semi-arid conditions of Egypt. Meanwhile, various trials were done to raise fruit set, minimise the percentage of fruit drop, increase tree yield and improve fruit quality by spraying trees with biosimulators such as yeast. Nanotechnology provides the opportunity to develop improved systems for delivering biosimulators and thus potentially enhance yields or nutritional values.

In this respect, sol-gels are used today in many fields including sensors, coatings, optical, and biological due to their numerous advantages over other materials. Furthermore, sol-gels can be formed into different forms as films, fibers, powders, and monoliths nanomaterials. Also, the processing conditions of sol-gels can be manipulated by changing the type and concentration of sol components allowing for sol-gels to be used for different industrial applications.

Nanomaterials have emerged as suitable alternatives to overcome limitations of micro-materials and monolithics which can be provided by biosimulators like yeast, while posing preparation challenges related to the control of elemental composition and stoichiometry in the nanocluster phase.

The main goal of this work is using chemically modified nano-materials (CMNM) with desired functionality and physicochemical properties loaded on yeast and to test their application toward solutions of problems regarding the productivity of mango trees through improving flowering, fruit set and fruit quality of mango trees especially under semi-arid conditions of Egypt.

Keywords: Fruit quality, fruit set, mango trees, sol-gel nanomaterials, yeast