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Improving fruit quality of Greenhouse Tomatoes

Producing high quality Tomato fruit is a challenge that requires specific attention to secure fruit quality. Tomato quality is not only in size, shape and colour but also eventually judged by the consumer by taste, flavor etc. Most attention is usually directed to plant development, trellises, manipulating the plant to change from vegetative stage to productive stage and more.

What the consumer see, touch and taste is the final product – the tomato fruit itself.

The final formation and the taste of the tomato fruit are determined unfortunately from its first stage of formation and thereafter the plant adds its taste and flavor.

An interesting research conducted in Israel highlighted the importance of Magnesium provided in the form of Magnesium Chloride (25%) combined with a change of the Potassium (K) source from Potasium Nitrate (KNO#) to Potassium Chloride. The combination of Potassium is sourced from: KCl.MgCl2 + KCl (25%:75% in terms of K supplied). The results show that Plant height and total chlorophyll were the highest in the KCl + KCl.MgCl2 treatment.

Leaf Mg content was significantly lower in the KCl treatment, whereas highest in the KCl + KC.MgCl2 treatment. Both KCl and KCl + KCl.MgCl2 led to a significantly higher leaf Clorophyl content as compared with the KNO3 treatment, but no Cl toxicity was observed in either treatment. The total yield was not different among treatments. Fruit firmness and freshness of the calyx were significantly imporved by KCl and KCl + KCl.MgCl2, and the number or rotten and blotchy fruits were significantly reduced by both these treatments. KCl + KCl.MgCl2 also led to significantly higher levls of glucose, Mg and dry matter content in the fruit.

Another effect was noticed as a lower NO3 (Nitrate) and higher Fe (Iron) contents. Although KCl as sole K source showed lower foliar Mg level as compared to KNO3, the use of the KCl in tomato fertigation improved tomato fruit appearance and qualities. However, 25% replacement of KCl by KCl + KCl.MgCl2 increased the foliar Mg level and improved fruit qualities even further.

The Experiment hypothesis:

Since the appearance of the tomato fruit is generally considered to be an index of quality and often determines consumer choice. Great efforts have recently been focused in producing a good appearance and quality tomato through the utilization of inexpensive and environmentally friendly resources. Production of quality fruits is controlled by the interaction of genetic, environmental and cultural factors, including plant nutrients. Among essential plant nutrients, potassium is the one that is absorbed by the tomato plant in the largest amounts and it is considered to be the key to production of quality fruits. Most of the tomato studies have so far shown that increasing the electrical conductivity (EC) of the nutrient solution improves fruit quality and increases shelf life.

In Israel, most soil-less greenhouse tomatoes are fertilized with NKO3, despite the fact that the use of this K source leads to high NO3 leachate and is costly. Use of KCl as alternative potassium source is avoided due to the fear that its anion, Cl might damage the plant. However, in a comparative study the results show that, KCl enhanced fruit appearance and improved fruit quality as compared with NKO3, however, a significantly lower foliar Mg content and Mg deficiency was observed during plant growth while using KCl as a sole K source in tomato fertigation.

A level of less that 0.4% Mg in the dry matter of young fully expanded leaves is generally considered critical in greenhouse-grown tomatoes, experiments report that 50-80 ppm Mg in the nutrient solution results in the best overall yield and fruit quality in rockwool-grown tomato. However, the interaction between magnesium and tomato production and its fruit quality was the main aim of this experiment.

Based on studies and known facts about the effects of Mg in crop production, the experiment argued that if we were to boost Mg concentrations at the same time as we reduced NO3 and raised Cl levels in the nutrient solution – through the use of KCl as potassium source rather than KNO3 – then the tomato plant would maintain high foliar Mg, leading to an improvement in the quality parameters over and above the previously mentioned benefits of KCl. Accordingly, the chosen K source of potassium magnesium chloride (KCl.MgCl2.6H2O, quiK-Mag), a fertilizer derived from Carnallite (a natural mineral from the Dead Sea), and substituted it for 25% of the KCl, Potassium magnesium chloride (KCl.MgCl2) contains 15% K2O, 14% MgO and 39% Ci, with 4% NaCl (maximum), and is recommended for organic agriculture (DSW, 2000).

The aim of this experiment was to compare the growth, leaf mineral content, fruit yield and quality of greenhouse-grown-tomato with KCl as sole K source or 25% substituted by KCl.MgCl2.

(This article is mainly a quote from a published scientific article and not originated by Ben Safronovitz).