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## **MANAGEMENT OF BORIC NUTRITION IN JALAPEÑO PEPPER (*Capsicum annuum*), IN TRICKLE IRRIGATION SYSTEMS**

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The trickle irrigation systems development and fertigation have allowed to the incorporation of balanced balanced nutritive solutions in jalapeño pepper cultivation (*Capsicum annuum*) in large parts of Mexico, achieving a significant increase in yields and final cultivated product quality. In recent years an optimal balance of macroelements have been determined, but still there are several doubts about balances and microelement concentrations, especially in regard to boron for jalapeño pepper cultivation.

In the case of boron, the more important functions for jalapeño pepper cultivation are related, on one hand, to sugar transportation from leaves to fruit, thus achieving this greater weight and quality, and on the other, to the flowering process improvements, being this determinant in the pollen feasibility as well as in size and flower color.

Frequently, in Mexico the boron application has been made on the base previous to transplantation, via foliar irrigation or via fertilization by irrigation, not in a continuous way, but in a sporadic, neglecting the optimal concentrations for its better utilization as well as its relationship with other ions, especially with Calcium.

Tests made on Northwest states of Mexico in jalapeño pepper cultivation, exposed to high temperatures (42°C) and low relative humidity (25% HR), where the falling of flowers was an important aspect to correct, demonstrated that a proper use of boric nutrition in trickle irrigation systems improve the flower pollination process, avoiding flower fall and increasing the quantity of mature fruits and consequently, final cultivation yields.

In general, irrigation water on that area has a boron concentration varying from 0.3 to 0.5 ppm, with which normally for that cultivation, it would not be necessary to incorporate to the nutritive solution of irrigation any boron source. Nevertheless, in extreme weather conditions the addition of boron to nutritive solutions to obtain a concentration of 1 ppm had important results on the pollination process, and maturity of the fruit. The boron source used for trickle irrigation systems was Boric Acid (17,5 B) and its application was made on each watering.

The optimal rank of boron concentration in nutritive solutions must go from 0.5 to 1 ppm, but becoming phytotoxic if concentration in the solution exceeds 2 ppm. This is the reason why it is not advisable to make sporadic boron applications in high concentrations, but it is advisable to incorporate it continuously in lower doses.

It is not only important to maintain the boron in a proper concentration, but also it is important to maintain an optimal relationship with other microelements and especially with calcium.

Calcium and boron have the characteristic of being absorbed and transported to the plant's interior through a flow of exudation current and they also have, depending on their levels in the solution, a synergic or antagonic behavior.

Plant roots absorb boron as boric acid ( $H_3BO_4$ ), so it is incorporated to the flood of sap.

If calcium is applied instead of boron, or if boron is applied in lower concentrations, deficiencies on this element may occur.

For boron concentrations of 1 ppm it is recommended to work with calcium concentrations from 5 meq/lt to 10 meq/lt.

In a word, in jalapeño pepper cultivation, a proper boron concentration in nutritive solutions must be maintained, so that it fluctuates from 0.5 to 1 ppm. In extreme temperatures and humidity conditions these concentrations must be increased at least to 1 ppm in order to support the flowering process and maturity of fruits. Never exceed concentrations in nutritive solution of 2 ppm because there is risk of phytotoxicity.

In addition to maintaining a correct boron concentration, it is important to keep its relationship with the calcium ion, so as to favor its synergism in absorption.

Boric acid worked very well as a proper source of soluble boron for trickle irrigation systems, without any problem of dropper clogging, due to the fact that is a quick assimilable boron source for the ionic way in which it is absorbed by the plant.