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Impact Of Boron Deficiency In Tomato Plant & Ways To Recover Using Boric Acid - A Farmer Perspective

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Abstract: Fertility of soil plays an important role in plant growth. Micronutrient Boron plays an important role and vegetative and reproductive growth of tomato crop. Boron deficiency in tomato crop causes leaf deformity, stem shortening, fruit failure and would lead to less crop yield. Boric acid application to the floral parts of tomato crop, can resolve Boron deficiency symptoms to some extent and would aid in crop productivity and good tomato yield.

INTRODUCTION

Tomato plants are warm season plants, which are sun lovers and generally grown during summer season during March to June annually. To begin with tomato seeds are grown indoors by sowing tomato seeds in small nursery beds containing soil of 3 inch depth for 6 weeks time period. Farmer on adding manure compost, enables seeds to develop into tomato seedlings. Later, nursery Beds of tomato seedlings are transported, transplanted and stacked into fields maintaining optimal spacing. Tomato seedlings on exposure to sunlight, on addition of fertilizer, providing sufficient water through drip irrigation, would allow them to grow into hardened seedlings, which later on after specific time frame grow into tomato plants. Tomato plants later bears flowers, develop strong stem with small branches, thus completes vegetative growth. Pollination of tomato flowers by insects and wind would enable them to transform into big plants bearing flowers, which on full ripening are converted into ripened red tomatoes.

Role of Boron in tomato plant growth

- Boron is a micro nutrient element, which plays an important role in plant growth. Functions of Boron include -facilitating tomato plants ion absorption, aids in pollen viability, affects in cell division required for proper growth, synthesis of plant cell wall, root elongation and overall growth of plants.
- Even though every plant including tomato crop is provided with sunlight, urea as Fertilizer and all other requirements, the lack of sufficient or even the small quantities of Boron, would disturb Vegetative growth as well as reproductive growth.

Boron deficiency in tomato plants include :

1. Yellowing and curling of yellow leaves
2. Shortened and thickened stem
3. Failure to set tomato fruits

4. Cracks on tomatoes with uneven ripening.

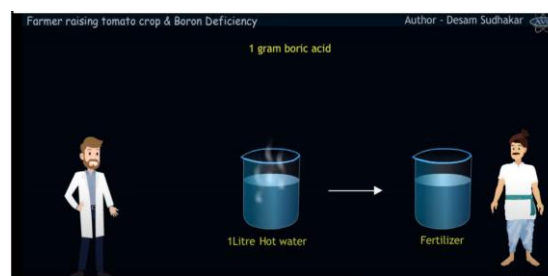
Tomato plants with Boron deficiency would cause various symptoms, which decreases the tomato crop yield, causing revenue loss to farmer after putting lots of efforts and hard work.



Boron Deficiency

Restoration of Boron deficiency symptoms with application of Boric acid

- Boron deficiency in tomato plant can be restored with application of Boron compound called Boric acid.
- Boric acid Fertilizer can be prepared by adding 1 gram boric acid to 1 litre hot water and on thorough mixing, results in the formation of aqueous boric acid solution.
- Application of boric acid solution to boron deficient tomato crop, would enable them to recover from existing Boron deficiency symptoms.



Boric acid

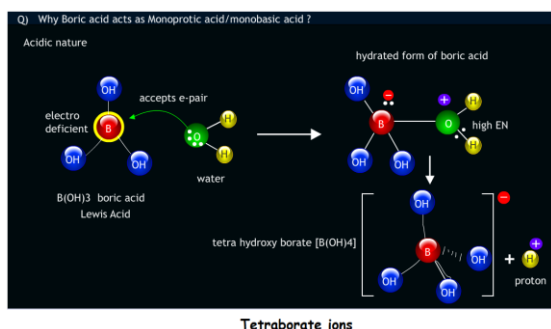
Boric Acid structure - Chemistry involved

- Boron is a group III element of Periodic table with atomic number 3. Boron forms many

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compounds, of which boric acid is an important one.

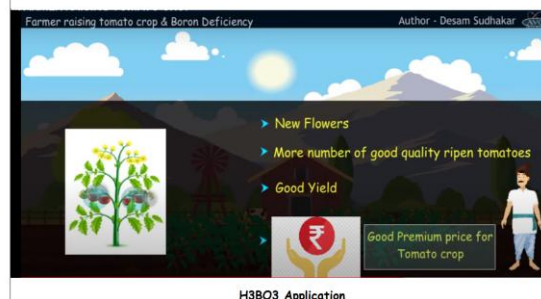
- Boric acid is a white crystalline solid with molecular formula H_3BO_3 (or) $B(OH)_3$, commonly called as orthoboric acid.
- In boric acid $B(OH)_3$, the central Boron element is covalently bonded to three hydroxyl groups - 3B-OH bonds.
- With each covalent B-OH bond comprises of two electrons, with three covalent bonds, the central Boron element of boric acid is surrounded by six Valence Electrons, which makes it electron deficient due to incomplete octet. Boric acid with electron deficient boron is an electron pair electron acceptor, makes it act as a Lewis acid.
- On addition of boric acid $[B(OH)_3]$ to hot water, the lone electron pair on electron rich Oxygen of water molecules, are being donated to electron deficient boron of boric acid, allows it to dissolve and thereby forms hydrated boric acid with the molecular structure $[B(OH)_3 - OH_2^+]$ -Protonated species.
- Positively charged oxygen of Hydrated Boric Acid, being highly electronegative, withdraws electrons from O-H bond, distances proton attached to it and thereby forms Tetra borate ion $[B(OH)_4^-]$ along with proton $[H^+]$. Aqueous boric acid solution formed by adding 1 gram boric acid to 1 litre hot water, acts as fertilizer, which on application would serve as source to boron deficient plant.



Application of Boric Acid to Tomato plant - Relieving Boron deficiency

Farmers on spraying boric acid fertilizer in limited quantities to the floral parts of tomato plant like Petals, sepals, stamen, pistil, stigma etc ; would enable Boron assimilation in plant and aid in replenishing Boron deficiency symptoms.

- The application of boric acid fertilizer to tomato plant would promote formation of more number of female flowers, after pollination would facilitate to set more tomato fruits, which are deprived of cracks and uneven ripens and also helps farmer to get good crop yield and revenue.



CONCLUSION

Boron is the chief micronutrient of plants, which is essential for proper vegetative and reproductive growth. Boron Deficiency in tomato plants causing symptoms like yellowing and curling of tomato leaves, stem shortening, failure to set fruit, causing cracks & uneven ripening would in turn lead to poor tomato crop yield. Application of foliar aqueous boric acid spray to floral parts of tomato plant in Limited quantities would enable tomato plant to produce more number of good flowers, facilitates to have quality ripen tomatoes, helping farmer raising tomato crop to good crop yield & revenue.

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