NITRICITY

Boost the quality and productivity of your crop with the right sources of nitrogen and calcium

WHY ARE NITROGEN AND CALCIUM IMPORTANT FOR PLANTS?

Nitrogen (N) is a nutrient that is essential for plant growth. It is considered the fourth most important component of plant biomass, following carbon (C), hydrogen (H), and oxygen (O). Nitrogen is a major constituent of amino acids and chlorophyll, and its deficiency is the most limiting factor for crop growth after water availability. Calcium (Ca) is another essential plant nutrient that is crucial for cell wall structure and stability as well as signaling responses to both biotic and abiotic stresses.

CALCIUM NITRATE: A SINGLE FERTILIZER WITH DUAL BENEFITS

Calcium nitrate (CN) is a fertilizer designed to supply both N and Ca to plants. Plants have the ability to absorb/uptake two forms of N via the root system: nitrate (NO_3^-) and ammonium (NH_4^+). Nitrogen in CN is in the form of NO_3^-, which is rapidly absorbed by plants. Calcium Nitrate is not only a valuable source of N, but it also supplies readily available Ca to plants. The agronomic benefits offered by CN have been documented across various crops, including citrus, potato, and tomato.

Citrus

A study conducted by the Instituto Agronomico of Campinas (IAC) in Brazil examined the agronomic performance of CN and ammonium nitrate (AN) in a "Valencia" orange orchard. The experiment involved the application of the fertilizers at four different rates: 71, 143, 241, and 285 lbs/acre of N. The field trial was installed in 2003, and fruit yield and nitrogen use efficiency (NUE) were measured from 2009 to 2012. The results showed that the use of CN significantly increased orange yield (Fig. 1). It was observed that for AN, fruit yield peaked at 241 lbs N/acre while for CN, it continued to grow linearly at 285 lbs N/acre. The NUE declined as the N rates increased for both N fertilizers, but was always higher using CN (Fig. 2). The reduced yield and NUE for AN was attributed to soil acidification.

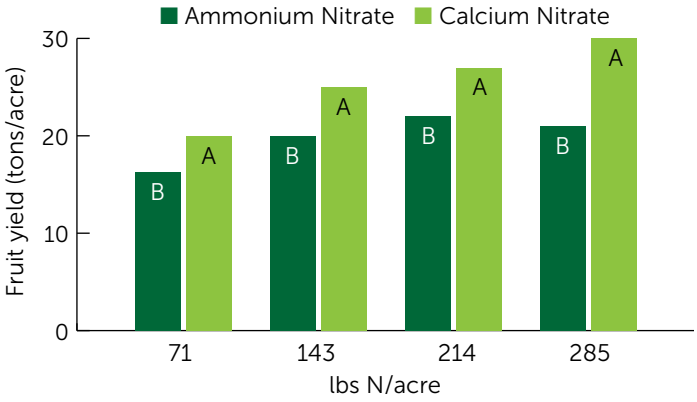

Fig. 1: Four years fruit yield average of "Valencia" orange fertilized with AN or CN at different nitrogen rates. Means assigned the same letter within a nitrogen rate are not statistically different (P<0.05). Adapted from Quaggio et al., 2014.

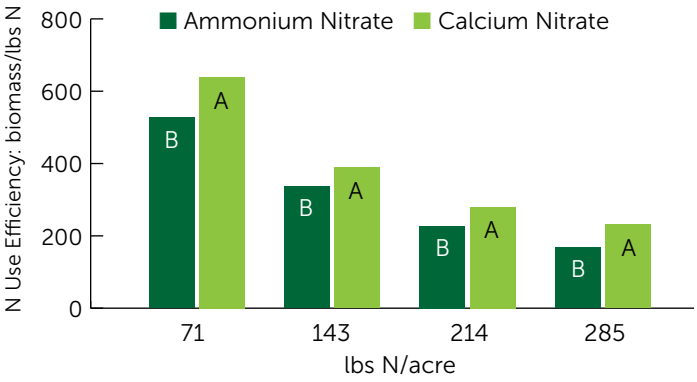

Fig. 2: Four years average NUE of "Valencia" orange fertilized with Ammonium Nitrate (AN) or Calcium Nitrate (CN). Means assigned the same letter within a nitrogen rate are not statistically different (P<0.05). Adapted from Quaggio et al., 2014.

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Potato

A study conducted at the Wisconsin-Madison Hancock station from 1997 to 1999 using "Russet Burbank" potatoes, evaluated the effect of different fertilizer treatments on potato yield and quality. The treatments involved top-dressing additional 123 lbs N/acre as a single application (AN) or in 4 split applications (CN, AN, UAN+$CaCl_2$, or Urea+CN+$CaCl_2$), starting at hilling stage with a 2-week interval between them. The results showed no treatment effect on yield but significant difference in quality (Fig. 3). The combination of readily available N and Ca, as found in CN, has shown to increase Ca tuber content. Calcium nutrition is crucial for improving shelf life and reducing the occurrence of physiological disorders like internal brown spot (IBS). The application of fertilizers that contained or could form NH_4^+ reduced absorption of Ca and magnesium (Mg) due to competition for absorption sites in the roots. This led to sub-optimal nutrition of these two nutrients.

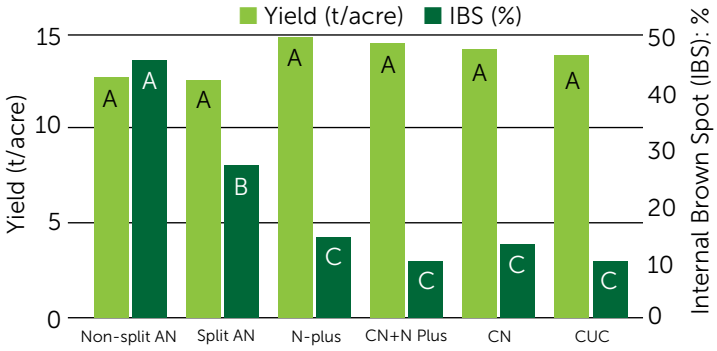

Fig. 3: Yields and Internal Brown Spot of "Russell" potato treated with different N fertilizers. "N-Plus" is a commercial formulation containing CaCl2 and UAN, while "CUC" is a mixture of CaCl2, Urea, and CN. Means assigned the same letter are not statistically different (P<0.05). Adapted from Ozger et al., 2016.

Processing tomato

A field trial was conducted during the summer seasons of 2001 and 2002 at El-Baramoon Horticultural Research Farm in Egypt with tomato variety cv. Peto 286. Three N fertilizer treatments were tested: AN, CN, and 50% AN plus 50% CN (AN+CN). The N rate for all treatments was 133 lbs N/acre, split-applied three times with 20 days intervals after transplanting. The results showed that the CN treatment significantly increased marketable yields (Fig. 4). The trial results confirm previous findings reported by other authors about tomatoes' preference for $N\text{-}NO_3^-$ compared with $N\text{-}NH_4^+$. Furthermore, the number of fruits with blossom end rot (BER) disorder was significantly reduced with CN (fig. 5). The extra soluble Ca supplied with CN treatment was crucial to decrease the amount of fruits with BER, thus increasing the total marketable yield.

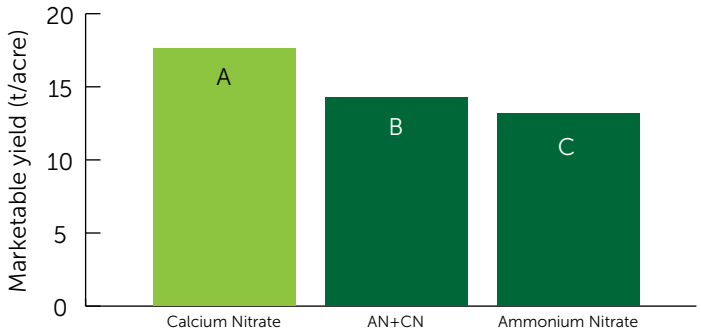

Fig. 4: Marketable yields of tomato fertilized with Calcium Nitrate, Ammonium Nitrate, or a combination of both. Means assigned the same letter are not statistically different (P<0.05). Adapted from El-Rahim et al., 2003.

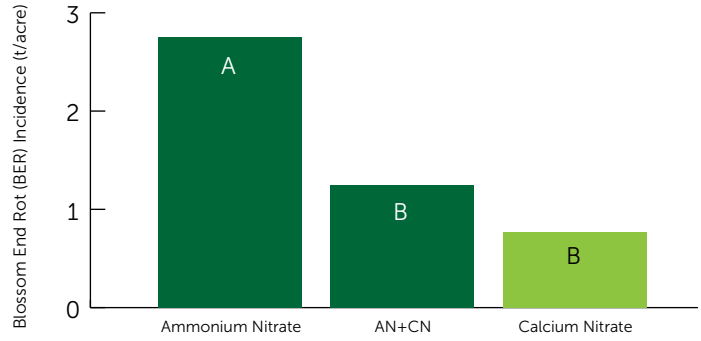

Fig. 5: Blossom end rot incidence in tomatoes fertilized with Calcium Nitrate, Ammonium Nitrate, or a combination of both. Means assigned the same letter are not statistically different (P<0.05). Adapted from El-Rahim et al., 2003.

CONCLUSIONS

Nitrogen fertilizer plays a crucial role in maximizing crop productivity. The addition of soluble Ca can enhance crop quality and improve plant health. CN offers several advantages as it delivers the benefits of readily available N and Ca to plants. This combination allows for efficient nutrient uptake by plants, leading to improved crop performance. By considering the technical, environmental, and economic aspects, CN proves to be a favorable choice for optimizing crop yield and quality.

BIBLIOGRAPHY

El-Rahim, A., Aida, M., El-Said L.F., Tolba, M.H. 2003. Effect of ammonium nitrate, calcium nitrate and planting spaces on yield and yield components of tomato. Journal of Agriculture Science, Mansoura University: 28(2), 1391-1399

Ozgen, S., Karlsson, B.H. & Palta, J.P. 2016. Response of potatoes (cv russet burbank) to supplemental calcium applications under field conditions. Tuber calcium, yield, and incidence of internal brown spot. American Journal of Potato Research: 83, 195-204

Quaggio, J., Souza, T., Zambrosi, F., Boaretto, R.,Mattos Jr, D. 2014. Nitrogen-fertilizer forms affect the nitrogen-use efficiency in fertigated citrus groves. Journal of Plant Nutrition and Soil Science: 249, 329-333.