Plant nutrition concepts in nut crops

Nut trees are normally low yielding high value crops and good nutritional management practices are necessary to ensure optimum yield and quality.

Besides important physical soil factors such as soil compaction, soil drainage, effective rooting depth and soil temperature, important chemical aspects to consider are soil pH, salinity, fertilizer timing and placement, nitrogen form, the crop / pruning nutrient removal amounts and nutrient application for nutrient reserve maintenance.

Nut crops are mostly a group of unrelated crops. Generally, they are grouped together because the fruit type is a nut and harvesting, post-harvest processing, nutritional value and marketing are relatively similar.

To generalize with nutrient strategies for the different nut types would be an error so it is best to focus on a few factors that would be common to must nut types.

Most nut trees are sensitive to chloride. Although chloride is an essential element in trace amounts, excess chloride, either already in the soil or in the irrigation water, or applied as KCl fertilizer to supply the tree with Potassium (K), will cause a reduction in yield and quality. Toxic amounts of chloride will result in leaf scorch and will reduce photosynthetic capacity. In addition, there is a negative linear relationship between chloride uptake and reduced nitrate-nitrogen uptake. Chloride therefore, even in sub-toxic amounts but in excess, will inhibit nitrate nitrogen uptake affecting plant growth, resulting in reduced yield and quality.

(Photocredit: Wes Asai)

Most nut trees are susceptible to salinity. Naturally occurring excesses of chloride are often associated with excessive sodium, the two main elemental ions causing salinity stress. Salinity stress, or salt accumulation in the root zone, will occur in drier regions and / or with insufficient irrigation water to leach out any accumulated salts. It is imperative in situations such as this to select fertilizers with the lowest salt index. Because nitrogen and potassium are both elements used in the greatest quantities by horticultural crops - including nuts - it makes pe

use Potassium Nitrate as the fertilizer of choice to supply both these “high requirement” elements.

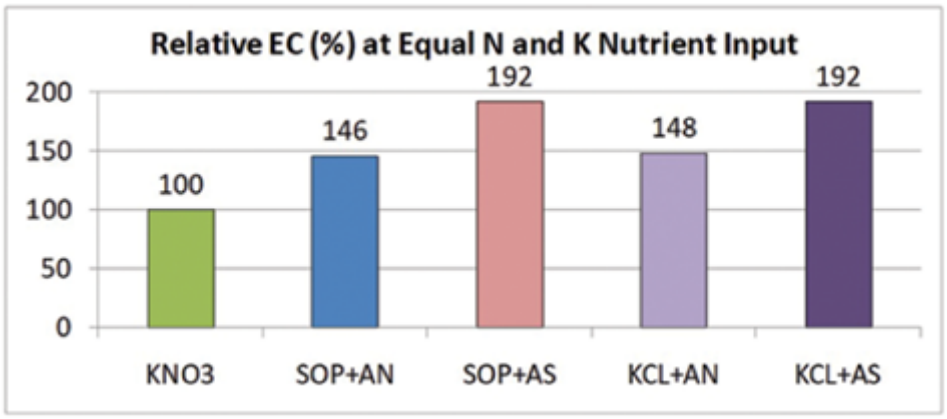
Salinity is not only caused by excess chloride and sodium. Excesses of calcium and magnesium, generally associated with high pH soils, will also cause salinity. In addition, any element given in abundance to the requirement by the plant also contributes to root zone salinity which will compound any natural salt salinity that there is. A good example of this is an excess of sulphates besides an excess of chlorides as referred to above.

Sulphur is certainly an essential element, but it is needed in relatively small amounts. Often growers will go chloride free (on good advice) and then apply the large K requirement as potassium sulphate. The excess sulphate (**up to 10x more than what is required**) contributes directly to soil salinity which will affect both yield and quality.

In Pecan production (Dr. Chris Schmidt, 2021 – personal communication), soil electrical conductivity (EC) should be less than 1.9 $mScm^{-1}$ and yield losses from 10% to 50% can be expected with salinity increases from 2.5 to 4.9 $mScm^{-1}$ EC respectively.

Salinity burn in Pecan leaves (Schmidt, 2016)

The figure below shows the relative salt index or percent EC compared to Potassium Nitrate as the standard (100%). The shown fertilizer types are adding salts in excess to what is required by the plant, contributing to the EC stress (salinity stress). At the same amount of N and K, using potassium sulphate or potassium chloride in conjunction with another N source greatly increases the root zone salinity.



KNO_3= Potassium nitrate, SOP= Potassium Sulphate, AN= Ammonium nitrate, AS= Ammonium Sulphate, KCl= Potassium Chloride.

Besides supplying both essential elements, Potassium Nitrate supplies nitrogen in the ***Nitrate*** $(NO_3)^-$ form. As can be seen from the chemical formula, this is a negative anion. Plants like to maintain an electrochemical balance and $(NO_3)^-$ synergistically enhances the uptake of K^+, Ca^{++} and Mg^{++}, the positively charged cations. It therefore makes perfect sense to supply the high nitrogen requirement along with the high potassium and relatively high calcium and magnesium requirements using Nitrate nitrogen. Potassium Nitrate enables producers to maximize their nitrate inputs facilitating this uptake synergy. For high pH areas, acid-enhanced Potassium Nitrate is available as Ultrasol K Plus Acid***.

For a comprehensive overview of the Pecan nut industry as well as detailed guidelines on Pecan tree nutrition, please refer to the recently held Pecan Webinar link https://dt9xom8irs6kr.cloudfront.net/u219626/799505-110057752452735225.mp4

**All claims in this article can be substantiated with references which can be made available on request.*

***Reg No K5020 Act 36/1947. Registration holder Sociedad Quimica y Minera (Africa)(Pty)Ltd*

****Reg No K6489 Act 36/1947. Registration holder Sociedad Quimica y Minera (Africa)(Pty)Ltd*