

## Summary

The procedure that I developed that analyzes the sap squeezed out of leaf tissue is intended to replace or compliment the current plant tissue testing procedures that analyzes dry leaf tissue to monitor the nutrient status of plants. These analytical results will then used to procedure fertilize recommendations. The sap test is based on the nutrient content of the fluid released from the freshly squeezed leaf tissue. Preliminary results indicate that this method may detect nutrient imbalances sooner. This method is faster and less expensive to run than the traditional analysis. Before this method can be implemented we need with the help of growers conduct field trials to correlate the analytical results with plant response.

## Background and approach

Traditional fertilizer recommendations are based on the analysis of dried leaf tissue or dried leaf petiole testing. This procedure was used in part because sample sizes needed to be large enough and the nutrient concentration of those samples needed to be high enough for the instrumentation to detect the change in concentration in the plant related to the growing media the plants were grown in. The other draw back to the traditional procedure was the cost and time involved in the sample preparation. Also there was not a single method that could accurately recover all the nutrients of interest. For example the dry ash procedure was best for the recovery of boron but sulfur, silica, selenium, iodine and chloride were lost and for other elements the recoveries were low depending on the tissue type. With the wet ash procedure recoveries (% measured/total present) were best for most elements, however, chloride was lost, boron and silica recoveries were variable and not reliable.

With the development of the axial viewed plasma emission spectrometers with UV solid state detectors that can read down to 130 nm it is now possible to measure most of the elements listed in the periodic table with a tenfold improvement in sensitivity. With this new technology I developed a procedure that could recover all the elements of interest with a single sample preparation.

This procedure simply involves freezing the tissue sample then thawing it out and squeezing out the fluid with a garlic press, diluting the sample one to ten with water and analyzing it on the ICP for all the elements of interest including Boron, silica, sulfur, nitrogen and chloride. A second sample is diluted one to 50 with water and

**analyzed for ammonia and nitrate. The new method costs approximately one-third the price of the traditional analysis.**

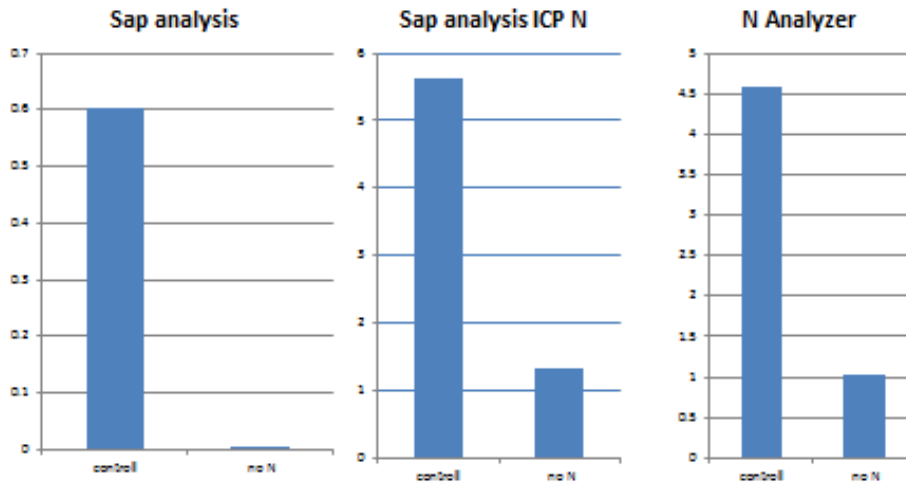
**At the current rate of analysis if all the mentioned tests were to be requested by the grower (which is not usually the case) the cost would be \$78.00. The cost for the new test would range from \$14.00 to \$33.00. Most important the analysis can be completed in 24 hours. In order for this new testing procedure to be useful to growers we need to conduct field trials to provide fertilizer recommendations.**

**Recently there is an increased use of high tunnels and green houses to produce vegetables. This agricultural practice is much more productive than field grown produce. As a result this practice is very intensive and requires ongoing monitoring of the nutrient status of the plants. Over the last few years productivity has decreased in these high tunnels. It is suspected that cause maybe over fertilization and a nutrient imbalance in the soil.**

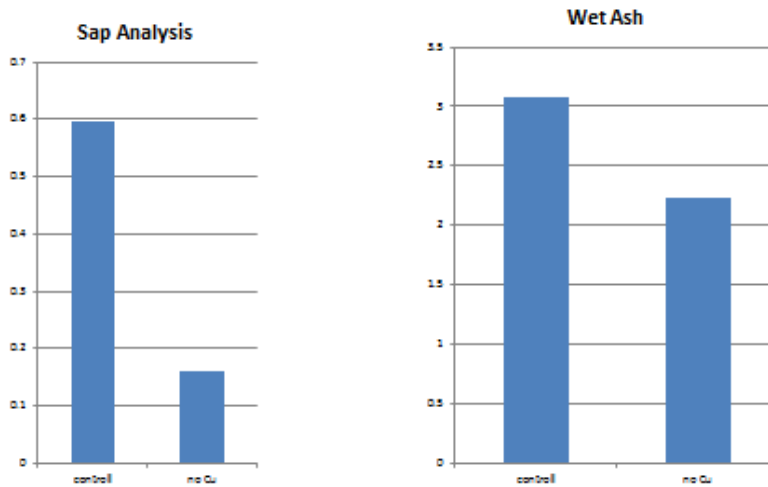
**I am requesting growers to help us develop recommendations by setting up field trials using your current set up with the use of this new sap test. Plant tissue would be tested by both the current methods and the new method. This approach of working directly with growers would be an efficient way to gather useful information with less redundancy and lower cost. The collaborative project could include working with growers using high tunnels and greenhouses to grow plants at current manufacture recommended rates, 75%, 50% 25% and 10% of that rate. Tissue samples would be taken once a week after the plant was old enough so that less than 10% of the foliage would be taken. I would also like to compare the results between fresh tissue and mature tissue because if we can use mature tissue rather than new tissue it would not interfere with the new growth. This field experiment could help us determine the optimal fertilizer application rate.**

**Preliminary data indicates that this test is more sensitive to changes and it may be possible to detect nutrient imbalances before visual symptoms occur and the practices can be implemented soon enough to prevent yield loss.**

## Sap analysis Vs Total Tissue Analysis Wet Ash Control or Without Nitrogen



## Sap analysis Vs Total Tissue Analysis Wet Ash Control or Without Copper



These two examples show that the sap testing when compared with total tissue testing detects greater changes in nutrient composition in the plant when the nutrient had been withheld. Results for nitrogen are in % and Cu are in ppm

