QUESTIONS & ANSWERS FROM 2009

2009 represented a year full of uncertainty, anticipation, anxiety, surprises, and many more emotions in terms of the economy and weather. Some growers closed the season with a terrific year while others felt their crop yields could have been substantially better. Other than the economy, many other factors played a vital role in determining both the yield and quality of 2009's crop. In this newsletter, we want to briefly discuss some frequently asked questions we've heard from growers and hopefully shed some light on some issues that are not often well understood.

GROWER QUESTION: We applied a lot more Nitrogen than planned in 2009 and a) it still didn't seem like it was enough and, b) the tissue test results were on the low end of "optimum". Why?

Most people have a good understanding of nitrogen deficiency and toxicity and can readily identify symptoms associated with each. However, under variable growing conditions in certain years, these problems may throw growers a curve ball. In 2009, most areas in Wisconsin experienced one of the coolest summers in some time. The summer of 2009 will go on record as Wisconsin's seventh coldest in the last 115 years, according to the National Climatic Data Center. In fact, Madison had the coolest July ever - the mean temperature in Madison for the month was 65.7 degrees, breaking the previous July record of 66.7 degrees set back in 1891, according to Chris Franks, meteorologist with the National Weather Service Milwaukee/Sullivan.

According to Dr. Robert Miller, Colorado State University, lower temperatures and consequent decreased GDDs result in more vegetative growth than fruit production. These types of conditions promote biomass production. Facillitation of vegetative growth under cool weather conditions results in foliar nitrogen being tied up in complex structures such as heterocyclic rings (including pyridine, pyridoxine (vitamin B6), vitamin E, quinine, and the pyran nucleus, which is found in sugars and the anthocyanin pigments), and not only is ***consequently less available for fruit growth and development*** but also results in N-deficient appearing plants. If a grower applies additional N to correct what appears to be a N-deficiency, the cycle is potentially exacerbated. On the other hand, some plants may grow so rapidly when supplied with excessive nitrogen that they develop protoplasm faster than they can build sufficient supporting material in cell walls. Such plants are often rather weak and may be prone to mechanical injury.

GROWER QUESTION: The tissue test results for Nitrogen that I get from your lab appear to be 0.1% or more lower than my previous lab. Why?

For plant tissue analysis, all AgSource Laboratories use the Total Kjeldahl Nitrogen (TKN) method, a wet chemistry method that is based on the wet oxidation of soil organic matter and botanical materials using sulfuric acid and digestion catalyst and conversion of organic nitrogen to the ammonium form. Ammonium is determined using the diffusion-conductivity

Continued on back→

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technique. The method has a detection limit of approximately 0.001% N and is generally reproducible within +/-5%. TKN does not quantitatively digest nitrogen from heterocyclic compounds (bound in a carbon ring), oxidized forms such as nitrate and nitrite, or ammonium from within mineral lattice structures.

Some labs use combustion for plant tissue analysis. This method quantitatively determines the amount of nitrogen in all forms (ammonium, nitrate, protein and heterocyclic nitrogen) in botanical materials using an induction furnace and a thermal conductivity detector. Samples are ignited in an induction furnace at approximately 900°C, in helium and oxygen environment in a quartz combustion tube. An aliquot of the combustion gases is passed through a copper catalyst to remove oxygen and convert nitrous oxides to N2, scrubbed of moisture and carbon dioxide, and nitrogen content determined by thermal conductivity. The method has a detection limit of 0.01% nitrogen (dry basis) and is generally reproducible within +/-5%.

TKN is the original method established for determination of nitrogen in plants, manures and forages. Because it does not quantitatively determine N in forms of nitrate, ammonium and heterocyclic N, it will always yield a lower value than combustion analysis on the same sample. The variance between the TKN and combustion values depends upon how much N is present in the nitrate, ammonium or heterocyclic rings at the time of sampling. As discussed earlier, much more N may have been present in the heterocyclic rings in 2009 than in past years because of the cool growing conditions, thereby causing lower than expected tissue N values. However, TKN has a greater detection limit for samples that may read on the lower end of the scale, such as cranberry tissue and manure/waste samples with low solids. Even more importantly, Dr. Robert Miller (Colorado State University) has asserted in his research that combustion analysis cannot accurately determine nitrogen on samples containing less than 0.5% N. Because this "cut-off" point for accuracy with the combustion method is actually within the range of where cranberry tissue N results may fall, combustion is not a viable method for accurately determining nitrogen in cranberry tissue.

GROWER QUESTION: I received a phone call from the lab that there was insufficient material for my soil/tissue sample. How big a sample do I need to send to the lab?

Three principles guide collecting soil and tissue samples so that the information from the analysis is interpretable and relevant to the plantings where they were taken. The three principles are:

- Take the sample at the correct time
- Collect the correct tissue
- Take a representative sample

Sample at the right time. The correct time to collect cranberry tissue samples is in late summer to early fall, usually August 15 until September 15. Plants must be sampled at the proper point in time in order to correctly interpret the results. Nitrogen, for example, is relatively high in new leaves in the spring, levels off in midseason and then declines in the late summer and fall. Interpretations are based on knowing the relationship between nutrient levels in a particular part of a "standard" tissue in a specific time in the growing season. A tissue sample taken in the spring could show excess nitrogen compared to late summer standards and a sample taken in the late fall could show a deficiency even if it were adequate in late summer.

Sample the correct plant part. The correct tissue to collect for cranberries is current season growth on both fruiting and non-fruiting uprights, not including fruit. Sampling a different plant part will also lead to incorrect interpretations of the analysis. For example, the nitrogen content of one-year-old leaves is lower than for current season leaves. If one-year-old leaves are included in a sample nitrogen deficiency may be indicated, while if only current season leaves are sampled an adequate amount or an excess may be shown.

Take a representative sample. A representative sample is collected by taking samples across an entire bed, not just in one corner or along one edge. Either begin at one corner and walk diagonally to the other corner, or walk a zig-zag pattern across a bed and collect 10-12 sub-samples as you go. Each sub-sample consists of 5-15 uprights. The sample should be representative of the planting because the results of the test can be no better than the sample sent in for analysis. The amount of tissue the lab actually tests is less than a teaspoon, so it is very important that the sample be characteristic of the bed. Don't sample diseased, damaged, insect infested or abnormal tissue. If you suspect a nutrient related disorder, sample when you see symptoms. Submit a sample of abnormal appearing tissue along with a sample not showing the symptoms that is collected on the same day. By taking two samples, one from a normal area and one from an affected area you'll be able to compare the two and draw conclusions.

Insufficient Sample vs. Good Sample