

Plant Sap Analysis as a Nutrient Diagnostic Tool

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Plant sap testing, which provides a snapshot of nutrient movement within plants, is drawing interest from producers across the Palouse. Sap testing offers a short-term way to check for emerging nutrient issues in a crop by comparing nutrient concentrations in new and old leaves. This is different from tissue testing, a common practice that measures the total nutrient content in plant material to show the overall nutrient concentration in a crop. Sap analysis may help producers fine-tune fertilizer use by reducing early-season applications and directing in-season adjustments. This can improve nutrient use efficiency, lower costs, and reduce the environmental risks associated with fertilizer overapplication.

This project, which was funded by the Western Sustainable Agriculture Research and Education (WSARE) Professional + Producer grant program, was designed to test whether sap analysis could provide a fast, in-season nutrient check for winter wheat and triticale on the Palouse. From 2023 to 2025, we partnered with three Whitman County producers to compare grain yield and quality between fields treated with foliar fertilizer guided by periodic sap analysis and those treated with traditional fertilization methods. Foliar application involves spraying fertilizer directly onto plant leaves, allowing the plant to absorb nutrients through the leaf surface. We also tracked costs and overall feasibility to understand how sap analysis might fit into day-to-day farm operations.

While sap testing did provide a useful nutrient snapshot, there were some challenges associated with it. We sent the samples out to a lab and relied upon the lab's determination of optimal nutrient levels and fertilizer recommendations. Results typically took three to seven days to process, and additional time was needed to review and act on the lab's fertilizer suggestions. In addition, many of the suggested products were often difficult to source locally, which limited how quickly nutrient issues could be addressed.

In the final year of the project, we set out to make sap test results easier to understand. Because guidelines for "normal" nutrient levels in sap aren't readily available in our area, we created our own by comparing sap and tissue samples from the same plants. Tissue tests already have well-established benchmarks that tell us whether a plant has too much, too little, or the right amount of a nutrient (we classified nutrient levels in our tissue samples as high, deficient, or adequate based on these established metrics). By matching each sap sample to its corresponding tissue result, we could see what sap nutrient levels looked like in healthy versus nutrient-deficient plants. From this, we built reference ranges for sap tests and were

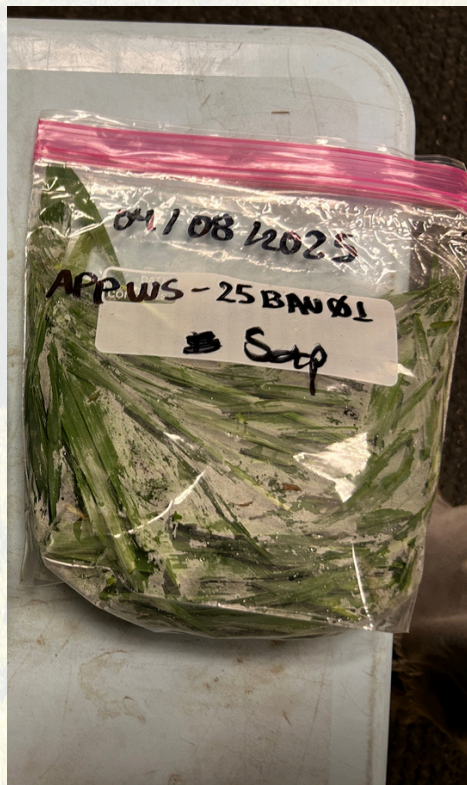
able to identify preliminary sap ranges for seven of the fourteen nutrients we measured.

Separately, we looked at how foliar nutrition affected yield and grain quality under real on-farm conditions. In the first year, winter wheat yielded an average of 78.4 bushels per acre in control strips and 104.2 bushels per acre where foliar feeding was attempted. Winter triticale averaged 53.6 and 47.7 bushels per acre in control and sap-tested strips, respectively. In the second year, two of three fields produced significantly higher yields where foliar fertilizers were applied: winter wheat increased by 10 bushels per acre over the 104.7 bushels per acre control, and winter triticale yields were double the 36.4 bushels per acre control. The third farm showed no yield difference, aligning with its goal to maintain yield while reducing fertilizer use. Because most in-season decisions were based on producer experience rather than sap test results, we do not attribute these yield outcomes to sap testing. Instead, they indicate that targeted foliar applications can help maintain or improve yield in this region.

Overall, sap testing can complement tissue testing as a rapid, in-season check, but it requires clearly defined nutrient ranges to be fully effective. Our field results indicate that foliar fertilizer applications can provide value in this region. As lab turnaround time improves and publicly available sap guidance data is developed, sap testing could become a more precise and effective tool for pinpointing when and what to apply. Ultimately, the feasibility and economic viability of this approach will determine its value for growers. A final report with full results and recommendations is underway and will be available in Spring 2026.



Collecting old and new leaves for sap analysis in winter triticale



Sap samples packed and ready for shipping for nutrient analysis