BATTLE RIVER IMPLEMENTS LTD.

NOVEMBER 2021

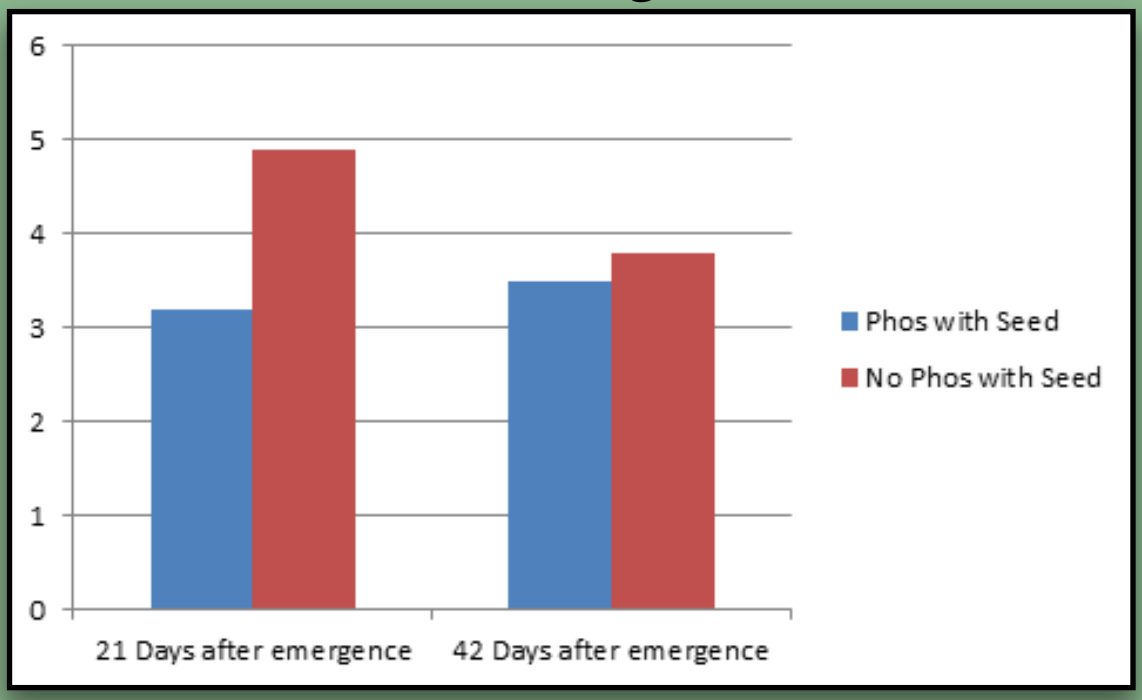
AGRONOMY UPDATE

While doing some tissue testing at the Battle River Training Field this summer to see what impact seed placed phosphate has on overall nutrient uptake, I noticed something unexpected. I had assumed I would see all nutrients showing higher concentrations in the leaves three weeks after emergence. Early access to phosphate has long been known to give our crops a “pop-up” effect. You would expect a good supply of phosphate close at hand to the young seedlings would result in better early season root development and subsequently, better overall nutrient uptake.

The majority of the nutrients in the first tissue test showed just that; initial elevated concentrations in the leaves of the wheat where phosphate had been placed with the seed as compared to the rest of the field. However copper levels did not follow this pattern. In fact they showed the opposite, with copper concentrations greatly reduced where we seed-placed the phosphate. Follow up testing three weeks later showed the copper levels in that wheat actually improved over time as the phosphate in the seed row became bound up in the soil, although levels never did recover to those seen in the rest of the field. All other nutrients except boron (which stayed flat) decreased in concentration in both treatments during that same 3 week interval, with the strips that had seed placed phosphate dropping the most.

Copper levels in Brandon Wheat in 2021

Battle River Training Field - Killam



Mycorrhizai/Root Hair Interactions

This field already has marginal levels of copper (0.5 ppm), and by adding phosphate to the seed I seemed to have transformed copper from marginally available levels for the wheat to deficient. An internet search and a bit of reading showed me that what I was observing was actually fairly common. It turns out that phosphorus placed in close proximity to the seed interferes with soil mycorrhizal fungal populations, which has implications for the uptake of soil immobile nutrients.

Normally, these mycorrhizai form a symbiotic relationship with the crop roots allowing the wheat to access nutrients that are not easily reached by the root hairs alone. This illustration shows how it works, using phosphate as an example. However, in the presence of high phosphorus levels, the micorrhizal population never properly develops and these relationships do not form as they normally would. This impacts the uptake of not only copper, but a few other nutrients as well.

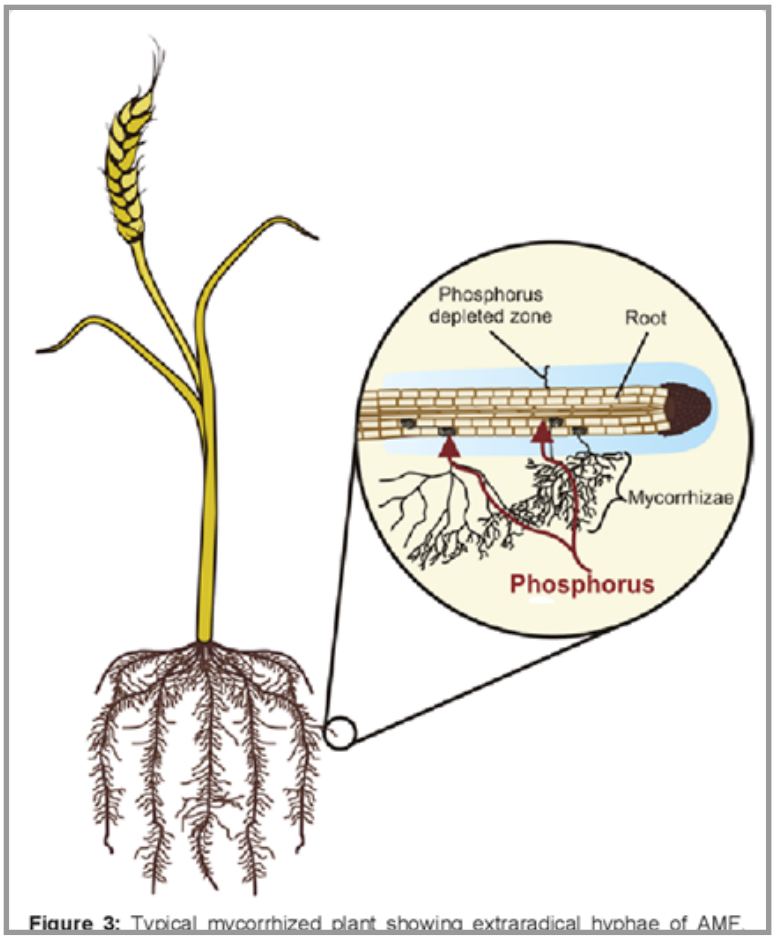


Figure 3: Typical mycorrhized plant showing extraradical hyphae of AMF

Glomus, Bolutus, Amanita, etc (Image taken from Researchgate.net)

From a practical perspective, this alters my approach on how to best manage the nutrient plan for this field. My soil test may tell me that I have adequate copper based on its soil concentration, but if I am seed placing my phosphate that may not be true. My long term goal has been to improve phosphorus soil test levels to above 20 ppm, as phosphate removal has far outstripped replacement over the last decade. I am now approaching these soil test levels, but what impact does that have on copper availability, or on other nutrients such as potassium?

Rebuilding P levels has been a successful strategy that has resulted in higher and more consistent yields over the past several years, but I now know that I also need to start paying more attention to other nutrient levels; not just in the field, but also in the plants during the growing season. My fertilizer applications over the past 6 years are changing the Phos to copper and Phos to potash ratios in the field. This in turn has an impact on how well the crop takes them up; something a soil test alone may not pick up on. It is also a good reminder that nothing we do on a field can be viewed as an isolated, self-contained “solution”. By solving my phosphate issue, I am creating new issues to address. Soils are living biological systems and we need to remain aware that all of our management practices have far reaching and sometimes unintended outcomes.

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