



Packing a Powerful Punch: Seed Nutrient Density

Elston Solberg and Jill DeMulder, Agri-Knowledge Unit

If no one is willing to pay me for nutrient dense seed, why should I care?

The amount of nutrients contained within a seed is a reflection of the nutrient environment it is grown in and has an impact on that seed's performance as:

1. Seed for the next generation
2. Building blocks for products made from seed

Seed for the next generation

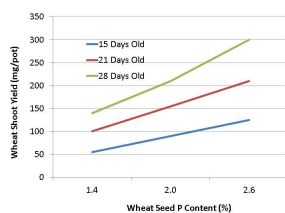
When I think like a germinating seed, I worry about certain key elements especially in cold early season soil environments. Phosphorus (P), zinc (Zn), boron (B), manganese (Mn) and magnesium (Mg) are my key concerns. Phosphorus (P) because it's the battery nutrient at the heart of the ADP/ATP cycle which is the energy currency of all cells. Zinc (Zn) because it's involved in all enzymatic mediated reactions. Enzymes speed biological transformations by at 1,000-1,000,000 fold, which in part explains cold soil responses. Boron (B) helps to drive early roots, aids in cell differentiation, is key for cell integrity and is critical for pollination. Mn aids in fighting many soil/seed borne diseases and is essential for splitting H₂O in photosynthesis. Mg is the central atom of the chlorophyll molecule and drives the most important living reaction on the planet, photosynthesis.

We know from the scientific literature that seeds higher in these nutrients have:

- ✓ Increased germ and seedling vigor
- ✓ Increased disease resistance

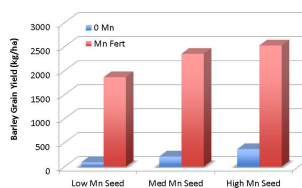
We also know that most yield loss is attributed to abiotic stress, which is especially severe early in a crop's life.

Effect of wheat seed P content on dry matter yield when grown in pots



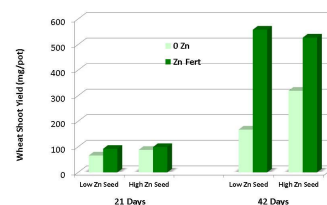
Adapted from Bolland and Baker, 1998

Effect of Mn Content of barley seeds and Mn fertilizer (soil & foliar) on grain yield of barley on a Mn deficient soil in South Australia



Adapted from Longprecher, Marcar and Graham, 1991

Effect of Zn content of wheat seeds and Zn fertilizer on seedling vigor in Zn deficient potted soil.



Adapted from Rengel and Graham, 1995

Implications:

1. If you have a choice between similar seed lots (germ, vigor, 1000 KWT, etc.), choose the lot that is most nutrient dense.
2. Choice of certified seed grower - choose growers who pay particular attention to fertility and those nutrients in particular - ask them to see the soil test and fertility package that went on with the seed or ask for seed analysis
3. Seed to save for reuse - if you're saving seed for use on your farm - select fields with the highest background fertility, implement a fertility package that ensures key nutrients are available when the plant requires them. Start with P and Zn, and then evolve to others. Take tissue tests to monitor progress. Analyze seed to ensure the plan worked.
4. Consider priming, impregnating and/or seed-placed nutrients as additional supports. Run strips across fields and see what works on your farm. Today, this is easy to do with a little coaching.

Seed for building blocks

In North America, it is a common practice to add iron (Fe) to flour/bread and iodine to salt while in Finland selenium (Se) has been added to commonly used fertilizers to address chronic human Se deficiency through food grown on Se fertilized ground. Currently over 2 billion people are Fe deficient and a similar number deficient in Zn. In North America, roughly 6 in 10 people do not ingest sufficient Mg. Moreover as yields per acre increase, the nutrient density of the crops we grow will decline unless action is taken.

In a perfect world, with extensive research, we should strive to get to a place where animal and human food will not need supplementation because the crops that are consumed will be nutrient dense. Plant breeding is part of the answer in conjunction with agronomic fine tuning, fertility management and deeper understanding of nutrient bioavailability.

Companies have already begun niche-market contracting for specific nutrient dense crops. This grower opportunity will continue to expand over the next 3 decades and much of it will be consumer education driven. Until then, growers will have to be content with producing a seed with the power to produce healthy, vigorous, abiotic stress resistant seedlings that consistently produce higher, more nutrient-dense yields.

So in the meantime, each of us should pick a couple of fields to focus our nutrient dense attention on and then Learn, UnLearn and ReLearn constantly