

Whither Organic Wheat Breeding?



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Questions, Questions, Questions

- What is the market demand for organically produced wheat?
 - I understand that it is significant and increasing.
 - We do not know how long this will last.
- How much of the wheat acreage in Colorado is currently managed in an organic production system 
 - I do not know exactly how much.
 - I think though that it is somewhere in the area of 50,000 acres, or about 2.3% of our total acres.
 - How long will it stay at this level?
- If organic wheat commands such a high market price why haven't more Colorado producers moved in this direction?
 - Access to markets, on-farm storage, access to organic fertilizers
 - Perennial weeds – bindweed, Canadian thistle, etc
 - Land values, land resource stewardship, no-till

Questions, Questions, Questions

- Is a separate breeding program required to develop varieties best-adapted for organic systems?
 - I feel that this is a strongly held opinion of producers who have experience with organic wheat.
 - I do not know if this is merely a reaction to problems observed with organic wheat and a feeling that breeding, rather than other management approaches, is the best way to solve these problems.
- If a separate organic wheat breeding effort is deemed desirable by Colorado producers, what are our knowledge gaps?
 - Is there a genotype x environment interaction between organic and conventional systems?
 - If so, what role does breeding, rather than management, have in addressing this interaction?
 - How would we approach this in a rational and strategic manner?

Breeding and Selection Targets

- Disease and insect resistance – lack of chemical control measures
 - Insects: aphid resistance, stem sawfly resistance, etc
 - Diseases: stripe rust, virus/mite resistance, etc (common bunt resistance...)
- Nitrogen – inadequacy of organic fertilizer inputs
 - Improved nitrogen use efficiency is needed
 - Grain protein deviation – a relatively simple approach, already implemented
- Weed competitiveness – potential target traits (Lazzaro et al., 2019)
 - Above-ground biomass before stem elongation – very do-able (NDVI, *Canopeo*)
 - Increased plant height – very do-able
 - Tillering, flag leaf morphology – not really being addressed now
 - Effectiveness against perennial weed problems or winter annual grasses and broadleaves?
- End-use quality
 - Improved baking performance at lower protein levels – do-able, to a point
 - Hard red wheats? Hard white wheats? Both?

Challenges

- Genetic gain considerations
 - Prioritization of breeding objectives
 - Organic wheat – not just a new breeding objective
 - Look at it as an entirely new program (hard red/hard white analogy...)
- Operational and field trial management considerations
 - Availability of plot land on research stations?
 - Manure application uniformity, sufficiency
 - Weed control – mechanical or none?
- Philosophical considerations
 - Food production must increase 70% globally by 2050.
 - Are the 97% of our conventional growers willing to provide additional funds?
 - Would funding be better spent on specialists in soil fertility, weed science, plant pathology, and entomology? Is this really a breeder problem?
 - If organic-specific varieties exist, we likely already have them in our programs.



Thank You