Breeding Wheat for Organic and Conventional Cropping Systems

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Acknowledgements:

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Reason for this Research:

- Belief that public research is often wasteful and does not attempt to maximize the impact of our resources.
  - We often do not share our bulks.
  - We often only breed for one potential market.
- It is complementary to my conventional and also future transgenic breeding effort.
Reason for this Research:

• In my breeding program we have many lines that are “near-misses”. Exceptional for end-use quality with good disease and insect resistance, but do not have exceptional grain yield. In the past these lines were discarded because there was no market for them.

• However, organic wheat is marketed on its quality and needs excellent disease and insect resistance because they have limited choices for weed, insect, and disease control.
Reason for this Research:

- Conventional wheat cultivars: excellent agronomics and acceptable end-use quality and disease and insect resistance with most weeds controlled by herbicides.
- Organic wheat cultivars: excellent end-use quality, disease, and insect resistance with acceptable agronomic performance. Ability to suppress weeds.
- Huge opportunity for using parents from the two programs. Note the programs are not mutually exclusive—the same cultivar can be used in each system.
Research Approach:

- Expand the crossing block to add traits not previously considered (e.g. seed borne diseases—*Ustilago spp.*)
- For efficiency, treat the early generations similarly (though this may change for weed suppression selection).
- Split the later generation material into conventional and organic testing procedures. Note the selection criteria will be different.
Traditional Plant Breeding

Introduce Variation

Segregation and Selection

Evaluation and Release

Year 1 and 2

Year 3 to 6

Year 7 and 12
Segregation and Selection:
Mean annual water balances were derived from the Newhall Simulation Model (Van Raalte et al., 1992) using 1981 to 1990 normals for precipitation and temperature from a population of 135 weather stations (Swank and Estes, 1992). The annual water balances represent the cumulative differences between monthly precipitation and potential evapotranspiration. The water balance surface was constructed from a terrain regression applied to the USGS 90 meter digital elevation models (DEM's: 1:250000) with a final resolution of 20m.
Summary of Organic Trials:

- Main nurseries are at Mead and Sidney.
- Additional testing at Clay Center and Concord.
- Integrated with the six major testing sites for the conventional breeding effort.
UNIVERSITY OF NEBRASKA—LINCOLN
PANHANDLE RESEARCH AND EXTENSION CENTER

ORGANIC WHEAT VARIETY TRIAL
DATE PLANTED: 9-21-06
IN COOPERATION WITH:

Partially funded by the NEBRASKA WHEAT BOARD
NE99495 Hard Red Winter Wheat

- Alliance/Karl 92
- Licensed to Kansas Organic Producers
- NE99495 is semidwarf wheat with medium plant height for a semidwarf cultivar and acceptable winterhardiness for production in Nebraska.
- It is slightly later than Alliance and slightly earlier than Millennium for flowering date.
- It is moderately resistant to Hessian fly and stem rust, moderately susceptible to moderately resistant to leaf rust, and susceptible to wheat streak mosaic and wheat soilborne virus and stripe rust.
NE99495 Hard Red Winter Wheat

- It has good yield potential and has genetically lower test weight.
- Previous yield trials indicate it is best adapted to rainfed production in western Nebraska (North Platte & west).
NE01481: Under review for exclusive release to Organic Producers—Excellent Quality and disease resistance, including wheat soilborne mosaic virus. Adapted to eastern Nebraska.
Moving Forward:

- For truly unique organic products, we have expanded our end-use quality to be more than our conventional bake tests. We are hoping to define new markets.

- We also hope to increase our understanding of genotype x environment interactions, especially as it relates to those aspects of the environment we can control.

Thank you!