The Ancient Grains Einkorn, Emmer, Spelt, & Heritage Wheat

Agronomics

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WANTED: LOOKING FOR Speltz or Emory Seed. Call (701) 584-3873.

AKC Pointing Labs, Yellow males and females, $650. Ready end of April. See info at acornagelabs.org 701-269-3070.


WANTED: MINERAL INTERESTS/OIL & Gas Leases - Experienced Family Owned Oil Production & Exploration Co. We'll Help You Monetize Your Mineral Assets. Send details to P.O. Box 8946, Denver, CO 80201. MineralAssets.com
Ancient grains have history in US and northern plains states
Immigrant farmers bring landraces
USDA brings emmer seed from Russia
Dakotas identified as good growing areas
Mediterranean climate & low rainfall areas:
  - white common, durum, pollard, turanicum, emmer

- Continental climate, cold winter:
  - hard red common (long season), spelt

- Continental climate, intensely cold winter:
  - hard red common (short season), spelt,
  - possibly durum, turanicum, & emmer

- Coastal moderated, humid summer:
  - soft red common, spelt (dry summer: soft white)
Ancient & Heritage wheat

- Ancient wheat
  - Thrashes with hull intact
  - Einkorn, emmer, and spelt = order of appearance
  - Winter or spring types, mainly spring
  - 5000-12,000 years old

- Heritage wheat
  - Free thrashing
  - Winter or spring types
  - Modern varieties, can be from 30-150 years old
  - Pre 1950’s may be most common definition

- Limited supply of seed for all types
Ancient Grain Seed
emmer, einkorn, & spelt

- Seed sources and varieties limited
  - Einkorn in particular

- Little variety improvement or breeding effort has occurred
  - Emmer, 1 variety MSU
  - Spelt, 2 spring varieties AC, CDC, few private winter varieties, 1 variety MSU

- Main source of seed are landraces
  - Farmer saved seed
  - GRIN
Einkorn
Ancient Grain Agronomics

What we know

- Production practices & management recommendations similar to wheat
  - Yields (in hull) similar to wheat
    - Plant lodging can be an issue
  - Pest problems
    - Weed, disease, & insect
- Management
  - Variety choice
  - Seeding date
  - Planting rate
  - Fertility
Objective 1: Germplasm

- Evaluate germplasm of ancient, heritage, and modern wheat
  - All research sites and multiple on-farm sites
    - Variety trials, observation screening, seed increase
  - Multiple sources of seed
    - Initially started with 224 vt’s and landraces
    - National Small Grains Collection (GRIN), organic seedsman and farming groups, universities, state seed foundations, farmers
    - Additional lines being accessed throughout project
      - Over 500 lines to date
Emmer landrace seed increases
Emmer Variety Trials

Emmer Variety Trial-Cathay

Emmer Variety Trial-Robison
2012 Einkorn & Emmer Seed Increases
**Objective 1: Germplasm**

- **Adaptability to organic systems**
  - Yield, maturity, pest resistance, vigor, height, lodging

- **Desirable grain and baking characteristics**
  - Hulling, protein, test weight, quality

- **Select and increase lines that fit criteria**
  - Research trials
  - Field scale production
- NPSAS FBC seed increase
- Emmer
  - 117 accessions
- Einkorn
  - 97 accessions
- Spelt
  - 67 accessions
- Evaluate and increase accessions to field scale
  - 100-2012
  - 10-2013
  - 3-2014
  - 1 in 2015
<table>
<thead>
<tr>
<th>Year</th>
<th>Plant</th>
<th>Harvest</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>1 gm, 4 ft row</td>
<td>100 gms</td>
</tr>
<tr>
<td>2013</td>
<td>100 gms, 0.003 ac</td>
<td>2500 gms</td>
</tr>
<tr>
<td>2014</td>
<td>5.5 lbs (2500 gms), 0.05 ac</td>
<td>100 lbs</td>
</tr>
<tr>
<td>2015</td>
<td>100 lbs, 1 ac</td>
<td>2000 lbs</td>
</tr>
<tr>
<td>2016</td>
<td>Possible to plant, 10-20 ac</td>
<td></td>
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</tbody>
</table>
NPSAS FBC wheat/einkorn projects

- Einkorn
  - TM23

- Modern wheat
  - Dylan

- Heritage wheat
  - Mida
  - Ceres
Objective 2: Management

- Develop management recommendations for heritage wheat, emmer and einkorn
  - N fertility management
    - Heritage winter wheat and emmer
  - Planting date
    - Heritage winter wheat, emmer, & einkorn
  - Planting rate
    - Heritage winter wheat, emmer & einkorn

- Trials conducted at research sites and on-farm
Emmer seeding rate
2012 organic specialty grain trial
NDSU:CREC

Spring spelt, einkorn & emmer on June 26

Planted April 18

Harvested July 30

Previous crop potatoes

Above average yields
Emmer, einkorn & wheat trials
July 19, 2011

- May 5 planting date
- Previous crop = cover crop
<table>
<thead>
<tr>
<th>Year</th>
<th>Acres/Plot</th>
<th>Increase</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002-03-04</td>
<td>.0025 ac</td>
<td>1 farm, small plot increase (3.5 lbs)</td>
<td>1 farm, small plot increase (3.5 lbs)</td>
</tr>
<tr>
<td>2005</td>
<td>.1 ac</td>
<td>2 farms, strip increase (140 lbs)</td>
<td>2 farms, strip increase (140 lbs)</td>
</tr>
<tr>
<td>2006</td>
<td>2 ac</td>
<td>1 grower</td>
<td>1 grower (1400 lbs)</td>
</tr>
<tr>
<td>2007</td>
<td>18 ac</td>
<td>1 grower</td>
<td>1 grower (16,000 lbs)</td>
</tr>
<tr>
<td>2008</td>
<td>144 ac</td>
<td>2 growers</td>
<td>2 growers (1975 lbs/ac avg)</td>
</tr>
</tbody>
</table>
2008 ND Common emmer field
Lewis Seibold, Cathay
Active People:  Gil Stallknecht, advisor retired MSU researcher

- Lentz farm
  - Rene Featherstone

- Bluebird farm
  - Sam & Brooke Lucy

- Heritage Wheat Conservancy
  - Eli Rogosa

- Purity Foods
  - Market spelt products

- Einkorn.com
  - Market einkorn products and may contract production

- Jovial
  - Importing & marketing einkorn from Italy
Plant breeding

- Hal Lafaver
  - Private spelt breeder

- Pierre Hucl
  - University Saskatchewan breeder

- Dr. Karl-Josef Mueller
  - German einkorn breeder
Saskatchewan spring emmer, einkorn and spelt wheat breeding initiative

Objectives:

- Develop a spring spelt variety with stem rust resistance similar to current common spring wheat classes grown in Saskatchewan.

- Develop a high lutein einkorn variety with competitive agronomic performance equal to the long-term agronomic einkorn check.

- Develop a food-type emmer wheat variety which is shorter-strawed but equal in yield to the feed quality variety ‘Vernal'.
Laboratory deawner
Commercial deawner
Have you heard of this company?

SEED SAVER CO.
Howard, South Dakota
Dehulling
HORN Dehuller – friction
Impact Dehullers
Dehuller design project

De-hull emmer and einkorn

Process at least 120 kg/hr

Operate with minimal supervision

Minimal maintenance and adjustment during operation

Adjustable for variability in grain size (dependent on growing conditions)

Cost less than $10K.
Results of crossing Black Winter Emmer with Khorosan in the F2 generation

Thanks to “Mid-Atlantic Plant Research Center” in Maryland
Summary points

- The ancient wheats represent different species and subspecies which have great genetic diversity for important traits.

- While there are overall differences among species in nutrition and baking quality, the qualities of any one variety from among these species cannot be determined without testing.

- There is huge market potential for these grains, but a definite need for education, promotion and product development.

- Seed evaluation & increase of adapted lines along with cultivar development needed for future crop expansion.

- Management practices need to be refined.

- Affordable small scale dehulling capacity remains an issue in producing ancient grains and new options are still in the R&D stages.
For more information on ancient grains and the Value-Added Grain Project

 Websites

- www.ogrin.org
- www.grownyc.org/greenmarket/topics/regionalgrain
- www.ag.ndsu.edu/CarringtonREC/agronomy-1/copy_of_crop-index
Thank You!