The use of CWR in breeding of crops and trees in Iceland

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What am I going to talk about?

- The Icelandic Flora
- Agriculture in Iceland during the ages
- Import of plants to Iceland
- Conservation of Icelandic plant material
- Use of wild plants in breeding
The Icelandic flora

- Around 490 vascular plants grow wild in Iceland
  - 300 dicots
  - 150 monocots
  - 40 fern species and gymnosperms
Origin of our species

• Native species (before settlement of Iceland)
• Some species came with the settlers
• New species have been brought to Iceland since the settlement, especially during the last 100 years
• Most of our species are also found in Norway
Variation in climate

• The climate was favourable in the first 400 years after the settlement
• The next five hundred years were colder
• It became warmer again after 1920
Estimated annual temperature in Reykjavík

Adapted from Thorarinson, 1974
The first agriculture

• The settlers started with similar agriculture as they practised in their home countries
• They protected field area around the farm houses for cultivation of grass and barley
• The area beyond the protected area was used for grazing
• Cows were relatively large part of the total number of livestock
Agriculture the following ages

• Proportion between sheep and cows changed. Sheep increased but cows decreased
• Cultivation of grain ceased
• Knowledge in cultivation of plants diminished
Import of plants

• The settlers
• Import 1600-1800
  – Vísi Gísli (Gísli Magnússon, 1621-1696)
  – Björn Halldórsson (1724-1794) in Sauðlausdalur
  – Danish farmers (around 1750)
Import from 1800 - 1900

• The period 1831 – 1858 was warm in Iceland
• Kitchen gardens became very common in Iceland at that period with potatoes and turnips (Brassica napus) as main species
• After 1858 we got a long cold period
Import after 1900

- A warm period started 1926
- Development in agriculture, horticulture and forestry
- Transportation from other countries increased
- Every year we import a lot of seed, living plants and soil
Conservation of Icelandic plant material

- Collection of semi wild native grass species
- Registration of semi wild grass fields (in situ)
Collected grass species

- Festuca rubra
- Poa pratensis
- Agrostis capillaris
- Deschampsia caespitosa
- Phleum pratense
- Alopecurus pratensis
Imported plants adapt to Icelandic environment

- Many imported crop species have gone through natural selection and adapted to Icelandic conditions
  - Phleum pratense
  - Alopecurus pratensis
  - Carum carvi
Borgir
Grænavatn
Hánefsstaðir
Hlíð
Hólar í Hornafirði
Hvítnes
Skálafell
Þambárvellir
Elymus alopex (kjarrhveiti)

• A wild relative of bread wheat
• Previously regarded as *E. caninus*, but according to Salomon (2005) the icelandic population should be regarded as separate species
• Endemic to Iceland

Elymus kronokensis subsp. Borealis (bláhveiti)
Leymus arenarius

• Used as perennial grain in Iceland for many centuries
• Similar use is also known from Russia and by North-American Indians
Hybridization between wheat and lymegrass in Iceland

• The aim was to improve the perennial lymegrass as cereal crop

• Four species:
  • *Leymus arenarius* and *Leymus mollis*
  • *Triticum aestivum* and *Triticum carthlicum*

Anamthawat-Jónsson et al. 1997. Wide hybridization between wheat (Triticum L.) and lymegrass (leymus Hochst.).
Results

• Hybrids deriving from \textit{L. arenarius} survived overwintering in Iceland but the hybrids from \textit{L. mollis} did not

• In milder climate both showed perenniality
Icelandic birch

• A large part of Icelandic birch is rather a shrub than a tree

• However, wild forests with relatively high trees are also found
Breeding of birch

• Þorsteinn Tómasson, an icelandic breeder, has used icelandic birch in his breeding work and crossed it with trees from Scandinavia
• The icelandic birch gives the hardiness for Icelandic circumstances
• The Scandinavian birch gives height, form and colors
Embla
Embla
Red birch
Birch pollen from Russia

Margrét Hallsdóttir, Ársskýrsla NÍ 2006, p 21
Summary

• The Icelandic Flora has expanded since the country was settled
• Plants adapted to our conditions are valuable for breeding in the future
• Some grass varieties in Iceland were selected from semi wild grass species
• Icelandic species as *Betula pubescens* and *Leymus arenarius* have been used in breeding work to give tolerance at Icelandic circumstances
• A seed from our main grass species is now preserved in NordGen and in situ