Experiences of the first steps of the production of Andean pseudocereals in Finland

International Congress of Quinoa and Andean Grains
November 14 and 15, 2013
National Agrarian University La Molina, Lima Peru

Dr. Marjo Keskitalo
MTT Agrifood Research Finland
marjo.keskitalo@mtt.fi
The time (h) between the sun rise and sun set in Finland is in the growing season between 15 to 24 h
The average temperature (1981-2010) in Finland

<table>
<thead>
<tr>
<th>C</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>41</td>
</tr>
<tr>
<td>4</td>
<td>39.2</td>
</tr>
<tr>
<td>3</td>
<td>37.4</td>
</tr>
<tr>
<td>2</td>
<td>35.6</td>
</tr>
<tr>
<td>1</td>
<td>33.8</td>
</tr>
<tr>
<td>0</td>
<td>32</td>
</tr>
<tr>
<td>-1</td>
<td>30.2</td>
</tr>
<tr>
<td>-2</td>
<td>28.4</td>
</tr>
<tr>
<td>-3</td>
<td>26.6</td>
</tr>
</tbody>
</table>

The average year temperature

Finnish Meteorological Institute

Keskitalo, M. 2013  MTT Agrifood Research Finland
The average precipitation (mm) in Finland 1981-2010

- Autumn is the rainy season
- Autumn is also the harvest season!
Fig. 1. Field experiment at MTT Agrifood Research Finland in 2000. The first experiments on quinoa were carried out in 1980’s by Miguel Carmen.
Fig. 2. Flowerheads and seeds of different quinoa accessions in MTT’s field experiment in 2000 (18.11.2000).

Keskitalo, M. 2013  MTT Agrifood Research Finland
Fig. 3. The mean seed yields of different quinoa accessions in MTT’s field experiment in 1999.
Protein content of quinoa accessions were comparable or even higher than cereals.

Fig. 4. The mean protein contents (% of DW) of seeds from different quinoa accessions in MTT’s field experiment in 1999.

Keskitalo, M. 2013  MTT Agrifood Research Finland
Fig. 5. Relationships between seed yield (kg/ha) and protein content (% DW) of different quinoa accessions in 1999.

Keskitalo, M. 2013  MTT Agrifood Research Finland

-> Seed yield had a negative impact on the protein contents of seeds

Siemensadon ja proteiinipitoisuuden yhteys vuoden 1999 kokeessa
Fig. 6. The potential seed yield formation was studied in the greenhouse, where the daily mean temperature was about 4 °C higher than the ambient one. Also, the growing season in the greenhouse was one month longer than outside.
Fig. 7. The comparison of yield formation of quinoa produced in the field and in the greenhouse, where the temperature was about 4° C higher than in the ambient conditions.

Keskitalo, M. 2013  MTT Agrifood Research Finland
Suomen suurin kvinoapelto vuonna 2009

Keskitalo, M. 2013  MTT Agrifood Research Finland
In 2013 quinoa was cultivated on 32 hectares.

Comparison - the total area of arable land in Finland is 2,3 milj ha.
Fig 8. The dry weight of entire plants and seeds (g), as well as the seed protein contents (% dry weight) of quinoa based on differently coloured flowerheads.

Eriväristen kvinoakantojen kuivapainot ja siementen proteiinipitoisuudet (%)

Keskitalo, M. 2013  MTT Agrifood Research Finland
Fig 8. The dry weight of entire plants and seeds (g), as well as the seed protein contents (% dry weight) of quinoa based on differently coloured flowerheads.
Fig 9. The height of the plant and the harvest index ((seed yield/plant entire biomass)*100) of quinoa based on differently coloured flowerheads in 2009.

Erväristen kvinoakantojen kasvin pituudet (cm) ja satoindeksi

-> Satoindeksi 50 on varsin suuri verrattuna esimerkiksi viljoihin
The lower the plant density, the higher the seed yield was
Problems:

(Too) Low plant density
Problems:

Aphids in the flowerheads - consequences?
Other animals like quinoa also…
Kvinoa Rainingon Luomutilalla

Kvinoa MTT:n kenttäkoessa

Kuva 28.9.2013
Quinoa is late maturing crop in Finland and in some years frost may occur before crop is ready for harvest

Quinoa field at MTT in October 2nd, 2013
Harvest time in 2013

Kvinoan korjuu 3.10.2013 MTT:ssä ja 4.10.2013 Rainingoilla
Siemenen pinnalla olevat saponiinit tulee poistaa ennen käyttöä

Käsitellyt siemenet

Käsittelemättömät siemenet
Conclusions (1)

- Quinoa may produce seed yields (1000 – 3000 kg/ha), which are comparable with other alternative crops in Finland – it is a promising new crop.
- There are now major pest or diseases hampering the production.
- The protein content of seeds may be the same or even higher compared to cereals.
Conclusions (1)

- Quinoa may produce seed yields (1000-3000 kg/ha), which are comparable with other alternative crops in Finland – it is a promising new crop
- There are no major pests or diseases hapering the production
- Protein content of seeds may be the same or even higher compared to cereals.

- Consumers are very interested in the health aspects of quinoa
- Farmers are ready to start the cultivation
Conclusions (2)

- There are still challenges to be solved in the production technology and therefore more research and information are needed:

  1) New or improved varieties
     - Early flowering
     - Evenness on maturity
     - Resistant to lodging

  2) Information on optimal seed rates and plant densities

  3) Optimization of plant nutritional requirements and fertilization

  4) Postharvest technology