

Domestication of field cress



- The process of domestication started around 1995
 - Five wild populations were used
 - There were gaps in research activities
 - No cross-breeding



Prof. Arnulf Merker



- Concerted efforts for domestication started in 201/2
 - Several populations were added
 - Other Lepidium species were also included
 - Cross-breeding has been a major activity





Domestication of field cress: Germplasm used

Germplasm	Source	When
5 populations	Sweden & Hungary	Since 1995
34 accessions	Europe and USA	Since 2011
36 populations	Sweden	Since 2012

- Latitude range:
- 55°33'22"N-60°40'01"N
- Longitude range
- 12°34'16"E 18°53'56"E





Domestication of field cress: Germplasm used



Some field cress populations collected in Sweden in 2012



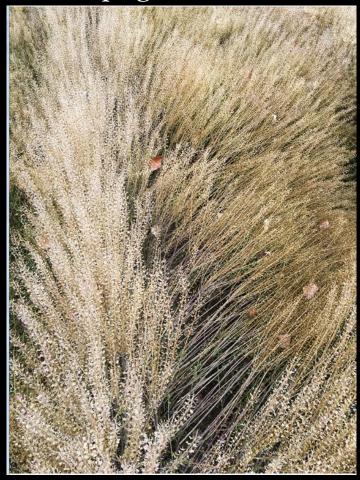
Major traits targeted

- Pod shattering
- Seed yield
- Oil content
- Synchronous maturity
- Seed dormancy
- Perenniality
- Pathogen resistance



Breeding for pod shatter resistance

- Pod shattering is a serious problem
- Developing shatter resistant lines has been top priority



A high yielding line susceptible to pod shattering



Field cress



Shatter resistant!





L. heterophyllum



Breeding for pod shatter resistance



- Newly developed breeding line that combines pod shatter resistance and perenniality but not high yielding
- Note: Most top yielding breeding lines have a medium level pod shatter resistance



Breeding to overcome seed dormancy

- Some highly shatter resistant lines showed low rate of seed germination
- Cross-breeding of these lines with readily germinating lines solved the problem!



A poorly germinating pod shatter resistant line

A well-germinated F2 hybrids of shatter resistant lines and readily germinating lines



Breeding to overcome seed dormancy

Some advanced breeding lines that combine various desirable traits







Breeding for perenniality









L. hirtum









L. campestre



L. heterophyllum

Breeding for seed yield and related traits

• Some interesting traits considered for high seed yield





• High yielding genotypes can produce up to 80 gm seeds per plant



Seed yield related traits: inflorescence length

- Wild type: = 10-20 cm
- Most B. lines = 25-38 cm
- Longest IL = 52 cm



IL = 17 cm



Medium sized IL: 30-35 cm



IL = 52 cm



Seed yield related traits: pod density

Variation in pod density among breeding lines









Seed yield related traits: plant vigor

Field trial at Lönnstorp in 2017/2018



PL-241 breeding line produced ca 6 t/ha at Lönnstorp in 2018



Breeding for earliness

- Two types of breeding lines have been developed
 - Early types mature two to three weeks earlier than the late types
 - Most of them have comparable yields
 - The top yielding breeding line is the late type





Early maturing

Late maturing



Disease resistance

- Two pathogens known to attack field cress have been identified
 - through DNA sequencing
- The pathogens are common on wild populations
- A number of potentially resistant genotypes have been identified



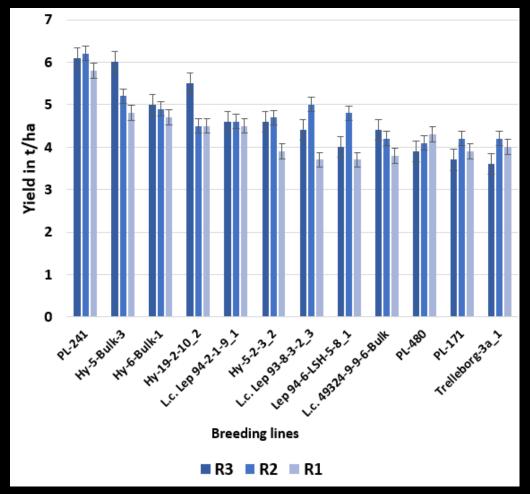
Alternaria brassicicola: dark spot

Botrytis cinerea: gray mold



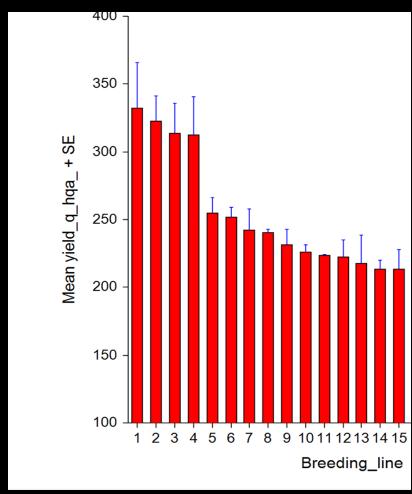
Seed yield of some breeding lines

Seed yield (t/ha) of 12 breeding lines in three replicates_ Lönnstorp _ summer 2018



- The highest seed yield at Umeå was about 3 t/ha in 2018
- Not-optimized planting techniques & agronomic practices contributed to lower yield at Lanna and Umeå

Average seed yield (q/ha) of 15 breeding lines_ Lanna_ summer 2017



NIR spectroscopy based analysis of oil content showed that the oil content is about 30%



Some important ongoing and planned activities

- Optimizing planting techniques that facilitate uniform seed germination
- Developing lines that have better competitive ability with weeds: Early spring is very important!
 - grow well at a temperature lower than 15°C
 - grow fast
- Developing more early maturing types for northern parts of Sweden



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