

Genetic shift in white clover after natural selection in a marginal area

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White clover in Iceland

- Unreliable crop
 - Yield differs between years
 - Generally low winter survival

- Need for improved cultivars
 - Stability - in yield and nitrogen fixation rate
 - High level of winter survival

- Traits associated with winter survival
 - Stolon morphology
 - Fatty acid composition of stolons

Objectives

- Monitor genetic shift after four years of natural selection in a marginal area
- Evaluate morphological traits associated with winter survival
- Assess composition of fatty acids in stolon tissue after exposure to frost

Experimental setup

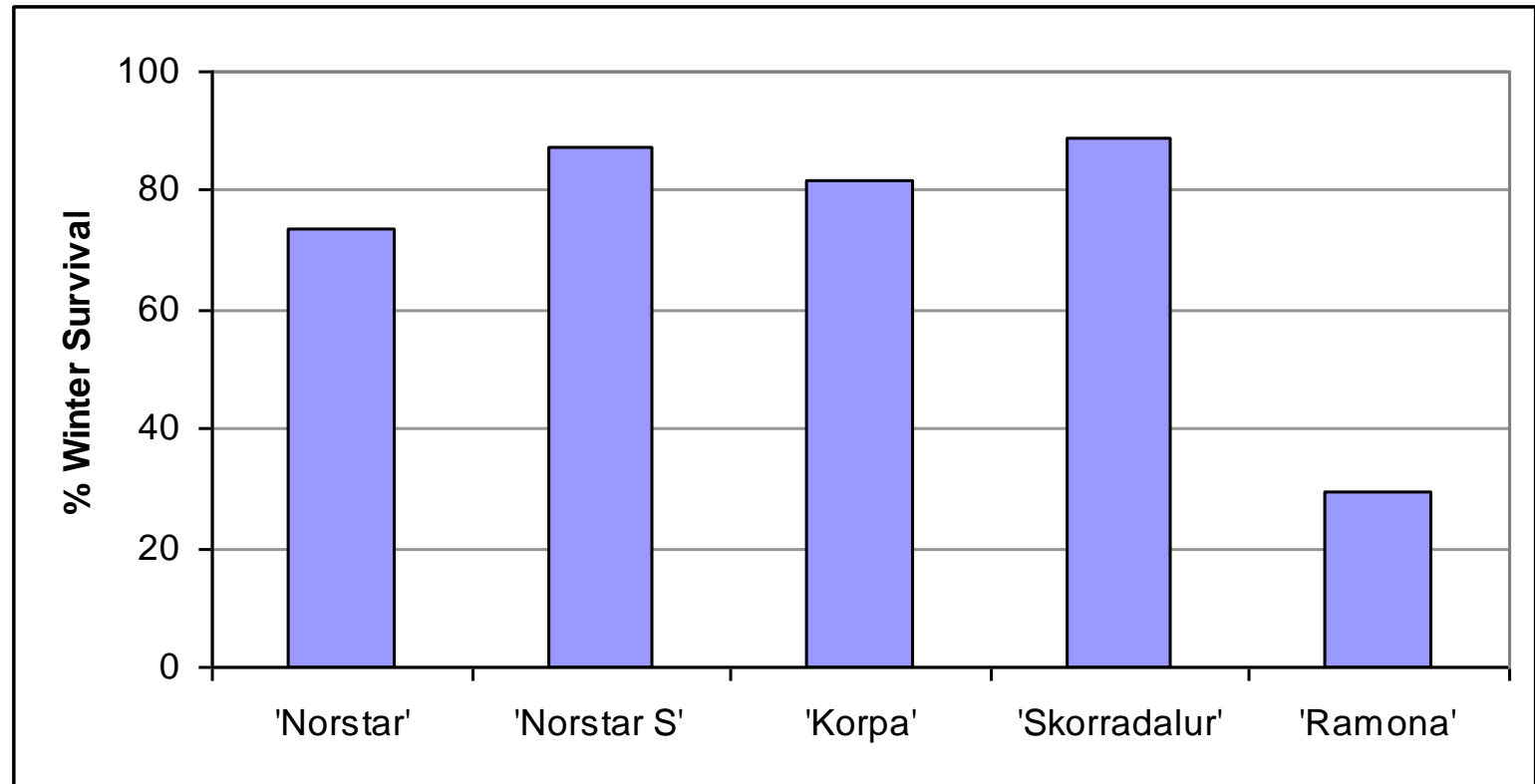
- Field trial
- White clover populations:
 - 'Norstar'
 - 'Norstar S' – four years of natural selection
- Reference populations:
 - 'Korpa' - local
 - 'Skorradalur' - wild
 - 'Ramona' - cultivar



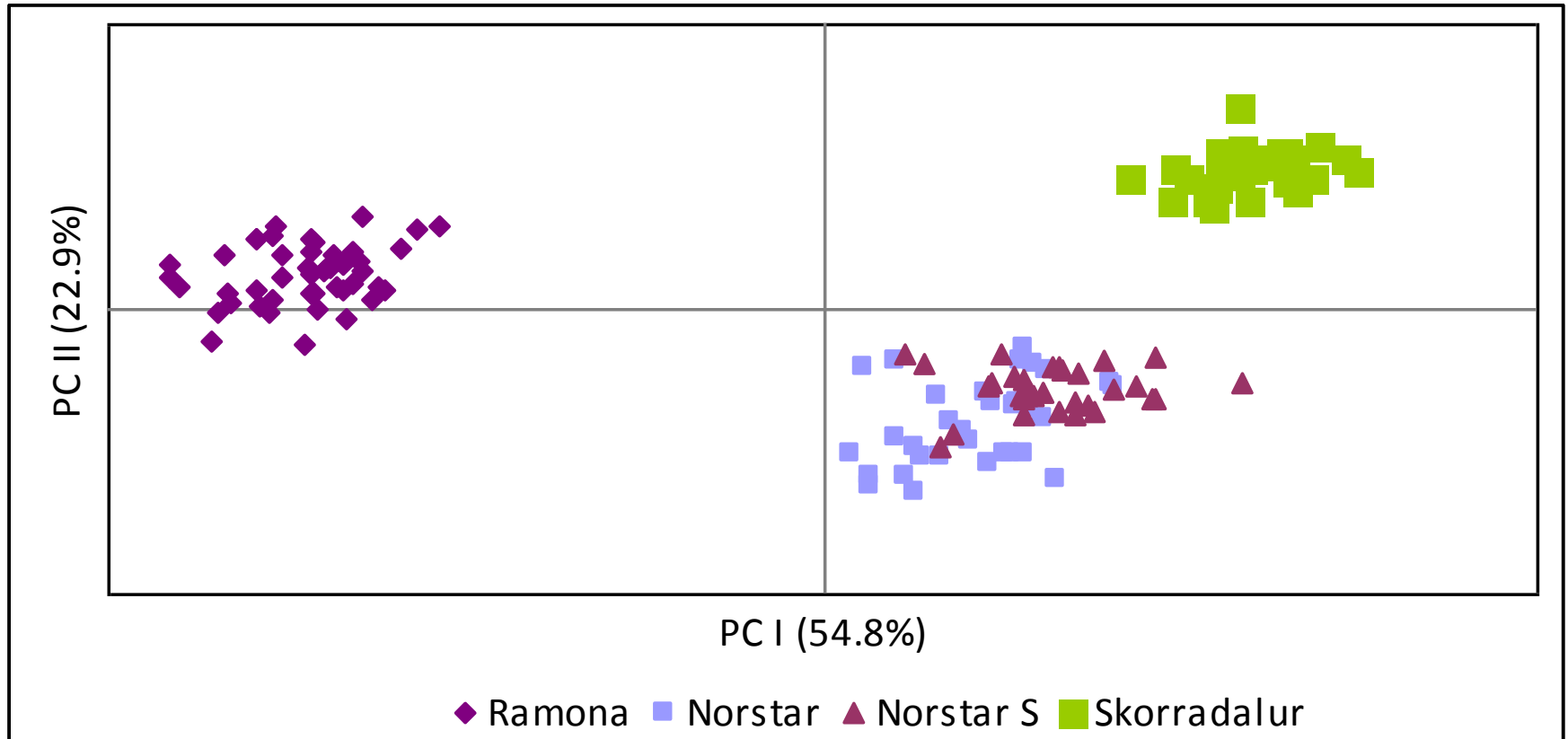
Methods

- AFLP study
- Phenotypic characterisation
 - Stolon characters - persistence
 - Leaf characters - yield
- Chemical analysis of stolon fatty acids

Winter survival

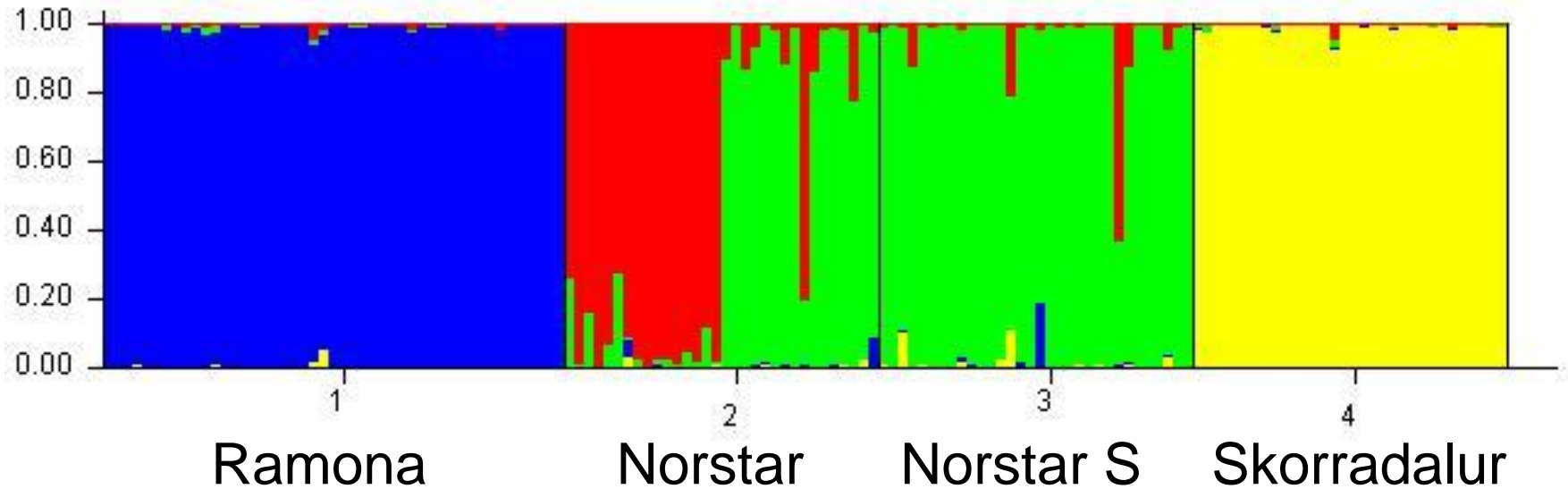


PCA – molecular diversity (AFLP)



Structure

- ▣ Assigns k populations to a dataset



$k = 4$

Phenotypic characters

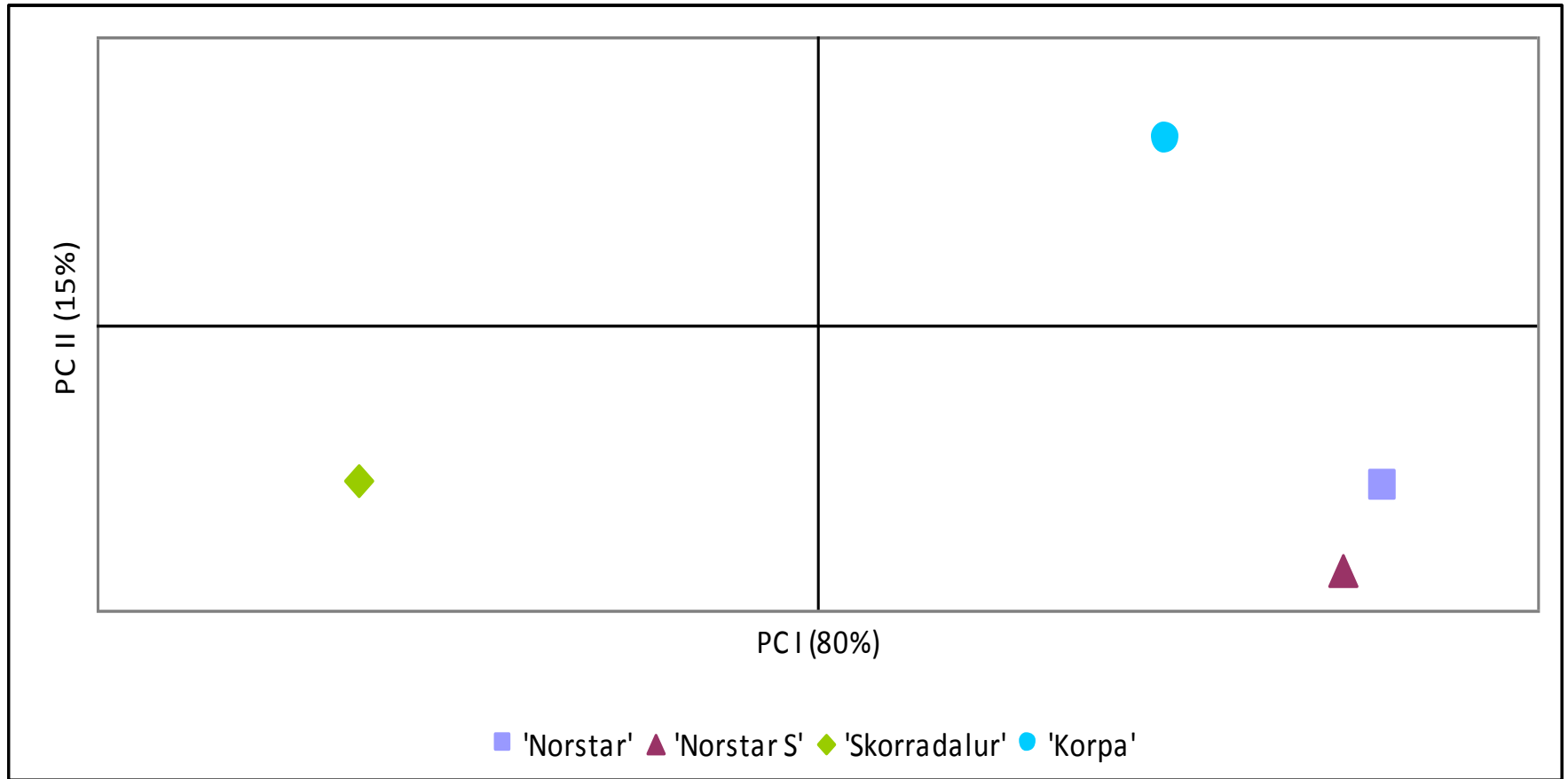
□ Persistence

- Specific stolon length (dry weight unit length⁻¹)
- Significantly higher in 'Norstar S' than in 'Norstar' (P=0.05)

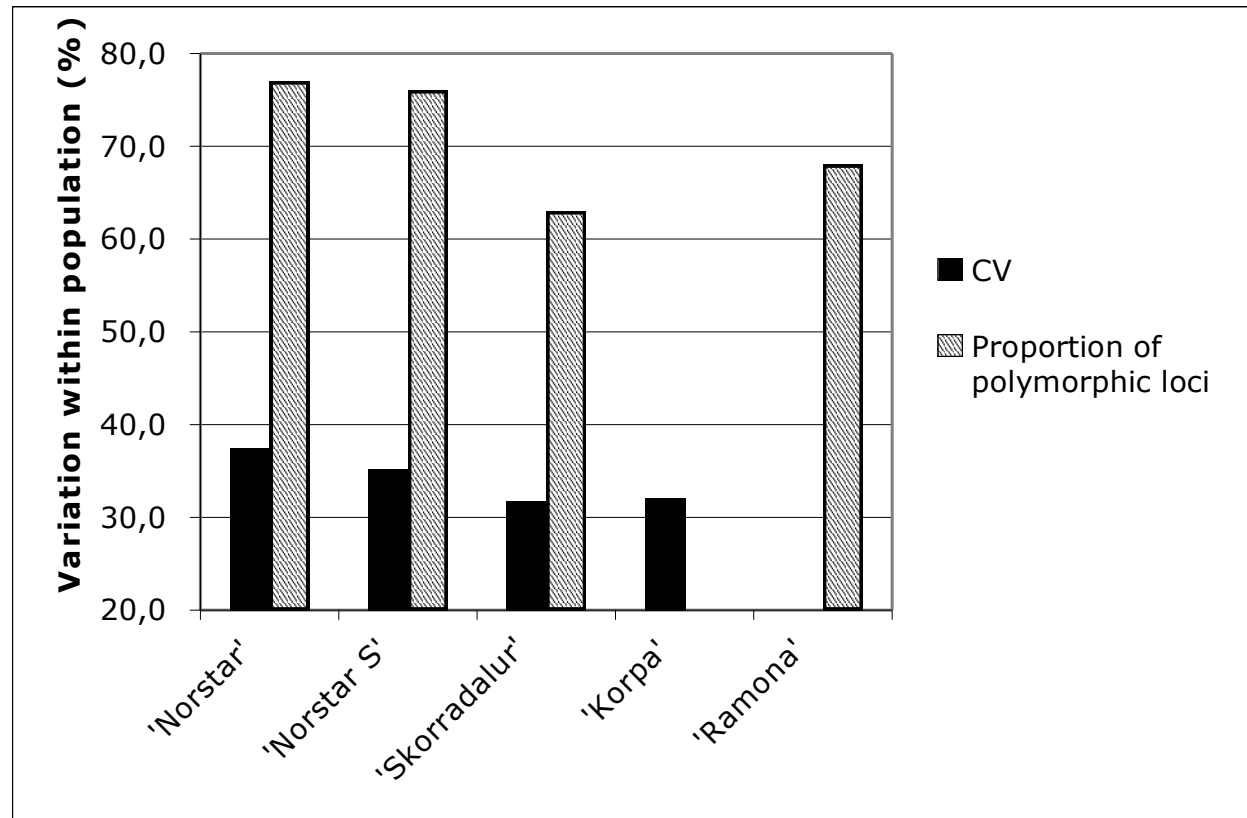
□ Yield

- Specific leaf area (dry weight per unit area⁻¹)
- No significant difference between 'Norstar S' and 'Norstar'

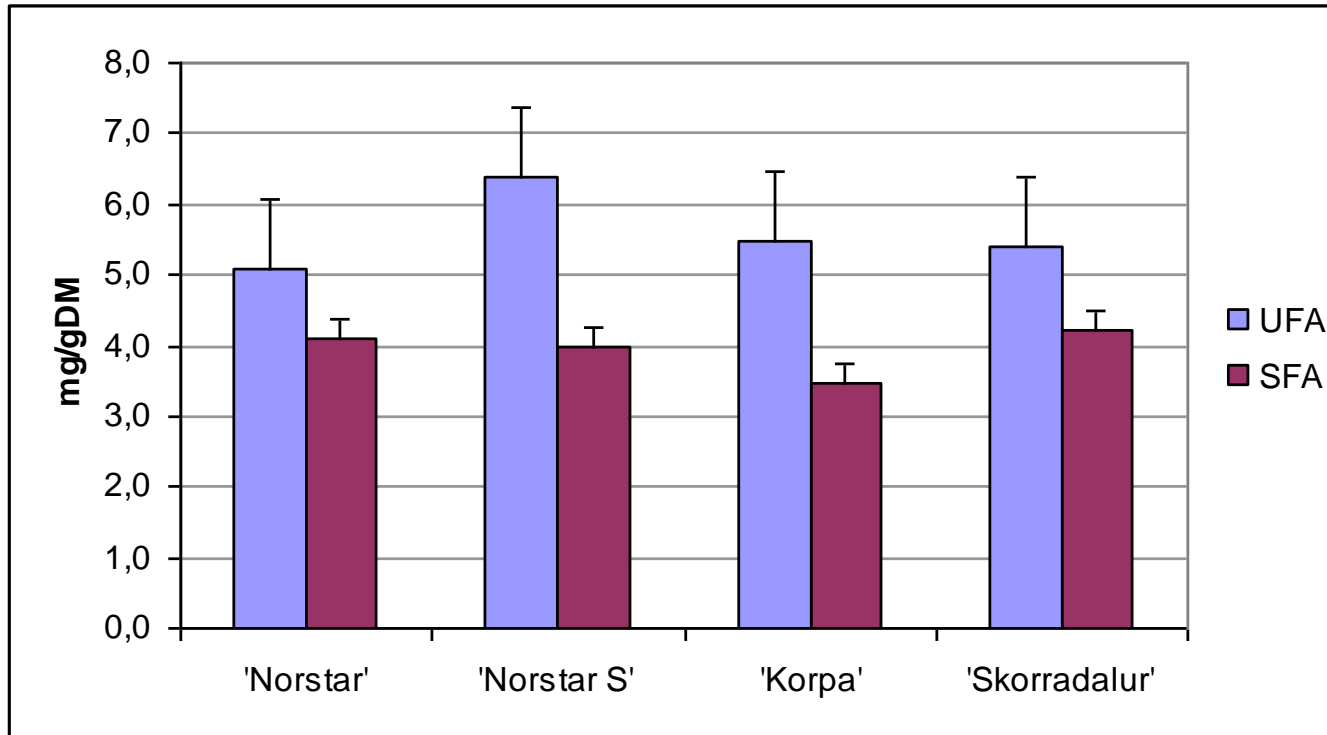
PCA - Morphological traits



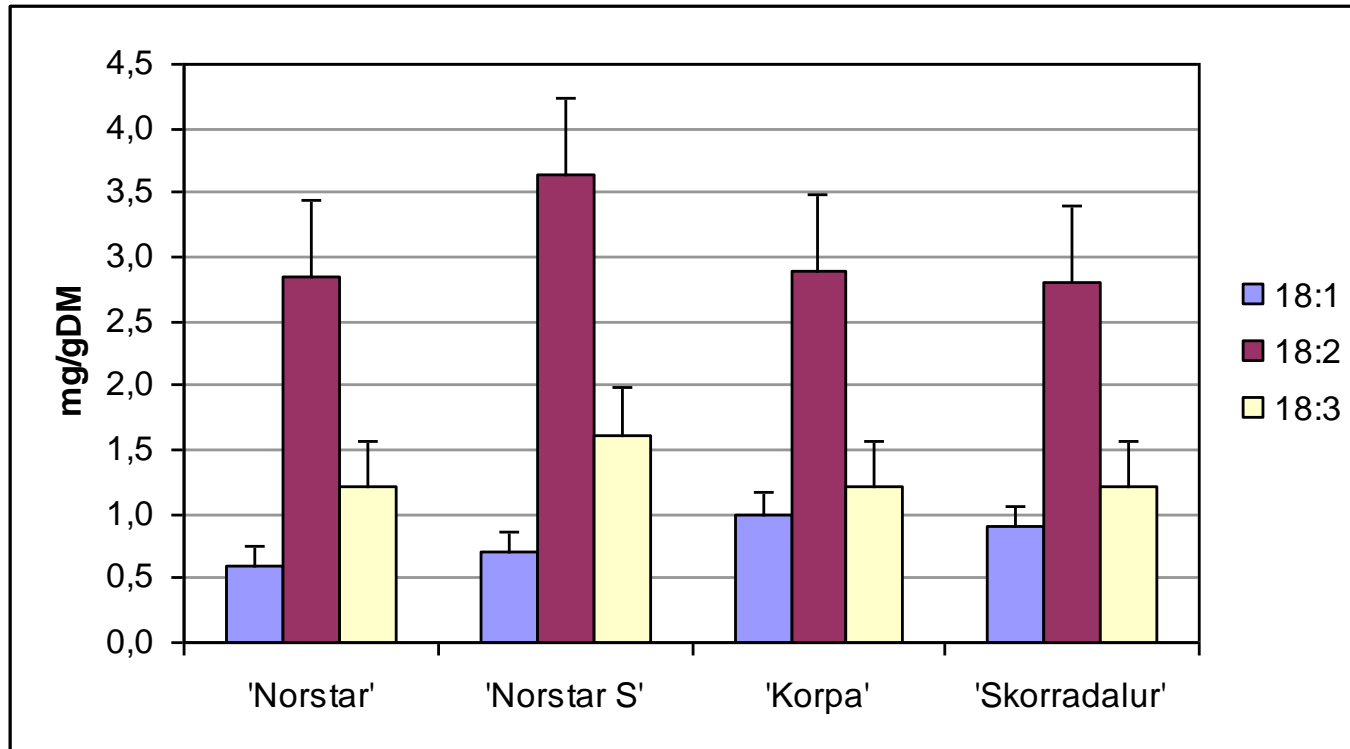
Pattern of variation within populations - phenotypic and molecular data



Fatty acid composition

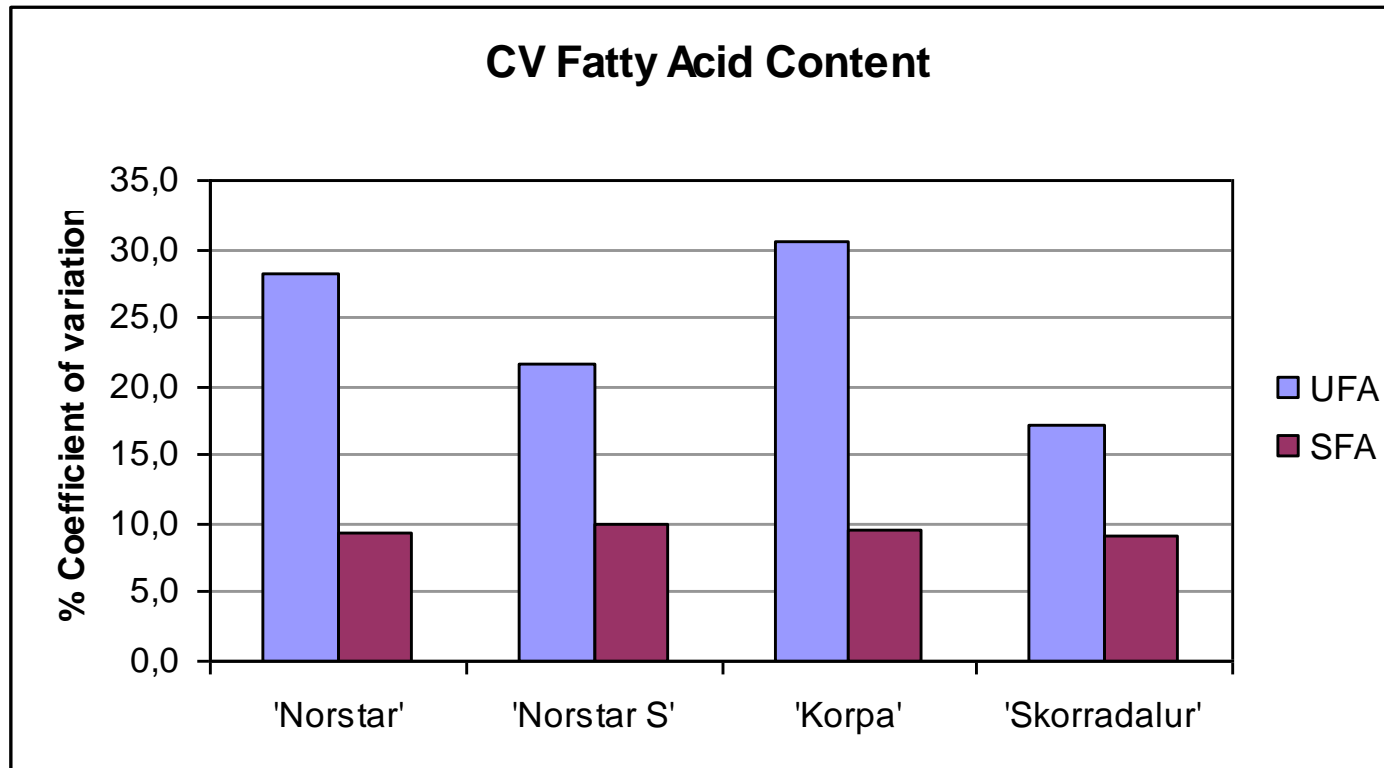


Fatty acid composition



18:1 oleic acid; 18:2 linoleic acid; 18:3 linolenic acid

Stabilising selection for degree of UFA



Main conclusions

- No conflict in simultaneous selection for high winter tolerance and maintained yield
- Homology between results obtained from molecular, phenotypic and fatty acid data
- Potential for further improvement of cultivars selected for marginal areas

Thank you for your attention!

