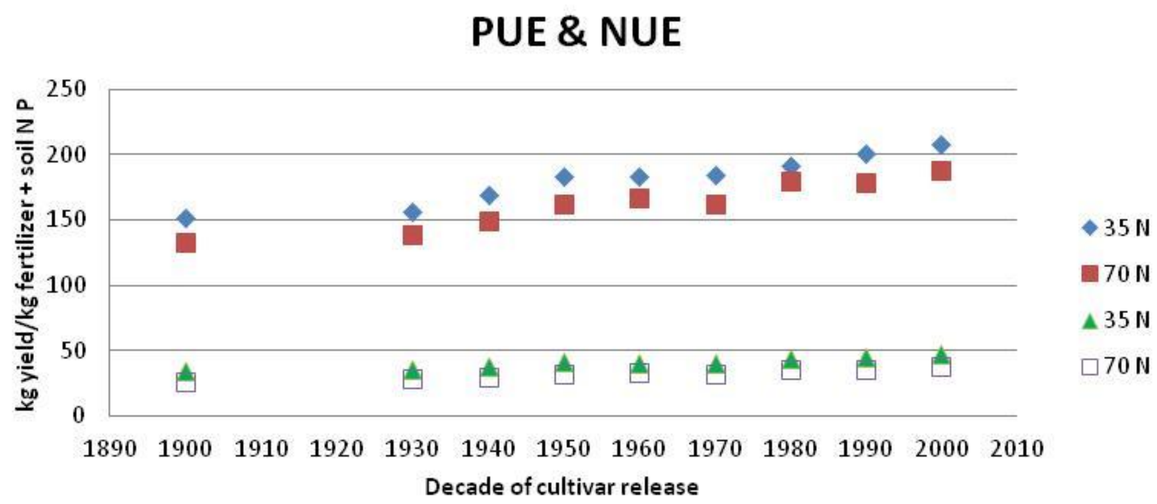
Nutrient use efficacy and resistance to seed borne diseases in European spring barley cultivars and landraces

Marja Jalli, Ari Rajala, Satu Latvala and Pirjo Peltonen Sainio, Natural Resources Institute Finland (Luke), Management and Production of Renewable Resources, FI-31600 Jokioinen, FINLAND, marja.jalli@luke.fi

Breeding has improved N and P use efficiency in barley

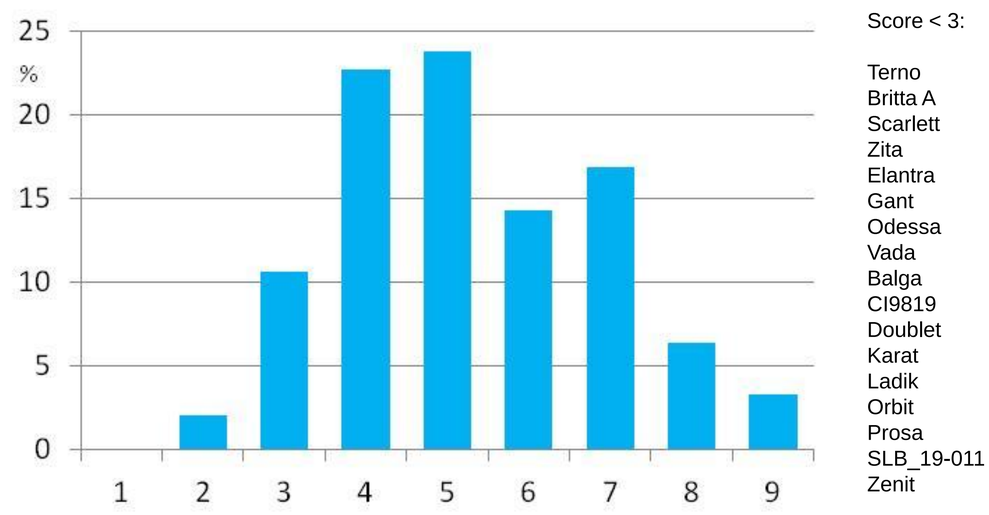
- 195 barley genotypes (72 NordGen landraces and 123 cultivars released during 1916-2010) were grown in two N regimes (35 and 70 kg N/ha) at the experimental farm of Luke in Jokioinen.
- Clear positive breeding effect on N and P use efficiency in barley cultivars was found. N and P use efficiency seemed to be coupled.
- Efficient N use and utilization correlated positively with grain yield and negatively with stem length.



N and P use efficiency at two fertilizer levels in European barley cultivars released in 1930-2000 (1900: barley landraces).

Significant improvement in net blotch resistance in European barley cultivars

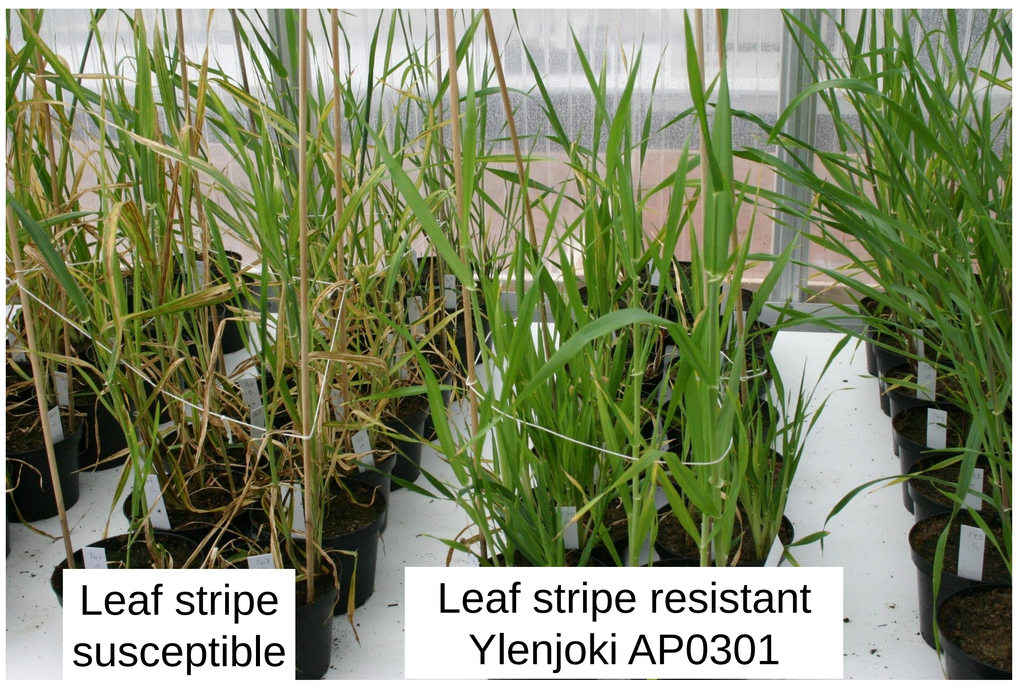
- 985 barley cultivars and landraces with different geographical origin were screened for net type (*Pyrenophora teres* f. *teres*) and spot type (*P. teres* f. *maculata*) resistance was tested in greenhouse.
- Frequency of resistant genotypes against net type net blotch was highest among European barley cultivars and Syrian landraces.
- Of the Nordic landraces only a Swedish landrace NGB15162 showed net blotch resistance that could be useful in breeding programmes.

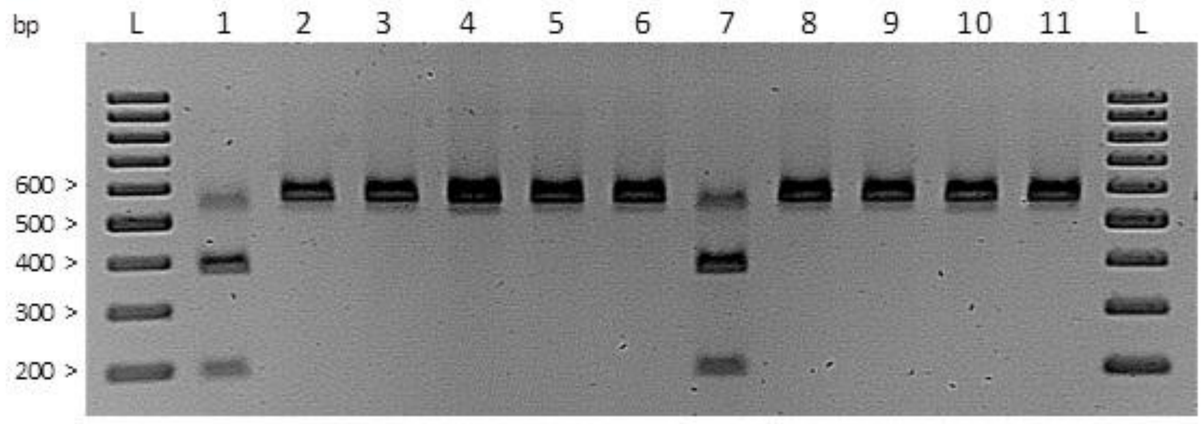


Frequency of different resistance types (according to the Tekauz scale) when testing 985 barley genotpes for net blotch resistance.

Good candidates for barley leaf stripe resistance in European barley landraces

- Leaf stripe resistance (*P. graminea*) was tested using a sandwich method, and loose smut resistánce (*Ustilago nuda*) using a point inoculation method in 125 barley genotypes (38 European landraces) in greenhouse.
- Significant differences in resistance was found.
- The most resistant genotype against leaf stripe was a Finnish landrace Ylenjoki AP0301 (NGB4413A). The most resistant cultivars were Jyvä and Harbinger.
- Moderate loose smut resistance was found among the tested barley landraces.
- Barley landrace from Croatia (Ljubljana KVL 15) showed best resistance for loose smut of the tested genotypes.
- Of the 125 barley genotypes tested, 13 resistant landraces and 11 resistant and four susceptible cultivars were characterized further using published leaf stripe resistance molecular markers for *Rdg1a* gene (Vada resistance).
- Four resistant cultivars and four resistant landraces (NGB13021, NGB16881, NGB9315 and NGB9410) showed to have leaf stripe resistance which genetic background differed from Vada resistance. However, there are no general molecular markers that could be used for screening leaf stripe resistance in all barley cultivars and landraces.





Marker FD526114 for Rdg1a gene (Vada resistance) was used to characterize barley leaf stripe resistance carried in tested landraces and cultivar Vada. PCR products were restricted with AflII (cuts in Vada) and size-fractionated on 2% agarose gel stained with ethidium bromide: 1 Vada, 2 NGB16881, 3 NGB314, 4 NGB4413A, 5 NGB4585, 6 NGB4669, 7 NGB6941, 8 NGB9315, 9 NGB9410, 10 NGB9478, 11 NGB9487, L is a DNA size marker (GeneRuler 100 bp DNA ladder, Thermo Scientific)