Nutrient content in wheat and the NAM-B1 gene
- A story of domestication and crop improvement

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The NAM-B1 gene
Null mutations of the wheat gene NAM-B1, delays leaf senescence by up to three weeks. The longer grain filling period allows for an increased transport of carbohydrates into the grain, potentially resulting in an increase in yield. In contrast the wildtype allele accelerates flag leaf senescence and efflux of protein and micro-nutrients to the developing grain. The wildtype allele was previously only known from tetraploid emmer and was thought to have been lost during the domestication of wheat (Uauy et al., 2006).

Historic presence of the wildtype allele
Wheats exhibited at the 1862 International Exhibition in London, and widely cultivated at the time, were brought to Sweden by the Royal Swedish Academy of Agriculture. The wheats were test cultivated and the harvest of 1867 was stored in glass jars. We genotyped these 64 wheats and found that the wildtype allele was still present in widely cultivated 19th century wheats, two bread wheats and two spelt wheats. Clearly NAM-B1 is not a domestication gene (Asplund et al., 2010).

Presence of the wildtype allele in Fennoscandian spring wheat
A screen of 367 bread wheats in the worldwide INRA core collection reveals only five (1.4 %) accessions with the wildtype allele. In contrast, 46 of 138 spring bread wheats from northern latitudes were wildtype. All the northern wildtype wheats had a Fennoscandian origin (Hagenblad et al., 2012). Fennoscandian spring wheats with the wild-type allele have a significantly faster senescence rate (Asplund et al., 2013). This trait might contribute to the preservation of the wildtype allele in Fennoscandia with its short growing season.

A selective sweep in NAM-B1
We screened 100 wild and landrace tetraploid wheats. The wildtype allele was found among wild emmers and emmers but not among durums. Sequence data suggest presence of a selective sweep in the NAM-B1 region. The size of the sweep is being investigated.

Further reading
