



Forages from the Nordic countries

Forage crop cultivation is a central part of agriculture in the Nordic countries (Norway, Sweden, Finland, Iceland and Denmark). It takes up an increasingly large part of the agricultural land as you travel north in the region and the climate becomes less suitable for other crops. Forages are a central source of fodder and form the basis of milk and meat production.

A WEALTH OF DIVERSITY

Most of the Nordic forage species have large natural distributions in the Nordic region and the natural populations can be an important genetic resource. These populations can harbour variation that is absent from the cultivated plants and when developing new cultivated varieties this variation can be used. For example, wild individuals that are winter hardy or resistant to a certain pest or disease can be crossed with cultivated plants to incorporate the important traits into a new cultivar. Landraces can also be a significant source of variation. Just like the natural populations they are generally well adapted to their local environment and can harbour unique qualities. The material exhibited in the field includes two Finnish landraces, one of timothy and one of red clover.

WILD RELATIVES

If the traits necessary to adapt a crop to new conditions are not available within the same species, variation in close relatives can be used. Many plant species can more or less easily hybridize with their close relatives. This makes it possible to transfer valuable properties into the cultivated crop via crossing. There is a large number of grass and clover species in the Nordic flora that are close relatives to the cultivated forage species. One example is the wild species 'alpine timothy' (*Phleum alpinum*) which is a close relative to the most commonly used forage species in the north, timothy (*P. pratense*, Figure 1).

TRAITS FOR SUCCESS

A combination of several different properties is needed to make a successful crop plant. Some traits, like for example yield, are valuable in basically all crops, while other traits are region or crop specific. In the Nordic region traits such as winter hardiness and earliness are essential to adapt the crop to the northern margin of its distribution. Disease and pest resistance is also essential in many forage species, even though the specific diseases differ. Increasing the resistance does not only increase the yield but also reduces the need for chemicals and thus reduces the environmental problems associated with agriculture. This is also an advantage of breeding for increased nutrient use efficiency as the need for industrial fertilizers can be reduced. Clovers (Figure 2) are especially important in this context as they are able to fix nitrogen from the air and thereby decrease the need for fertilizers.



Figure 1. A timothy (*Phleum pratense*) accession from central Sweden that is stored in the gene bank NordGen (NGB17014). Timothy is the major forage grass in most of the Nordic region.



Figure 2. Red clover (*Trifolium pratense*) pollinated by a bumble bee in a meadow in northern Sweden. Red clover is a good source of high quality forage for grazing animals and it is often sown in mixtures with forage grasses in the Nordic region.

CONSERVING DIVERSITY FOR THE FUTURE

In the face of climate change and an increasing human population, it is essential to produce new high yielding cultivars that are adapted to the changing climate and can be cultivated with a decreased environmental footprint. The diversity found in landraces and wild populations can be essential in this process. The conservation of diversity in crop species and their wild relatives is therefore an important part in assuring food security for the future.

There are however several threats to the genetic diversity important to agriculture. Landraces have for example been replaced to a very large extent by modern cultivars in the Nordic region. Natural and semi-natural populations are threatened by changes in land use, habitat loss, climate change and other human induced threats. Efforts are made to conserve these vital resources in several ways: in natural habitats, on farms and in gene banks. The gene bank for the Nordic region, NordGen, has made coordinated efforts to collect representative samples from the natural distributions of the most important forage species (see Figure 3 for an example) to assure their conservation for the future.

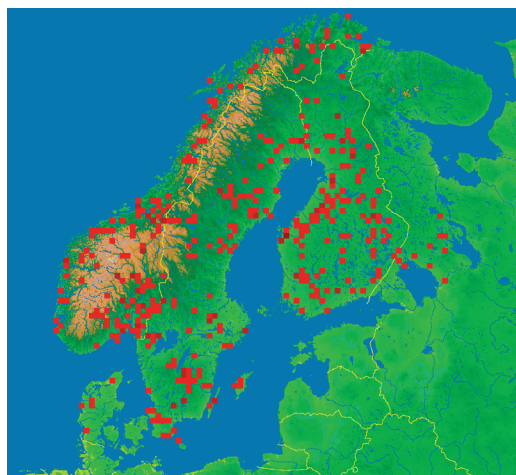


Figure 3. Geographic origin of the timothy accessions that are stored at NordGen, the gene bank for the Nordic region. Coordinated sampling has resulted in a good coverage across the natural distribution of timothy, and thereby of accessions adapted to different environments and climates.

MATERIAL IN THE FIELD

- Alpine timothy (*Phleum alpinum*), gene bank accession number NGB1340. A crop wild relative from Västerbotten in northern Sweden.
- Timothy 'Välikylä' (*Phleum pratense*), gene bank accession number NGB1105. Landrace from Nivala in central Finland
- Red clover 'Erkkilä' (*Trifolium pratense*), gene bank accession number NGB18270. A landrace from Sotkamo in central Finland

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WEB LINKS

NordGen: <http://www.nordgen.org/>. (In NordGen's database SESTO (<http://sesto.nordgen.org/sesto/>) you can find more information on all accessions stored here)

Svalbard Global Seed Vault: www.seedvault.no

EURISCO: <http://eurisco.ecpgr.org/>

PGR Secure: <http://www.pgrsecure.org/>