FORAGE GRASS BREEDING FOR EFFICIENT SUSTAINABLE RUMINANT PRODUCTION

Grass breeding started at the Welsh Plant Breeding Station in 1919 and the Aberystwyth `S` strains were the basis for the expansion of grassland productivity after the war. In the sixties and seventies the Station concentrated on developing new breeding techniques. One of these involved the development of stable hybrids between Italian and perennial ryegrasses and led to the highly successful varieties Sabrina, Sabel and Augusta.

Today's breeding programmes combine the molecular scientific research of marker assisted selection with established breeding methods, including pedigree recurrent selection, for the production of new varieties tailored to the rapidly changing face of UK and international grassland farming.

In the face of rising feed costs, ruminant farmers need to make increased use of environmentally benign healthy forages to produce high quality products. Present breeding objectives at IBERS reflect these needs by the production of varieties combing high nutritive value and efficient use of inputs like nitrogen with a longer growing season. Using varieties combining these traits bred at IBERS for UK farmers, it will be possible to improve the efficiency of ruminant production and increase the proportion of forage in the ruminant diet. Consideration is also given to safeguarding the rural environment and providing options for mitigating the long-term impact of global warming by breeding for reduced nitrogen requirements per tonne of forage and reducing forage fed ruminant emissions of nitrous oxide and methane through improved rumen microbial efficiency.

In the UK and Ireland, ryegrasses account for over 90% of the grass seed sown for forage. Research concentrates on breeding perennials, Italians and hybrids with a strong emphasis on herbage quality and reduced inputs. New techniques being developed at IBERS enable breeders to introduce fescue genes into ryegrasses to improve drought tolerance, response to low nitrogen input and winter survival.
IBERS breeding programmes aim to combine all these traits with significant improvements in total and seasonal yields, quality, disease resistance, stress tolerance, persistence and seed production.

Perennial ryegrass breeding includes both diploid and tetraploid variety production in medium and late flowering categories. Improving herbage quality, including an emphasis on increased water soluble carbohydrate (WSC) content, leads to better palatability and intake at grazing, enhanced silage fermentation and increased ethanol production for biofuel use. This improved quality means that ruminants can obtain more nutrients from grass, with reduced methane and nitrous oxide emissions during rumen fermentation and will also require less supplemental concentrates for the same productivity potential. Public concern about nitrate leaching has been increasing, leading to governments introducing nitrate limiting legislations, the breeders at IBERS aim to improve forage nitrogen use efficiency with new varieties that are able to perform well with less nitrogen fertiliser and make better use of available nitrogen from clover and applied sources.

Large plot trials to give an accurate assessment of variety performance

Italian ryegrass breeding at IBERS has concentrated on improving the nutritive value of the herbage and in particular stem digestibility and WSC content whilst also maximising productivity throughout the growing season. Improvements in these characteristics enables farmers to capitalise on both the grazing and silage making opportunities provided by this species with the high nutritive value improving animal performance from both grazed forage and improved silage

Hybrids between perennial and Italian, provide options for increasing the flexibility of sward management. Breeding concentrates on increasing the efficiency of herbage production through improving quality, persistence and regrowth potential of tetraploid hybrids. Better quality leads directly to improvements in animal production while greater persistence increases sward longevity and flexibility. Improved regrowth allows extra silage cuts or more frequent grazing.

Species hybridisation between fescue and ryegrass aims at improving adaptability, enabling grassland farmers to cope with reductions in nitrogen use and the impact of a changing climate. Though ryegrasses are superior in establishment and quality, fescues tend to be more broadly resilient to environmental stresses and less demanding of nutrients, particularly nitrogen. The aim is to transfer these beneficial traits from fescue species to ryegrass.

Sampling plot trials using a specialist plot harvester

Technology transfer. IBERS ensures wide availability of seed of its grass and clover varieties to all UK and Irish farmers through commercial partners Germinal Holdings Ltd (British Seed Houses in England , Wales and Scotland, McCauslands in N.Ireland and Germinal Ireland in the Republic of Ireland). A number of new varieties in all the important species are currently available and the breeding expertise of IBERS combined with the marketing experience of Germinal will enable grassland farmers to face future challenges with confidence