



Improving the uniformity and quality of broadleaf planting stock

PROJECT TEAM

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COMPLETION DATE: December 2009

BACKGROUND

The planting of broadleaf species in Ireland has increased in recent years; they now account for more than 30% of the planting programme. Consequently, there has been a renewed focus on improving the yield and quality of broadleaf planting stock in the nursery. The main focus of the QUALIBROAD project was to address these issues for broadleaf species of importance in the forestry programme in Ireland. The development of new seed pretreatments and seed storage protocols, and the effects of post germination aspects (cloches, fertilisation, mini-plugs) of nursery culture on seedling growth, yield and quality were examined during the early years of the project. The seed research element of the project focussed on common alder (*Alnus glutinosa* Gaertn.), birch (*Betula pendula* Roth and *Betula pubescens* Ehrh.), ash (*Fraxinus excelsior* L.), and pedunculate oak (*Quercus robur* L.). Most of this research was completed in 2007. In 2008, research on ash seeds was continued and new research was initiated on the seeds of spindle tree (*Euonymus europaeus* L.), rowan (*Sorbus aucuparia* L.) and blackthorn (*Prunus spinosa* L.), most of which are important for the more diverse species mix in new plantings. Research on the use of the exponential fertilisation method as a means of culturing oak seedlings in the nursery was conducted in 2008 and 2009.

OBJECTIVES

- To improve seed germination in spindle, rowan and blackthorn.
- To grow oak seedlings to plantable size in a single season using the exponential fertilisation method.

PROGRESS

Seed research

The effects of seed moisture content, warm treatment duration and chilling on the germination response of spindle and rowan seeds were investigated. Although the data have not been fully analysed yet, it appears that spindle seeds require very long periods of chilling to effectively release dormancy (much longer periods than recommended in literature). The germination response can be enhanced by using seed moisture content levels lower than the fully imbibed state. Some preliminary work commenced on blackthorn, focussing mainly on developing methods to break dormancy (especially the hard outer 'seed coat'), but no results are available yet.

Nutrition research

In collaboration with Prof. Douglass Jacobs of Purdue University, Indiana, the use of exponential nutrient loading to improve the quality of pedunculate oak seedlings, as well as its impact on the leaching dynamics was examined. Exponential nutrient loading of pedunculate oak seedlings shows potential as a means of producing nutritionally superior seedlings at Ballintemple nursery in one year. The exponential fertilisation technique involves giving seedlings incrementally increasing fertiliser rates that match their growth during nursery production. In addition, loading involves application of high fertiliser rates towards the end of the season (levels that exceed seedling growth demands) and allow them to store nutrients for use after planting. Results of the 2009 study at Ballintemple nursery indicate that exponentially loaded seedlings receiving 1,500 kg N ha⁻¹ during the abnormally wet summer reached final heights near target specifications (40 cm). In addition, these seedlings had superior stem and root nutrition compared to seedlings reared under conventional fertilisation (180 kg N ha⁻¹). These seedlings are likely to perform better after planting than conventionally produced stock. The fact that mean seedling height reached 40 cm during an exceptionally wet summer also indicates that 1-0 oak



Fertiliser trial (centre bed) at Ballintemple nursery in 2009.



Seedlings given 1,500 kg N ha⁻¹.

seedling production is possible in Ireland and that lower exponential rates may provide similar results in drier summers.

OUTPUTS

O'Reilly, C. 2009. *Enhancing seed germination in broadleaf species in bare root nurseries*. Invited oral presentation at: Innovation and New Horizons in Tree Nursery Stock Production and Forest Restoration – from Research to Business. IUFRO Conference, Rome, 12 March 2009.

O'Reilly, C., De Arip, N., Doody, C., O'Leary, D., Doody, P. and Thompson, B. 2008. Increasing the yield and quality of broadleaf planting stock through higher N fertilisation in the nursery. *Irish Forestry* 65: 5-16.

Doody, C. and O'Reilly, C. 2009. *Long periods of warm pretreatment enhance germination in common ash*. Poster presentation at Innovation and New Horizons in Tree Nursery Stock Production and Forest Restoration – from Research to Business. IUFRO Conference, Rome, 12 March 2009.

Schmal, J.L. 2009. *Exponential Nitrogen Fertilization of Quercus Robur Seedlings in County Carlow, Ireland*. M. Sc. (Forestry), Purdue University, West Lafayette, Indiana, USA.

Schmal, J., Jacobs, D.F. and O'Reilly, C. 2009. *Exponential fertilisation of pedunculate oak (Quercus robur L.) seedlings: quality assessment, nutrient budgeting, and leaching dynamics*. Poster presented at Spring Research Symposium, Purdue University, Indiana, April 2009.