Plant Selection in a Changing Climate©

Mary Forrest
Department of Crop Science, Horticulture and Forestry, University College Dublin, Dublin 4, Ireland

INTRODUCTION

According to climatologists, the climate in Great Britain and Ireland is changing. As horticulturists we see this in our ability to grow so-called tender shrubs such as *Olea* (olive) outdoors and in the enhanced flowering and fruiting of shrubs such as *Berberis* and *Rhaphiolepis*. If the climate continues to change then the nursery stock industry will also have to change the range of trees and shrubs it grows for the garden centre and landscape trade.

CLIMATE CHANGE SCENARIOS

The study *Gardening in the Global Greenhouse* (Bisgrove and Hadley, 2002) predicts some major climate changes with consequences for horticulture in Great Britain. Annual mean temperatures have already increased by 1.7 °C since the 1750s with a 1 °C increase in the 20th century. The number of cold days and frost incidence has decreased. In 2002 the U.K. Climate Impacts Programme (UKCIP) suggested a scenario in which mean annual temperature in the U.K. will increase by 2 to 3.5 °C by the 2080s. There will be more hot and dry days in summer, and very wet and stormy winters with less frost and snow (Bisgrove and Hadley, 2002).

Bisgrove and Hadley predict changes in plant growth, availability of nutrients, and occurrence of pests and diseases. Higher temperatures will cause stress in some plants but will also allow a wider range of genera to be cultivated. Increased winter rainfall will lead to water logging problems for some trees, shrubs, and sub-shrubs.

A similar scenario is predicted for Ireland. From the 1960s to the present the number of days with frost has declined. At Birr, Co. Offaly, in the centre of the country, the number of days with frost has declined from 50 to less than 40. At Valentia, Co. Kerry, in the southwest, the decline is from 15 days to less than 5 days. Rainfall has increased in the northwest from 800 mm per annum in the 1890s to 1150 mm in the 1990s. Summer rainfall is declining in the southeast. However there is an increase in rainfall in March and October throughout the country (Holden et al., 2004). The Irish Committee on Climate Change has stated (2004) that mean temperatures are likely to be 2 °C warmer than in the last quarter of the 20th century. Summer will be warmer. Winters are likely to be wetter by up to 20% in the west of Ireland while summers are likely to be drier by a similar amount in the east of the country (Irish Committee for Climate Change, 2004).

PLANT SELECTION

Public enthusiasm for plants and trees both in their own gardens and in public open spaces is likely to continue. How will nursery stock producers fulfil the demands of the consumer and supply plants suitable for a changing climate?

With higher temperatures and less rainfall in summer, plants sold will have to be more capable of withstanding moisture stress. Those intended to survive the winter will have to be wind firm and withstand waterlogged conditions. Fortunately suit-

able subjects are already in cultivation. Some of the trees and shrubs suggested in this paper grow in plant collections in Britain and Ireland; some are common in landscape schemes, while others are native or naturalised.

SOURCES OF PLANTS SUITED TO HIGHER TEMPERATURES.

Relatives of Existing Genera in Cultivation. Privet (*Ligustrum ovalifolium*) is a common hedging plant. *Ligustrum lucidum* is a more handsome shrub with graceful panicles of flowers, grown as a shrub and as a street tree in London.

Genera from Families Already in Cultivation. *Laburnum* ×*watereri* 'Vossii' and *L. alpinum* are popular garden trees. Other members of the *Fabaceae* are *Cercis siliquastrum,* a medium sized tree with pink pea-like flowers; *Gleditsia triacanthos* 'Sunburst', a tall round-headed tree with golden pinnate leaves; *Sophora tetraptera*, a medium sized tree with tiny pinnate leaves and deep butterscotch yellow flowers and *Robinia pseudoacacia*, with pinnate leaves and white flowers.

Solanum laxum 'Album' (syn. *S. jasminoides* 'Album') is a commonly grown climber. Relatives in the Solanaceae are *Cestrum* 'Newellii' with red flowers, which are already doing well in gardens, and *Cestrum parqui*, tenderer with greenish yellow flowers, in cultivation at the University of Oxford Botanic Garden.

Tree Species Cultivated in Continental Europe. *Catalpa bignonioides* is a flowering and fruiting landscape tree in London. *Koelreuteria paniculata* is a large tree with yellow flowers followed by bladder-like fruits. It grows in continental Europe and in collections in U.K. and Ireland. *Paulownia tomentosa,* a large tree with mauve flowers, is grown as a street tree in Paris and in collections in U.K. and Ireland.

Shrubs Native to the Mediterranean. Many members of the *Lamiaceae* (mint family) are native to the Mediterranean where they are found in dry, hot-baked, situations. *Salvia microphylla* var. *microphylla* (syn. *S. neurepia*), with red flowers, *Phlomis fruticosa,* with grey foliage and yellow flowers and *P. italica* with grey foliage and pink flowers, all grow to small or medium sized shrubs. *Cistus* (*Cistaceae*), the rockroses, are small to medium sized summer flowering shrubs which grow well in dry conditions.

Trees and Shrubs from Australia and New Zealand. Several plants in the Myrtaceae (myrtle family) including *Eucalyptus*, *Luma apiculata* (syn. *Myrtus apiculata*), and *Luma chequen* (syn. *Myrtus chequen*) are already cultivated in what are currently regarded as favoured situations in U.K. and Ireland. *Callistemon citrinus* is well known but less so is *C. pallidus,* a large evergreen shrub with pale yellow bottlebrush flowers. *Metrosideros umbellate* (syn. *M. lucida*) has glossy green leaves and, in late summer, bright red flowers with masses of stamens. Of the Proteaceae, *Protea* from South Africa and *Banksia* from Australia are both likely to become more in demand for gardens, while striking foliage shrubs such as *Gevuina avellana* and *Lomatia ferruginea* could become more widely grown as landscape shrubs. This is already the case with *Grevillea rosmarinifolia,* a medium-sized shrub which has been used in landscape situations in London.

Books and Articles About Tender Plants. *Shrubs for the milder counties* (Arnold-Foster, 1948) discusses a number of plants suitable for mild gardens in the south-west of England including *Lavatera*, *Abutilon*, *Correa,* and *Coprosma* which

have become popular garden shrubs, no longer confined to that area. More recently, former I.P.P.S. GB&I President Philip McMillan Browse has edited *Gardening on the Edge* (McMillan Browse, 2004), which reviews plants introduced to the south-west of England since the mid 20th century. Nursery growers could follow the lead of plant enthusiasts and see what "new" plants are being grown in gardens. *Restionaceae* is a South African family of clump forming, reed–like plants. Some 15 different species are growing in the garden of Phemie Rose, Kilvarock, near Durrus, Co. Cork, Ireland. *Pseudopanax,* a New Zealand genus related to *Hedera,* grows in well-sheltered gardens in Ireland with many being grown in a garden in Shankill, Dublin.

SOURCES FOR PLANTS SUITED TO WINDY AND WATERLOGGED SITUATIONS.

Native Trees and Shrubs. A number of native trees species do well in less-favourable conditions, for example *Prunus spinosa*, *Crataegus monogyna, Sorbus aucuparia, Betula pendula*, *B. pubescens, Ulex europaeus, Viburnum opulus, Euonymus europaeus, Ilex aquifolium,* and *Sambucus nigra.*

Naturalised, Alien or Pioneer Species. Some species introduced, as garden plants are suited to local conditions and become naturalised. Reynolds (2002) lists such plants in Ireland and some of these are suited to difficult growing conditions including *Buddleja davidii, Rhododendron ponticum, Symphoricarpos albus* var. *laevigatus* (*S. rivularis*), *S. albus*, *Leycesteria formosa, Prunus laurocerasus,* and *Cotoneaster simonsii.* However, some of these must be used with great caution as they can become invasive in certain situations.

Trees and Shrubs Adapted to Growing in Waterlogged Soils. *Alnus glutinosa* and *Salix* are familiar riparian species in Great Britain and Ireland. *Taxodium distichum*, swamp cypress, native to the Everglades in Florida is cultivated as an ornamental tree and increasingly seen as a landscape tree. *Cornus alba* and its many forms are grown in urban and rural area. *Betula nigra,* river birch, while only cultivated in plant collections at present, is suitable for planting in damp conditions.

Long Lived Shrubs Which Have Withstood Neglect in City Gardens. *Lonicera nitida, Ilex aquifolium, I.* × *altaclerensis* 'Hodginsii', *E. japonicus, E. fortunei, Forsythia* × *intermedia,* and *Fatsia japonica* are some examples.

Trees Resistant to Severe Wind. *Acer pseudoplatanus*, *Crataegus,* and *I. aquifolium* withstand severe wind conditions in the west of Ireland. White (1994) lists *Taxus baccata*, *Sequoiadendron giganteum*, and *Metasequoia glyptostroboides* as wind tolerant conifers.

SELECTION OF PROPAGATION MATERIAL

Genotypic and phenotypic variation occurs in plants not only in relation to morphology but also in relation to climatic tolerance. Nursery growers are already used to the concept of selecting provenance of propagating stock on the basis of winter hardiness and similar considerations will need to be taken account of in relation to drought tolerance, wind resistance and so on. The effect of climate on flowering and fruiting may also need to be considered and nurseries may need to trial new plants before marketing. At the Royal Botanic Gardens, Kew, following the loss of many trees in the storm of 1987, selection based on phenotypic variation now forms part

of the redevelopment policy (Bisgrove and Hadley, 2002).

CONCLUSION

In a changing climate where the range of trees and shrubs cultivated will alter, the nursery trade could look to more tender plants and familiar "tried and tested" plants to fulfil the demand by the pubic and private sector for trees and shrubs.

LITERATURE CITED

Arnold-Foster, W. 1948 (new edition 2000). Shrubs for the milder counties. Alison Hodge, Penzance, Cornwall, U.K.

Bisgrove, R. and **P. Hadley.** 2002. Gardening in the global greenhouse: the impacts of climate change on gardens in the U.K. UKCIP, Oxford.

Holden, N., J. Sweeney, A. Brereton and **R. Fealy.** 2004. Climate change and Irish agriculture. In: T. Keane and J.F. Collins (eds.), Climate, weather and Irish agriculture 2nd ed. 360–361. Agmet, Dublin.

Irish Committee on Climate Change. 2004. Climate change and Irish Agriculture website at <www.ria/committees/iccc/indev.html> at 7 Jan 2004

McMillan Browse, P (ed)**.** 2004. Gardening on the edge. Alison Hodge, Penzance, Cornwall, U.K.

Reynolds, S. 2002. A catalogue of alien plants in Ireland. National Botanic Gardens,

Use of Long Cuttings to Reduce Propagation Time of Rose and Fruit Rootstocks and Street Trees©

Wolfgang Spethmann

Division of Tree Nursery Science, Department of Horticultural Science, University of Hannover, D-30419 Hannover, Herrenhaeuser Str. 2, Germany

INTRODUCTION

Difficult-to-root species and cultivars need very precise coordination of plant and culture parameters (Spethmann 1998; 2000). More than 50 factors or conditions that can be altered need to be ranked. The most important ones are effective age stage of the stock plant, sticking date, humidification method, and method of overwintering.

Factors such as substrate mixture or growth hormone have been over estimated. For example, rhododendrons have been rooted in peat but also in pure gravel; difficult-to-root oaks have been rooted in gravel, peat, peat mixtures, or perlite. The success of specific hormone concentrations or formulations varies from year to year. Many species root without any hormone, most other species could be rooted with only one or two concentrations of IBA. For many years we have used only 0.5% IBA and a 3 peat : 1 sand mix (v/v) as a substrate for all species.

The importance of cutting length has very rarely been investigated. The range is mostly 10 to 30 cm, long cuttings of 1 m and more are only associated with *Salix* and *Populus*. Our investigations show that long cuttings (60 to 250 cm) of difficult-to-root species can be rooted successfully. As a result the production time of standard rose rootstocks, fruit trees, and street trees could be shortened and costs saved.