

# Evaluating plant hardiness

In the first of two articles discussing the limitations of hardiness ratings, KENNETH COX looks at plant survival in colder parts of the UK and its bearing on the RHS system

**F**OLLOWING THE SEVEREST winter in living memory, the subject of plant hardiness is particularly pertinent once again. I come to this subject, not as a scientist but as an author and nurseryman who wishes to give practical advice to readers and customers on plant hardiness.

My books on rhododendrons have generally been for a worldwide market and therefore need to reflect hardiness ratings that can be used internationally. My book *Garden Plants for Scotland*, written with Raoul Curtis-Machin, required a different approach. It was aimed purely at the Scottish market, so dealt with hardiness only as it pertained to Scotland. The book is a practical guide to selecting and growing plants for the length and breadth of Scotland, from the mild west coast or the windswept Shetlands to the coldest inland valleys. The latter experience record UK low temperatures: -27°C was recorded both at Braemar, Aberdeenshire, in 1982, and at Altnaharra, Highland, in 1995.

## Scottish Garden Plant Award

Some English gardeners may not appreciate how different the more northern climate affects plant performance. Many alpine plants,



Late spring frosts can damage flowers, such as this *Camellia*, and influence plant hardiness

such as *Meconopsis*, are much happier in the cooler summers of Scotland than they are further south. But others, perfectly at home further south, are poor performers in Scotland. *Camellia japonica*, *Cornus florida* and *Magnolia grandiflora* are a few of the many that may grow but are unlikely to flower. This led me to set up Scotland's version of the RHS's Award of Garden Merit (AGM). It is called the Scottish Garden Plant Award, born of the realisation that Scottish gardeners need to assess plant performance and hardiness for themselves.

It has long been apparent that plant hardiness in a northern maritime climate, such as that of

Britain and Ireland, is a complex issue and that plant survival is predicted by many factors and combinations of factors. I am convinced that tolerance of significant sub-zero temperatures is only part of the story as regards hardiness in Britain. I think it is more useful to define a 'hardy plant' one which is 'likely to survive and perform well in a given situation', perhaps best defined as 'robustness'. In this way, the full range of factors can be considered.

## Extreme cold

This is the traditional measure of hardiness and is a good predictor of survival of a plant in a continental climate where winters tend to be reliable and long. UK winters tend to be relatively mild: extreme sub-zero temperatures of -12°C to -18°C over large parts of the country only happen occasionally. Recent extreme winters were those of 1940, 1947, 1963, 1979 and 2009–10. Every 20–30 years seems to be the pattern, global warming notwithstanding.

I am not sure how useful such winters are in assessing hardiness, as they only come along once in a generation. If a plant survives 29 years out of 30, should it be considered hardy? The USDA ratings,



*Clematis armandii* 'Apple Blossom' is rated as H4 by the RHS system but its hardiness in very cold or northern UK gardens has been questioned

which rate plants according to winter cold tolerance, are used widely in North America, and to some extent in Europe. In the UK, they are of limited value and are often a poor predictor of plant survival.

### Timing of cold weather

Britain's fickle climate with wild seasonal temperature fluctuations is a regular problem for many plants. Winter and spring are stop-start: one minute it's mild and moist and buds are opening, the next it's sharp and frosty. Heavy snow can appear over night, only to turn to slush 24 hours later. Late frosts in spring can cause severe damage: *Camellia*, *Magnolia* and *Rhododendron* will suffer from frosted flowers, and frosted shoots and bark split can be fatal in severe cases.

In autumn, perennials that grow and flower late, such as salvias and penstemons, can be killed outright by a sudden drop in temperature. Garden centre and nursery stock, which has been grown under protection, is often planted out in gardens in March and April, only to be caught by late frosts or winds.

### Drainage, and winter wet

The same plant in well-drained soil is often considerably more likely to survive a winter than one in heavy, waterlogged soil. This is particularly true of plants from Mediterranean climate regions. Many plants from these places have silvery leaves and are able to withstand significant winter chills, but their native winters are usually drier than in the UK. Prolonged periods of damp cold cause root death, fungal diseases of foliage and die-back. Other plants such as *Dianthus* tend to rot if left in contact with wet cold soil. Mulching with gravel or growing over paving gives the plants more 'hardiness'.

### Hardiness of roots relative to foliage

The roots of most plants are far less hardy than the stems, branches and leaves. Snow, surface soil and frost all act as insulation to prevent the deeper soil and the roots from reaching much below freezing. Contrast this with a plant in a container with its youngest roots spiralling round the container's edge. These roots will be exposed to sub-zero temperature which will match

the outside air temperature. I have noted over the years than certain otherwise tough evergreens are particularly vulnerable to root-kill in pots. Examples include *Camellia*, *Ceanothus*, *Magnolia*, *Photinia*, *Prunus laurocerasus* and *Rosmarinus*. The 2009–10 winter has seen large numbers of nursery and garden centre stock suffering terminal root-kill. I was surprised to see how badly *Skimmia* were affected in Scotland, for example. Waterlogged pots increase the likelihood of root death. Plants often look healthy enough until mid spring when they collapse and die. The large volume of containerised Italian stock sold in the UK is particularly vulnerable.

### Ripening of wood

The further north you go, the more some plants struggle to ripen wood, due to the relative drop in the intensity and heat of summer sunlight. Plants that originate in the continental climate of eastern North America such as *Cornus florida*, *Magnolia grandiflora*, *Sassafras* and many others are unable to ripen their wood or set flower buds in cool northern summers. Although such plants are rated as very hardy in the USDA ratings, they are not 'hardy' in Scotland and parts of northern England due to poor wood ripening.

Plants that do best in northern maritime climates tend to come from regions far from the equator. These include British Columbia, southern New Zealand and southern Chile or mountain regions with cooling monsoon rains such as the Chinese provinces of Sichuan and Yunnan and the Himalaya. Such plants ripen their wood in low light levels and relatively little summer heat, so are well adapted to UK gardens.

### Age of plants

With many trees and woody



plants, age brings hardiness. A mature *Crinodendron* may have all its leaves burned off in a hard winter, but will often regrow from the woody trunk. However, a three-year-old plant of the same species just planted out will probably be killed.

### Provenance

Recent attempts to re-establish long lost tree cover in Shetland has led to the realisation that only trees from similar latitudes (such as southern Chile, Norway and Alaska) adapt well to Shetland's cool and very windy conditions. Seedlings from populations further south are simply not 'hardy' enough to establish there. Many plant species have wide geographical distributions and they often show considerable variation in hardiness, influenced by the latitude and altitude they inhabit.

### Rainfall, drought, heat and sun

Extreme heat and drought is as damaging to some plants as extreme cold. Hotter, drier summers are making this more of an issue in the UK. It is worth considering whether heat and drought tolerance should be considered another aspect of 'hardiness'.

### Microclimates

Within a garden there are always areas which provide more shelter and protection. Examples include south- and west-facing walls, under the eaves of a house, or under trees. Choosing the correct site can often make the difference in terms of plant survival.

### The RHS hardiness ratings

Where does a UK gardener generally turn for advice on hardiness? Classic garden reference books are often reluctant to give hardiness details. The RHS, and its many affiliated publications with publishers such



Numerous *Hebe* cultivars are rated as H4 but they are unlikely to be hardy throughout the British Isles

as Dorling Kindersley, uses a well-established system of H ratings. However, confusingly, some publications use one to three snowflake symbols in place of the H ratings (see p118), and others use the USDA zone system.

The H categories are as follows:  
H1 Requires heated glass in the British Isles.

H2 Requires unheated glass.

H3 Hardy outside in some regions of the British Isles or in particular situations, or which, while usually grown outside in summer, need frost-free protection in winter (e.g. dahlias).

H4 Hardy throughout the British Isles.

These RHS ratings are used primarily to accompany the Award of Garden Merit (AGM) designation. I have long believed that the ratings are inadequate and need to be revised for several reasons.

The RHS H4 rating is defined as 'hardy throughout the British Isles'. Little or no recent formal trials have been done to back this claim up. Included in the AGM listing are H4-rated plants such as *Alstroemeria*, dozens of *Camellia japonica*, *Catalpa*

*bignonioides*, *Ceanothus* 'Puget Blue', *Cercis canadensis* 'Forest Pansy', *Clematis armandii* 'Apple Blossom', *Cornus florida* 'Cherokee Chief', 17 cultivars of *Fuchsia*, 15 cultivars of *Hebe*, 12 cultivars of *Hibiscus syriacus*, *Jasminum officinale* and so on. These and many H4-rated plants on the AGM lists are simply not reliably hardy in colder and northern gardens, and it is dishonest to claim otherwise. I am not talking about exceptional winters such as 2009–2010 either. A nurseryman who follows the RHS guidelines and writes 'H4 Hardy throughout the British Isles' on a plant such as *Rhodohypoxis baurii* is being dishonest and probably breaking the law. The Trade Descriptions Act 1968 makes it an offence for a trader 'to apply, by any means, false or misleading statements, or to knowingly or recklessly make such statements about goods and services.' As a matter of urgency therefore, the RHS needs to alter its H4 definition as it is patently untrue.

What gardeners in Braemar, Scotland, or Snowdonia in Wales, or half way up the English Pennines, want to know is which plants are really tough and likely to survive in their area. And many of the hardiness factors listed above need to be taken into consideration.

There is no way of telling from the RHS ratings which the really hardy plants are. I recommend, at the very least, that the RHS add an H5 rating for plants suitable for cold, inland and high altitude gardens. In other words, plants which really are suitable for 'throughout the British Isles'.

My father, Peter Cox, and I took the decision unilaterally to include an H5 rating for our rhododendron publications several years ago. We re-defined H4 as 'hardy in all but the coldest parts of the UK [and similar



maritime climates] and H5 as 'hardy anywhere in the UK [and moderate parts of Europe]'. Our system actually extends to H9. The feedback we have had is that gardeners appreciate it.

RHS publications are considered valuable reference books internationally and are written with this in mind, except in their treatment of hardiness. I cannot accept that the RHS should continue to publish a hardiness rating system which does not adequately cover the UK, let alone colder climates in nearby mainland Europe. The current RHS ratings are parochial and inadequate. At the very least they should cross reference the USDA ratings, which are valuable for those who live in a continental climate.

### The way forward

I am pleased to learn that, at long last, the RHS is now taking the issue of hardiness ratings more seriously. In recent correspondence, John David, their Chief Scientist, has said, 'In the run up to the next 10-yearly review of the AGM lists in 2012, we would like to put in place a revised hardiness rating system that more adequately reflects people's experience of growing plants, while retaining the relative simplicity of the current coding system. I am open to suggestions as to what might be more useful but we will be consulting with the RHS Plant Committees for their views as well.'

Additionally, the RHS has recently undertaken a hardiness survey following the hard winters of early 2009 and 2009–2010. I hope that the RHS will take into account the many factors that predict plant success or failure. These may include heat and drought-tolerance as well as cold hardiness.

The 'best practice' for hardiness and climate zones that I have seen is the Sunset Climate Zone system



Some plants such as *Sassafras albidum* need summer ripening in order to survive cold winters

(developed by *Sunset* magazine) for the American Pacific Northwest and now extended across North America. The continent is divided into 45 climate zones. For example: 'Zone 7: Oregon's Rogue River Valley, California's High Foothills Growing season: May to early October. Summers are hot and dry; typical winter lows run from 23°F to 9°F (-5°C to -13°C). The summer-

### FURTHER READING

- Brady, M** (2008) Hardiness zone maps of the northern hemisphere. *The Plantsman* n.s. 7(3): 170–176  
**Cox, K** (2005) *Rhododendrons and Azaleas: A Colour Guide*. Crowood Press  
**Cox, P & Cox, K** (2001) *The Encyclopedia of Rhododendron Species*. 2nd edn. Glendoick Publications  
**Cox, K & Curtis-Machin, R** (2008) *Garden Plants for Scotland*. Frances Lincoln, London

### WEB RESOURCES

**Sunset Climate Zones**  
[www.sunset.com/garden/climate-zones](http://www.sunset.com/garden/climate-zones)  
**RHS Award of Garden Merit listing**  
[www.rhs.org.uk/plants](http://www.rhs.org.uk/plants)  
 Click on Plant trials and awards

winter contrast suits plants that need dry, hot summers and moist, only moderately cold winters.'

Detailed maps of the Sunset system are available online so it is easy for Americans to look up where they live and from this information, suitable plants can be selected. North America boasts a far wider climatic range than the UK, from semi-tropical to desert to permafrost, so the system could be simplified for the UK, perhaps mapping the UK with five to six broad hardiness zones.

Existing UK climate maps I have seen are of little or no practical use to gardeners, placing Orkney and Cornwall in the same hardiness zone for example, so this would need to be done properly. Zone examples might be 'West Coastal' (Cornwall, Wales, Cumbria, Argyll), and 'Inland Northern Valleys and Hills'. The mapping could be revised and improved as yearly data was analysed (as happens with the USDA ratings in North America). This mapping, coupled with an H1–H5 hardiness rating system would provide a relatively straightforward but much more gardener-friendly plant hardiness system than currently exists.

### Conclusion

Plant hardiness is an infinitely complex subject and there is no simple one-size-fits-all solution to evaluating local climate and the hardiness of specific genera or taxa. But gardeners deserve better than what is currently available, and I strongly advocate more research on these issues as a matter of urgency.

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