

Heavy metal resistant clones of willows from polluted areas useful for land restoration programmes

Friedrich W.C. Mang

Am Knill 24, D-2000 Hamburg 73, Germany

and

Rainer Reher

Grüner Weg 1, D-2057 Büchen, Germany

In order to keep the tidal port of Hamburg navigable for big ships, silt is constantly removed and dried in special landfills, the so-called 'Spülfelder'. These silt deposit areas in the port region afford the most heavily polluted substrates in this region, since the silt absorbs the industrial pollutants from both the upper Elbe and the Hamburg region, such as phenolics, halogenated carbohydrates and heavy metals. Apparently, the special conditions of these silt deposit areas act strongly selectively on germination and development of plants. Fresh silt provides, however, an ideal seed bed, and superficially dry silt deposits are quickly covered with a special flora. Among these, willows play an important role.

All willows found on these places belong to the *Salix smithiana*-*dasyclados* complex which stems from

Salix × *smithiana* Willd. (= *S. caprea* × *viminalis*), and

Salix × *dasyclados* Wimm. (= <*S.* × *smithiana*> × *S. cinerea*).

Male and female clones taken from this material have been tested in various programmes and have proven to be excellently suited for planting in polluted areas, such as silt deposits, roadside verges, railway dams; they also have proven to be resistant to moderate salinity.

Restoration of montane willow scrub on Ben Lawers National Nature Reserve.

D. K. Mardon and H. M. Cole

The National Trust for Scotland, Fagus, Manse Road, Killin, Perthshire FK21 9SH

Ben Lawers National Nature Reserve (NNR) is managed jointly by The National Trust for Scotland (NTS) and The Nature Conservancy Council for Scotland (NCCS). Recently, it has been recognised that isolated willow plants on the reserve represent the remnants of a montane scrub community which has declined throughout Scotland (Mardon 1990). Some of these species are now uncommon and severely restricted in range. Active conservation measures have been initiated to restore areas of montane willow scrub.

Grazing by sheep has been identified as one of the greatest threats to the surviving species. Recovery and regeneration can only begin if this is removed. Enclosure fences have, therefore, been erected to protect selected areas from grazing. Although these areas contain populations of willows, conditions are often not

suitable for natural regeneration of scrub to occur being dioecious, pollination can only occur if male and female plants are growing in close proximity. Seedlings and cuttings are being grown and a programme of planting initiated.

Enclosure projects are being undertaken on several other NTS properties.

Reference

Mardon, D. K. 1990. Conservation of Montane Willow Scrub in Scotland. *Transactions of the Botanical Society of Edinburgh* **45**, 427–36.

Anatomical and morphological microfeatures of the leaf in *Salix* L. species and their physioecological significance

P. Paiero, P. Semenzato and T. Urso

Department of Forestry, University of Padua, Italy

The willows show the whole range of woody forms: tree forms in warm temperate climates, shrub forms in cold temperate climates and dwarf and prostrate forms in cold climates and arctic zones. The three ecophysionomic types are related to the three subgenera that constitute the genus *Salix*, *Salix*, *Vetrix* and *Chamaetia* respectively.

The great adaptability of the willows to a large diversity of environmental conditions suggested the presence of physiological adaptations. In studies the fine leaf morphology in some species growing in the Italian Alps were examined.

In most of the species examined some xeromorphic adaptations were found such as:

Thick cuticle and waxy layer on the epidermis.

Mucilages in the walls of the epidermal cell.

Phenolic compounds in the vacuole of the epidermal cells and underlying layers.

Hair and trichomes.

Our observations pointed out a relationship between ecological types and some of the xeromorphic adaptations (waxes).

(a) Warm-climate willows (subgenus *Salix*) possessed very thick waxes (up to 40 μ) and hairs

(b) Cold-climate willows (subgenus *Chamaetia*) possessed thin laminated waxes and no hairs

(c) Temperate-climate willows (subgenus *Vetrix*) possessed intermediate characters.