Pact 42 - 18 : Dagfinn Moe

Living Garden Plants Used in Research into Ancient Gardens as Demonstrated by Box (*Buxus sempervirens*) and Elm (*Ulmus glabra*)

Abstract

Investigations into garden history in the Bergen area, western Norway, have yielded new knowledge about the gardens and traditional management practices.

Living individuals of box (*Buxus sempervirens*), at Fana herregaard, Store Milde, Bergen, western Norway, are dated back to before 1690. They were planted in a Renaissance garden, where they were used in hedges and as solitaire garden elements. The individuals have survived the Little Ice Age (1700-1750), and therefore are probably a suitable genotype for use further north in areas of cooler climate.

Sections of two pollarded elms (*Ulmus glabra*) from Damsgaard, Bergen, have been studied. The trees were planted in 1780-1781. Changes in annual ring-width are attributed mostly to management (pollarding), but partly to pathogenic attacks, probably by the fungus *Ceratocystis ulmi*. The pollarding cycle has mainly been between 4 and 8 years.

INTRODUCTION

Work on garden history is of an interdisciplinary character. It needs cooperation of work by different specialists such as historians of garden-art, architects, botanical taxonomists etc. In such joint work each type of specialist will create new knowledge, both for the general topic and for the particular field itself.

Strictly botanical research in ancient gardens in western Norway has during recent years given important new information both within botany and for the ancient garden co-workers.

In this paper case studies from two projects will be presented : (1) « Old » individuals of box (*Buxus sempervirens*) at Fana herregård, 40 km

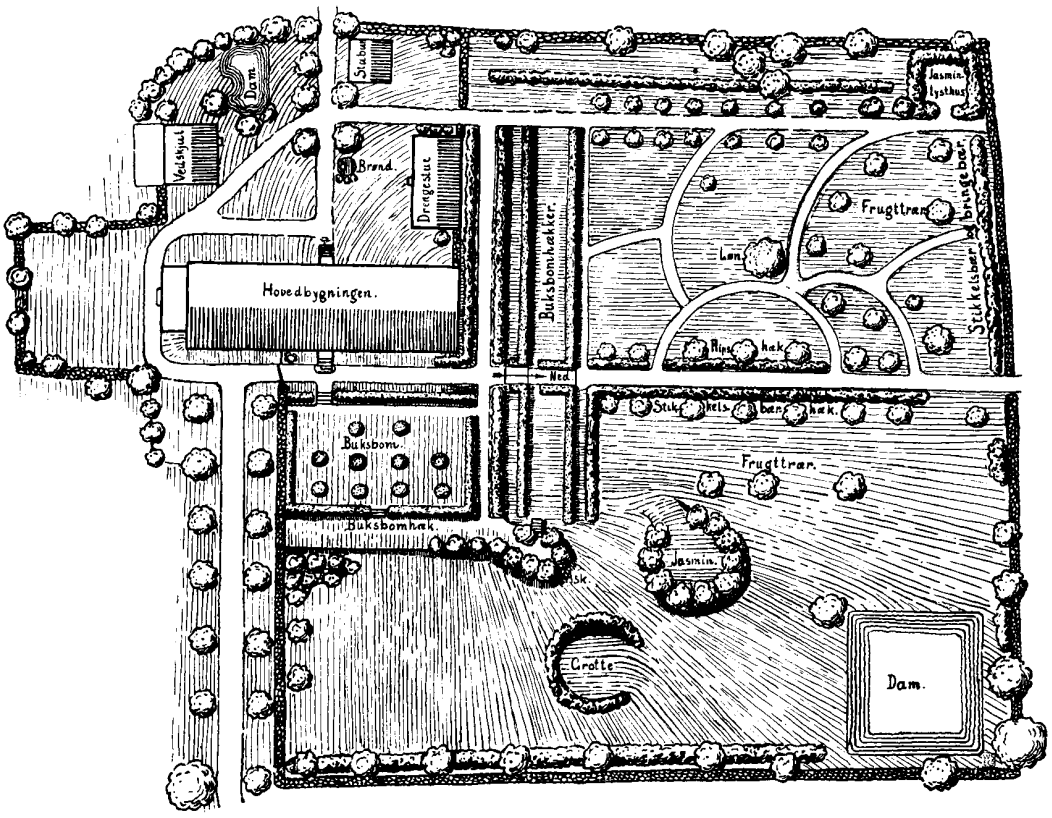

Fig. 1. A reconstruction map of the Milde Herregaard (Milde Estate) including the different parts of the garden made by Schnitler (1915). The Renaissance parterre with 10 box (= buksbom) plants is seen in front of the main building (= hovedbygningen). The main part of the hedges is made by box as well.

south of the city of Bergen at Store Milde, and (2) « old » garden elm trees in the baroque garden at Damsgaard, Laksevåg in Bergen (Figure 1).

Box studies at Milde

The age of the garden

Fana herregård (Milde Estate) in Bergen is known in the literature back to 1528, when Franciscan monks left their monastery (today the cathedral in Bergen) during the Reformation process in Norway (Hjellestad, 1919).

The main garden is surrounded by stone walls, and has included both a fruit tree, vegetable and a « Ribes » garden in addition to a small

Fig. 2. Box planted around 1670-1680 at Milde Herregaard, south of Bergen. Within the garden, box has been used both in hedges and as solitary specimens. Descriptions of the garden and of the individuals more than 100 years ago show only minor management, if any, at least during the last 150 years (Photo D. Moe).

Fig. 3. Box at Milde herregård, south of Bergen. The size of a the coin is 23 mm (Photo D. Moe).

Fig. 4. Part of cross-section of the yougest elm (dated back to ca. *1826). The changes of the tree-ring width is easily seen. The wavy picture is caused by pollarding (Radius – 26 cm) (Photo J.G. Moe).*

ornamental garden. The garden, as such, is first mentioned in 1719 (Hjellestad, 1919 ; Schübeler, 1888 ; Schnitler, 1915). In the middle part of the eighteenth century the box was mentioned as something special in the garden (Schübeler, 1888), and in 1915, Schnitler in his work made a plan of the garden based on the existing garden elements (Figure 2) (Moe, 1990, 1991). It shows a typical type of small Renaissance garden known especially from The Netherlands from the second part of sixteenth century.

Most of the box grow on a small, ca 150 m^2, square terrace in front of the old main building (Figure 3). (For general information about box see e.g. Baillon, 1859, Hegi, 1935, Wegmüller, 1984).

A few years ago, limited annual ring counts were made of some of the dry branches on the solitair box (Figure 4). This study was combined with a circumference measurement, as made previously by Schübeler (1888) (1,25 meter above the ground). In both cases the calculated age was a minimum of 300 years, possibly about 310 years (from 1989). In the second part of the seventeenth century Bergen was expanding greatly. Houses and churches were built, sculptures were made etc. (e.g. Lexow, 1930). But so far only documentary information about gardens and gardening exists.

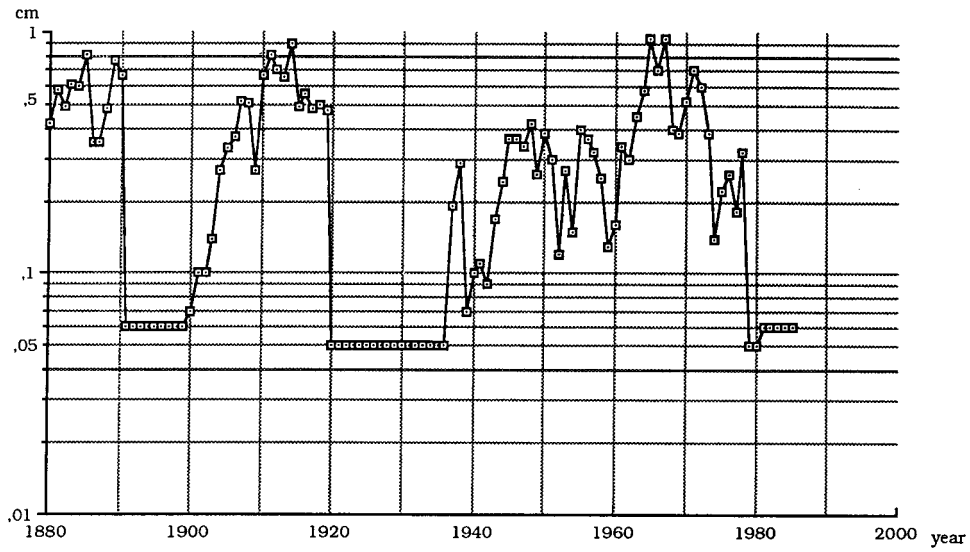

Fig. 5. Annual growth of the elm (dated back to ca. *1781) for the period 1880-1985 (The vertical axis: annual treering width in cm, horizontal axis: years A.D.). Several drops, some major, some minor, are seen in the section, mainly caused by park tree management. The changes in treering growth will give a «wavy» picture, (see figure 4). The recovery process differs. Often a short recovery is the normal as seen in e.g. 1886 and 1942. A long recovery often results from a fungus attack.*

However, the box at Store Milde are living proof of the earliest Renaissance garden dated in Norway so far. The garden at Rosendal Barony, Hardanger, western Norway, dates back to the period after 1692 (Schnitler, 1915) and is possibly younger.

The maximum age for garden individuals of box in Europe is not accurately known. Ages of more than 500 years should be possible according to Schübeler (1888) and Hegi (1935, p. 204-213). The growth of the species is very slow, from around 1 mm a year to less than 0,1 mm depending of local conditions and topiary. (Topiary – the art of modelling (e.g. Porcinai, 1949)).

Another aspect, more of interest to botanists and gardeners, is that this stand of box must be a very favourable source of *Buxus sempervirens* with regard to the climate and other conditions in northern Europe. The maximum of the Little Ice Age, dated to A.D. 1750, is well known in Scandinavia, with suggested reduced mean temperatures of 0,5-1,0° and agricultural damage in marginal areas (Matthews, 1989; Nesje and al., 1991). The survival of the stand of this south-European species during this severe period at Milde indicates a most suitable genotype for use further north and for genebanks. The species has been tried north of the Polar Circle in last century (Schübeler, 1888) with some success.

TABLE 1. — A COMPARISION OF YEAR WITH FALL IN GROWTH AND TREE-RING WIDTHS (BOTH THE 1781 AND THE 1826 ELM) BETWEEN 1781 AND 1939 OF THE STUDIED TREECYS

Fall in growth	1781	1794	1804	1808	1815	1820	1827	1833	1838	1846
"	1826						1834	1838	1845	1851
Fall in growth	1781	1857		1874	1880	1886	1891			
"	1826	1857	1864	1873	1880		1893	1900	1909	1912
Fall in growth	1781	1915	1920			1939	1952	1959	1968	1979
"	1826		1921	1924			(reduced growth)			

ELM STUDIES AT DAMSGAARD

The age of the garden

Damsgaard Hovedgaard (Damsgaard Estate) (in Laksevåg, Bergen, west Norway) (Figure 1) consists of a Rococo house of the Renaissance period, with a Baroque garden of *ca.* 1770-1790, and a so-called Victorian — « English » garden of the nineteenth century, both recently restored (Fægri *et al.*, 1989). A row of trees, mainly elms, flanks the front of the house on both sides (Aas and Moe, 1986), and has been a part of the Baroque-garden. Some of the elms were felled during alterations in 1985, and sections of two of them were examined.

The largest cross-section, more than 1 meter in diameter, was shown by counting the annual rings to date from 1781. The other section had almost uncountably narrow rings in the outermost 1.5 cm, but its date is estimated to *ca.* 1825. This section belonged to a tree, which probably was planted to fill a gap left by a death of an original tree (Fægri *et al.*, 1989).

The ring-widths

The annual rings of both elms were measured (Figure 5). Each tree has a history of more or less sudden falls in ring-width, followed by several years of very slow growth and then by a gradual recovery. Some of these coincide between the two trees, others do not (Table 1). The first fall in both may be attributed to damage to the young tree in transplanting.

These elms appear to have been pollarded for much of their lives; this is apparent both from the form of the surviving trees, and from early-nineteenth century coloured prints of them (Dreier, 1810a, 1810b). Different species and different climate most likely have developed different manage-

ment tradition (Rackham, 1988) and topiary. Several customary ways of pollarding elms in formal parks and other non-woodland situations are known in the Bergen region. The whole tree may be pollarded in a cycle of 4-5 years, resulting in hundreds of new shoots which are thinned the following year (park elms). Alternatively, the tree may be fully pollarded every 8-10 years, with half the branches being cut halfway through the cycle (more solitary trees). Longer- rotation pollarding may be adopted to save expense. The work is usually done in January-March (in Bergen) while the trees are dormant (Moe and Rackham, 1992).

Pollarding of a tree results in a sudden fall in the ringwidth followed by a period of slow growth and gradual recovery as the leafage is restored. Such cycles have been published from old oaks in England (Rackham, 1976, Fig. 5c), and are found in other trees both in Norway (Austad, 1988) and England (Rackham, 1988). Most of the regrowth cycles in these elms are undoubtedly due to their history of pollarding. In the elms studied, most falls in ringwidth were abrupt in the 19th century (e.g. the years 1857, 1885, and 1893), whereas in the twentieth century some reductions took place over two or three years, 1900, 1924. This difference is attributed to a change to a less drastic method of pollarding.

Disease

Pollarding of elm may facilitate for fungal attacks, this contrary to similar management of oak and ash. In this study some of the reductions in ring-width are associated with a specific brownish discolouration in the early-wood vessels (Stipes and Campana, 1981). These details are characteristic of attacks by *Ceratocystis ulmi*, the Dutch Elm Disease fungus, – a species which belongs to a group of fungi which is most selective concerning their hosts, and has been described by many previous authors (e.g. Peace, 1960), – and are familiar in infected elms.

Infection by *Ceratocystis* normally kills a larger or smaller part of the crown and thus has an effect similar to pollarding. The annual rings usually show a damage cycle : they suddenly become narrow and then gradually recover as the lost leafage is regenerated (Rackham, 1975, Fig. 26c). The trees, however, need more time to recover after a strong attack than by a pollarding.

Management may have been effected by damage caused by the fungi. It cannot categorically be stated that the damage cycles were caused by disease and not by pollarding, because it is quite possible that pollarding may have caused the disease to develop, or the trees may have been pollarded in response to disease. A possible connection between fungus damage and pollarding at Damsgård has been discussed by Moe and Rackham (1992).

Some general comments

Short-lived plants such as annuals are of limited interest in this kind of study, while perennials, and especially woody species, may be of great importance.

Throughout Europe a large number of trees and bushes are used in gardens. Most of these reach ages of more than 100 years, for some between 500 to 1000 years, e.g. Juniper (*Juniperus communis*), pine (*Pinus silvestris*) and Oak (*Quercus robur*). In central and south Europe, a large number of other taxa can be added. A well known example is olive (*Olea europaea*), but also possibly grape (*Vitis vinifera*).

Not all trees, however, are easy to use in this context, as shown by lime (*Tilia cordata*) trees planted at Damsgaard. Because of the unsuitable distribution of the vessels, and the poorly grown dense wood in late summer autumn, the different thin and narrow annual rings are difficult to distinguish.

Despite these limitations, detailed studies in most old woody garden plant species can give additional important information about the history of gardens.

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