



Disease-resistant elm cultivars
Butterfly Conservation trials report, 2010

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1. Abstract

The Hampshire & Isle of Wight Branch of *Butterfly Conservation* (BC) initiated trials of elm cultivars highly resistant to Dutch Elm Disease (DED) in 2000. The trials are in fulfilment of Objective 5 for the White-letter Hairstreak (WLH) in BC's South Central Regional Action Plan: to evaluate their potential as host plants for the butterfly, now a DEFRA UK Biodiversity Action Plan 'Priority' species (no. 945) on account of its increasing scarcity as a consequence of DED pandemic. The trials are believed to be the most comprehensive of their kind in the world.

2. Introduction

The elm trials are located at five sites in southern Hampshire. The sites feature very diverse ground conditions, from arid rendzinas atop an outlier of the South Downs to waterlogged London Clays less than one metre above sea level along the shores of Portsmouth Harbour. Accessions were completed by the spring of 2010, and now comprise all of the 13 commercially available cultivars with a scientifically proven '5 out of 5' resistance to DED, most released since 1995. The resistance of the trees to Dutch elm disease has been determined independently in North America and Europe by inoculation with unnaturally high doses of the causal microfungus, *Ophiostoma novo-ulmi*. The BC trials in Hampshire have therefore focussed on:

- Appearance (form / structure, leaf size and shape)
- Phenology
- Rate of growth

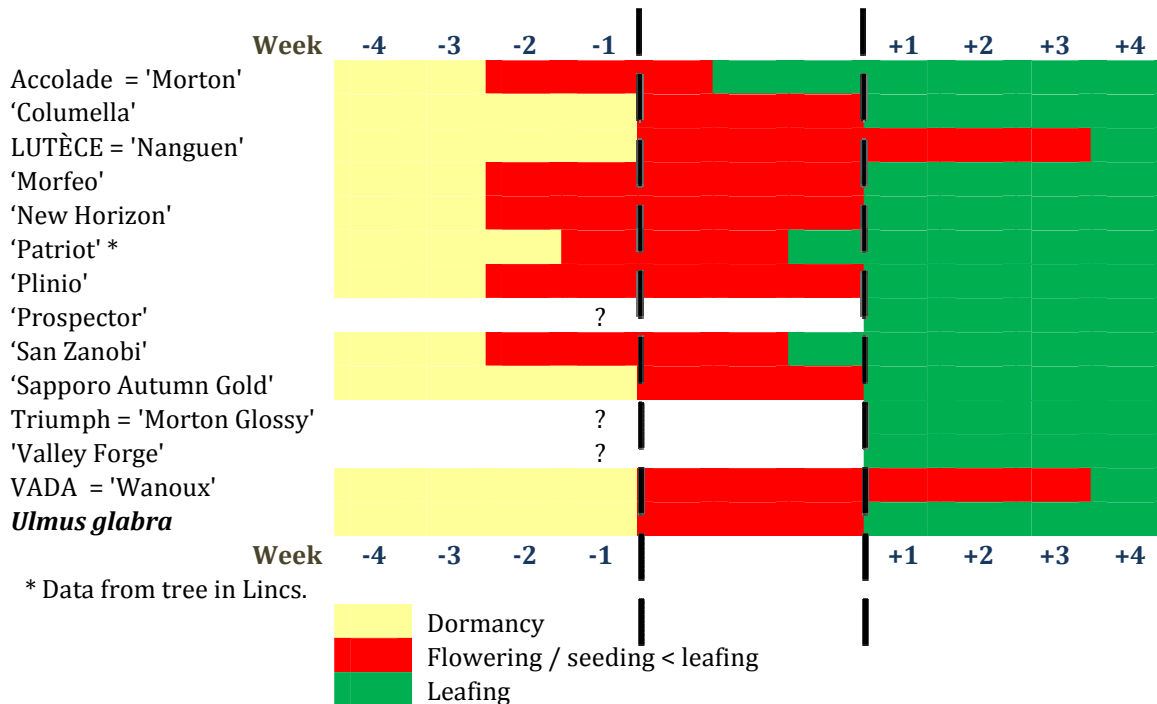
and susceptibility to:

- Wind rock
- Waterlogged, anoxic ground over winter
- Drought
- Leaf scorch
- Branch damage

4. Comparative phenology

Another factor of significance is the synchrony of the trees' phenology with the life-cycle of the WLH. The larva emerges from its ovum in mid March in Hampshire, and immediately feeds on the elm flowers, progressing to the seeds, and ultimately the leaves. Thus it is of critical importance that the cultivars are in flower at the same time as the native hostplants, such as the Wych Elm *Ulmus glabra*. Below is a simplified plot of the phenology of the cultivars relative to the Wych Elm.

Elm cultivar phenology (observed 2010), compared with the Wych Elm *Ulmus glabra*



As can be appreciated from the table, the majority of trees flower up to two weeks before *U. glabra* but, significantly, are still in flower when the flowers of *glabra* emerge. 'Accolade' flowers and flushes very early, whilst the Dutch clones 'Lutèce' and 'Vada' flower / seed at the same time as *glabra*, but the leaves do not flush until nearly a month later, although the seeds are retained until that time, and after. It is hoped the significance of these discrepancies to the butterfly can be evaluated in the next stage of the trial. It is worth mentioning however, that the butterfly was successfully, if inadvertently, reared on an exclusive diet of dried seeds at a *Cemagref* research station in France after young larvae were unwittingly gathered with seed which was partially dried placed in storage for several months.

5. Performance

Only one of the trees died in the trials, but some exhibited poor stability, requiring prolonged stake support, while others grew very slowly and / or exhibited poor structure. Nearly all the trees have Asiatic ancestors from which they have inherited anti-fungal genes. However, environmental conditions in the Far East are, with few exceptions, very different from those experienced in southern England. Typically, winters in the mountains of Asia, where most of the elm species are found, are dry and very cold, whilst summers are short, hot, and wet.

Many of these trees also differ in appearance to with their European counterparts, often being significantly smaller, with uncharacteristic foliage. Ergo: these trees would not, for all their virtues, look at home in the wider English countryside, and should only be planted as ornamentals in urban parks.

6. The butterfly

The White-letter Hairstreak *Satyrium w-album* is a monophagic species entirely reliant on Elm. Larvae have been very occasionally been found feeding on oak and bird cherry in continental Europe, but these occurrences are regarded as random.

Moreover, it is sexually mature elm which is required, as the larvae hatch in mid-March, a number of weeks before the leaves flush, and immediately feed on the elm flowers, progressing to the seeds.

Much encouragement can be found in the fact that the White-letter Hairstreak is en-demic to much of the Far East, including Japan, where it thrives on several of the elms used in hybridization in Europe and the USA. The insect is not found in North America however. Although the WLH has yet to colonize the trials trees, as most have only attained sexual maturity since 2008, a number of other elm-feeding Lepidoptera have been observed on the trees.



White-letter Hairstreak on *Ulmus* 'Lutèce', Julita, Sweden. Photo: Leif Wahlberg

7. The trees described

The following pages offer illustrated descriptions of the trees and their foliage.

A performance checklist is offered at the end of each page:

+++ = Good, ++ = Fair, + = Poor.

Accolade™ = 'Morton'

Hybrid cultivar: *Ulmus davidiana* var. *japonica* × *Ulmus davidiana* var. *japonica*

Origin: Morton Arboretum, USA; released 2000.



Photo: Marlin



DESCRIPTION

The parent tree at the Morton Arboretum is noted for the resemblance of its habit to the American Elm *Ulmus americana*, its upright-arching branches creating the familiar vase-shape, although the tree does not grow as large, reaching scarcely 20 m at maturity. Its glossy, deep green leaves are also markedly smaller, rarely exceeding 8 cm in length.

PERFORMANCE

- +++ Stability (resistance to wind rock)
- ++ Resistance to exposure (leaf scorch, branch breakage)
 - + Resemblance to native elm
- ++ Suitability for street planting
- ++ Rate of growth
- +++ Tolerance of waterlogging (>3 months' inundation over winter)
- +++ Tolerance of drought
 - ++ Flowering, fruiting, synchrony with Wych Elm *U. glabra*.
 - ++ Leafing synchrony with Wych Elm *U. glabra*.

Wikipedia: [http://en.wikipedia.org/wiki/Ulmus %27Morton%27](http://en.wikipedia.org/wiki/Ulmus_%27Morton%27)

'Columella'

Hybrid cultivar: 'Plantyn' selfed

Origin: Dorschkamp, Netherlands; released 1989.



DESCRIPTION

A tall, fastigiata tree with very upright branches, but develops a broader crown in later years. The rough and curiously twisted leaves, < 7 cm long, are the result of a recessive gene inherited from its Exeter Elm ancestor, and are arranged in asymmetric clusters on short branchlets. The first Dutch cultivar immune to DED to be released in 1989.

PERFORMANCE

- +++ Stability (resistance to wind rock)
- +++ Resistance to exposure (leaf scorch, branch breakage)
 - + Resemblance to native elm
- +++ Suitability for street planting
 - ++ Rate of growth
- +++ Tolerance of waterlogging (>3 months' inundation over winter)
 - + Tolerance of drought
- +++ Flowering, fruiting, synchrony with Wych Elm *U. glabra*.
- +++ Leafing synchrony with Wych Elm *U. glabra*.

Wikipedia: http://en.wikipedia.org/wiki/Ulmus_%27Columella%27

Lutèce™ = 'Nanguen'

Hybrid cultivar: 'Plantyn' × (*U. minor* × *U. minor*) × ('Bea Schwarz' × 'Bea Schwarz' self.)

Origin: Dorschkamp, Netherlands; released 2002 by INRA, France (patent holders).



DESCRIPTION

The stem of Lutèce typically forks at a height of 1 - 2 m, < 5 steeply ascending branches develop to form an open crown. Lutèce is distinguished by the shape and colour of its leaves; < 11 cm long × 10 cm wide, almost identical to those of the Field Elm, *U. minor*, being bright green in colour, with a rough upper surface and coarsely serrated margins.

PERFORMANCE

- ++ Stability (resistance to wind rock)
- +++ Resistance to exposure (leaf scorch, branch breakage)
- +++ Resemblance to native elm
 - + Suitability for street planting
- ++ Rate of growth
- +++ Tolerance of waterlogging (>3 months' inundation over winter)
- +++ Tolerance of drought
- +++ Flowering, fruiting, synchrony with Wych Elm *U. glabra*.
 - + Leafing synchrony with Wych Elm *U. glabra*.

Wikipedia: http://en.wikipedia.org/wiki/Ulmus_%27Nanguen%27

'Morfeo'

Hybrid cultivar: (*U. × hollandica* × *U. minor*) × *U. chenmoui*

Origin: Istituto per la Protezione delle Piante, Italy; released 2010.



DESCRIPTION

'Morfeo' is a robust, fast-growing tree able to freestand at a very early age. The stem forks at between 1.5 m and 2 m from the ground, the branches featuring irregular patches of corky bark. The reddish branchlets bear elliptic leaves, < 12 cm long × 8 cm broad, which closely resemble those of the Field Elm.

PERFORMANCE

- +++ Stability (resistance to wind rock)
- +++ Resistance to exposure (leaf scorch, branch breakage)
- +++ Resemblance to native elm
 - + Suitability for street planting
- +++ Rate of growth
- +++ Tolerance of waterlogging (>3 months' inundation over winter)
- +++ Tolerance of drought
 - ++ Flowering, fruiting, synchrony with Wych Elm *U. glabra*
- +++ Leafing synchrony with Wych Elm *U. glabra*.

Wikipedia: http://en.wikipedia.org/wiki/Ulmus_%27Morfeo%27

'New Horizon'

Hybrid cultivar: *Ulmus davidiana* var. *japonica* × *U. pumila*

Origin: Wisconsin Alumni Research Foundation (WARF); released 1995 .



DESCRIPTION

The tree has a compact pyramidal form, with comparatively dense foliage comprising glabrous, dark-green, elliptical leaves < 12 cm long by 7 cm broad, occasionally without the asymmetric bases typical of the genus. Growth is unusual; the tree increases in height only slowly, while its trunk thickens comparatively quickly. The crown can suffer <25 % dieback over winter.

PERFORMANCE

- +++ Stability (resistance to wind rock)
 - + Resistance to exposure (leaf scorch, branch breakage)
 - + Resemblance to native elm
- +++ Suitability for street planting
 - + Rate of growth
- +++ Tolerance of waterlogging (>3 months' inundation over winter)
- +++ Tolerance of drought
 - ++ Flowering, fruiting, synchrony with Wych Elm *U. glabra*
- +++ Leafing synchrony with Wych Elm *U. glabra*

Wikipedia: http://en.wikipedia.org/wiki/Ulmus_%27New_Horizon%27

'Patriot'

Hybrid cultivar: 'Urban' × *Ulmus davidiana* var. *japonica* 'Prospector'

Origin: U S National Arboretum, Washington D. C.; released 1995.



DESCRIPTION

'Patriot' is monocormic, and develops an upsweeping crown, ultimately adopting a narrow vase-shape. The leaves are slightly obovate, with doubly-serrate margins and typically acuminate apices, of an average size for the genus, < 10 cm long by 7.5 cm broad, glossy dark green turning yellow in autumn. Flowering usually begins when the tree is aged six years.

PERFORMANCE

- +++ Stability (resistance to wind rock)
- +++ Resistance to exposure (leaf scorch, branch breakage)
 - ++ Resemblance to native elm
- +++ Suitability for street planting
- +++ Rate of growth
 - ++ Tolerance of waterlogging (>3 months' inundation over winter)
- +++ Tolerance of drought
 - ++ Flowering, fruiting, synchrony with Wych Elm *U. glabra*.
 - ++ Leafing synchrony with Wych Elm *U. glab*

Wikipedia: http://en.wikipedia.org/wiki/Ulmus_%27Patriot%27

'Plinio'

Hybrid cultivar: 'Plantyn' × *U. pumila*

Origin: Istituto per la Protezione delle Piante, Italy; released 2004



'Plinio' on moist, fertile soil



'Plinio' on chalk downland



DESCRIPTION

A Jekyll and Hyde character, forming an ungainly, unsteady tree with splaying branches and often inadequate rootstock where grown on fertile soils, whereas on thin arid chalk soils a more substantial rootstock is stimulated, whilst the exposure produces a sturdy, bushy tree. The leaves are < 6.5 cm long by 3 cm broad and glabrous on both sides.

PERFORMANCE

- ++ Stability (resistance to wind rock)
- +++ Resistance to exposure (leaf scorch, branch breakage)
- ++ Resemblance to native elm
 - + Suitability for street planting
- ++ Rate of growth
- ++ Tolerance of waterlogging (>3 months' inundation over winter)
- +++ Tolerance of drought
 - ++ Flowering, fruiting, synchrony with Wych Elm *U. glabra*.
- +++ Leafing synchrony with Wych Elm *U. glabra*.

Wikipedia: http://en.wikipedia.org/wiki/Ulmus_%27Plinio%27

'Prospector'

Cultivar: *Ulmus davidiana* var. *japonica*

Origin: U S National Arboretum, Washington D. C.; released 1995.



DESCRIPTION

'Prospector' is a comparatively small, slow growing cultivar of the Japanese Elm, its broad-crown typical of the species. The tree ultimately attains a height of @ 14 m. The deep-green, glossy obovate leaves are < 11 cm long by 8 cm wide, emerging orange-red and turning yellow in autumn.

PERFORMANCE

- +++ Stability (resistance to wind rock)
 - + Resistance to exposure (leaf scorch, branch breakage)
- ++ Resemblance to native elm
 - + Suitability for street planting
- ++ Rate of growth
 - + Tolerance of waterlogging (>3 months' inundation over winter)
- +++ Tolerance of drought
 - ? Flowering, fruiting, synchrony with Wych Elm *U. glabra*.
- +++ Leafing synchrony with Wych Elm *U. glabra*.

Wikipedia: http://en.wikipedia.org/wiki/Ulmus_%27Prospector%27

'San Zanobi'

Hybrid cultivar: 'Plantyn' × *U. pumila*

Origin: Istituto per la Protezione delle Piante, Italy; released 2003.



DESCRIPTION

'San Zanobi' is a fastigate, monocormic tree, with glabrous, bright green leaves < 15 cm long × < 6 cm broad. Like its compatriot 'Plinio', the tree lacks striking autumn colours. The original propagation method in Italy using rooted cuttings often failed to develop a balanced, symmetric rootstock, and @ 15% of trees were blown down in gales.

PERFORMANCE

- ++ Stability (resistance to wind rock)
- +++ Resistance to exposure (leaf scorch, branch breakage)
- ++ Resemblance to native elm
- +++ Suitability for street planting
- +++ Rate of growth
 - + Tolerance of waterlogging (>3 months' inundation over winter)
- +++ Tolerance of drought
 - ++ Flowering, fruiting, synchrony with Wych Elm *U. glabra*.
 - ++ Leafing synchrony with Wych Elm *U. glabra*.

Wikipedia: http://en.wikipedia.org/wiki/Ulmus_%27San_Zanobi%27

'Sapporo Autumn Gold'

Hybrid cultivar: *Ulmus davidiana* var. *japonica* × *U. pumila*

Origin: Wisconsin Alumni Research Foundation (WARF); released 1975 .



DESCRIPTION

The tree forms a densely foliated vase-shaped crown. The leaves are narrowly-elliptical, < 9 cm long by < 4.5 cm wide. As the name implies, the leaves turn pale yellow in autumn. Flowering usually begins when the tree is aged six years. The tree is known to host the White-letter Hairstreak in UK.

PERFORMANCE

- +++ Stability (resistance to wind rock)
- +++ Resistance to exposure (leaf scorch, branch breakage)
 - + Resemblance to native elm
- ++ Suitability for street planting
- ++ Rate of growth
 - + Tolerance of waterlogging (>3 months' inundation over winter)
- +++ Tolerance of drought
- +++ Flowering, fruiting, synchrony with Wych Elm *U. glabra*.
- +++ Leafing synchrony with Wych Elm *U. glabra*.

Wikipedia: http://en.wikipedia.org/wiki/Ulmus_%27Sapporo_Autumn_Gold%27

Triumph™ = 'Morton Glossy'

Hybrid cultivar: 'Accolade' × 'Vanguard'

Origin: Morton Arboretum, USA; released 2000.



DESCRIPTION

Dismissed as "ugly" by Prof. Michael Dirr on account of its "wild" growth and splaying branches, a judgment confirmed by the *Butterfly Conservation* trials. The leaves are a deep glossy green when mature, < 10 cm in length by 5 cm broad, with rough upper surface and finely toothed margins. In commerce, the tree is propagated by grafting onto an *U. pumila* rootstock.

PERFORMANCE

- ++ Stability (resistance to wind rock)
 - + Resistance to exposure (leaf scorch, branch breakage)
 - + Resemblance to native elm
 - + Suitability for street planting
- ++ Rate of growth
 - + Tolerance of waterlogging (>3 months' inundation over winter)
- +++ Tolerance of drought
 - ? Flowering, fruiting, synchrony with Wych Elm *U. glabra*
- +++ Leafing synchrony with Wych Elm *U. glabra*

Wikipedia: http://en.wikipedia.org/wiki/Ulmus_%27Morton_Glossy%27

Vada™ = 'Wanoux'

Hybrid cultivar: 'Plantyn' × 'Plantyn' selfed

Origin: Dorschkamp, Netherlands; released 2003, by INRA, France (patent holders).



DESCRIPTION

'Vada' is a more compact tree than its elder sibling 'Lutèce', and grows at a significantly faster rate. The glossy, dark-green leaves, < 11 cm long by 8 cm wide, are coarsely toothed and have conspicuous venation. The *Butterfly Conservation* trial trees planted as whips in 2007 have yet to attain sexual maturity.

PERFORMANCE

- +++ Stability (resistance to wind rock)
- +++ Resistance to exposure (leaf scorch, branch breakage)
 - ++ Resemblance to native elm
- +++ Suitability for street planting
- +++ Rate of growth
 - ++ Tolerance of waterlogging (>3 months' inundation over winter)
- +++ Tolerance of drought
- +++ Flowering, fruiting, synchrony with Wych Elm *U. glabra*.
 - + Leafing synchrony with Wych Elm *U. glabra*.

Wikipedia: http://en.wikipedia.org/wiki/Ulmus_%27Wanoux%27

'Valley Forge'

Cultivar: *Ulmus americana*

Origin: U S National Arboretum, Washington D. C.; released 1995.



Photo: USDA, National Arboretum

DESCRIPTION

Prof. Michael Dirr described the tree's form as "floppy". All examples included in trials in California were withdrawn after a combination of rapid growth and poor structure condemned the trees as "likely to require more maintenance than most municipalities would find acceptable". However, these verdicts may simply reflect the fact that they were grown in warm climates. The dark green leaves are large, < 17 cm long by 10 cm broad.

PERFORMANCE

- +++ Stability (resistance to wind rock)
- ++ Resistance to exposure (leaf scorch, branch breakage)
 - ++ Resemblance to native elm
- +++ Suitability for street planting
 - ++ Rate of growth
- +++ Tolerance of waterlogging (>3 months' inundation over winter)
- +++ Tolerance of drought
 - ? Flowering, fruiting, synchrony with Wych Elm *U. glabra*.
- +++ Leafing synchrony with Wych Elm *U. glabra*.

Wikipedia: http://en.wikipedia.org/wiki/Ulmus_%27Valley_Forge%27

8. Recommended trees

Countryside

Sheltered sites with moist, well drained soils:

Morfeo
Lutece
Vada
Patriot
Valley Forge

Exposed sites with arid, chalk soils:

Morfeo
Plinio
Vada

Waterlogged sites with heavy clay soils:

Morfeo
Lutece
Valley Forge

Town

Parks:

Morfeo
Lutece
Vada
Columella
Patriot
Prospector
New Horizon
Sapporo Autumn Gold
Accolade
Valley Forge

Streets:

Columella
Patriot
San Zanobi (after due quality control by supplier)
New Horizon (on fertile, free draining soils only)

9. Disease-Resistant Elm Cultivars: Suppliers in or to the UK

'Accolade' (from 2012)

Bonte Hoek kwekerijen, Glimmen, Netherlands

Sizes not known.

www.bontehoek.nl

bontehoek@bontehoek.nl tel. 00 31 050 4061244

'Columella'

Hillier Nurseries, Ampfield, Hants

Bare-root to rootballed trees, girths 8 – 25 cm.

www.hilliertrees.co.uk

tel. 01794 368733

J A Jones, 99 Bankfield Lane, Southport, Lancs.

Bare-root to rootballed trees, girths 8 – 25 cm.

www.jajones.co.uk

email: sales@jajones.co.uk tel. 01704 228235

LUTÈCE ® = 'Nanguen'

Adrian Ayley, Southminster, Essex

15 & 30 litre potted standards

www.adrianayley.com tel. 01621 774473

Duchy of Cornwall Nursery, Lostwithiel, Cornwall

5-litre pot trees

www.duchyofcornwallnursery.co.uk

email: sales@duchyofcornwallnursery.co.uk tel. 01208 872668

F P Matthews 'Trees for Life', Tenbury Wells Worcs

12-litre pot / 2m high trees

www.frankpmatthews.com

email: enquiries@fpmatthews.co.uk tel. 01584 810214

Hillier Nurseries, Ampfield, Hants

Standards (from 2012)

www.hilliertrees.co.uk

tel. 01794 368733

Les Pépinières Minier, 49250 Beaufort-en-vallée, France

Bare-rooted whips

www.pepinieres-minier.fr

email: gbsales@minier-nurseries.fr tel. 00 33 2 41 79 48 43

'New Horizon'

Hillier Nurseries, Ampfield, Hants

Standards

www.hilliertrees.co.uk

tel. 01794 368733

'Patriot' (from 2012)

Bonte Hoek kwekerijen, Glimmen, Netherlands

Sizes not known.

www.bontehoek.nl

bontehoek@bontehoek.nl tel. 00 31 050 4061244

'Prospector' (from 2012)

Golden Hill Plant, Marden, Kent

Sizes not known

www.goldenhillplants.com

email: goldenhillplants@hotmail.com tel. 01622 833218

F P Matthews 'Trees for Life', Tenbury Wells, Worcs.

Sizes not known

www.frankpmatthews.com

email: enquiries@fpmatthews.co.uk tel. 01584 810214

'Plinio'

Umbrador, Spello, Italy

All sizes

www.umbrador.it

email: umbrador@pec.it, tel. 00 39 742 315007

'Rebona' (not included in BC trials)

Hillier Nurseries, Ampfield, Hants

Standards

www.hilliertrees.co.uk tel. 01794 368733

'San Zanobi'

Bonte Hoek kwekerijen, Glimmen, Netherlands

Sizes not known.

www.bontehoek.nl

email: bontehoek@bontehoek.nl tel. 00 31 50 4061244

Umbrador, Spello, Italy

All sizes

www.umbrador.it

email: umbrador@pec.it tel. 00 39 742 315007

'Sapporo Autumn Gold'

Ashridge Nurseries, Castle Cary, Somerset

Standards

www.ashridgetrees.co.uk/allprods.php

email: info@ashridgetrees.co.uk tel. 01963 359444

Buckingham Nurseries, Buckingham

Bare-rooted whips

www.buckingham-nurseries.co.uk

email: web-enquiries@buckingham-nurseries.co.uk tel. 01280 822133

'Sapporo Autumn Gold' cont.:

Chew Valley Trees, Chew Magna, Bristol
30-litre potted trees
<http://www.chewvalleytrees.co.uk>
email: info@chewvalleytrees.co.uk tel. 01275 333752

Golden Hill Plants, Marden, Kent
20-litre potted trees
www.goldenhillplants.com
email: goldenhillplants@hotmail.com tel. 01622 833218

Triumph® = 'Morton Glossy'

F P Matthews 'Trees for Life', Tenbury Wells, Worcs.
7-litre pot trees, small number (residual stock)
www.frankpmatthews.com
email: enquiries@fpmatthews.co.uk tel. 01584 810214

VADA® = 'Wanoux'

Adrian Ayley, Southminster, Essex
8 – 12 cm girth standards
www.adrianayley.com
tel. 01621 774473

Duchy of Cornwall Nursery, Lostwithiel, Cornwall
10-litre pot trees
www.duchyofcornwallnursery.co.uk
email: sales@duchyofcornwallnursery.co.uk tel. 01208 872668

Golden Hill Plants, Marden, Kent
40-litre and 2-litre potted trees
www.goldenhillplants.com
email: goldenhillplants@hotmail.com tel. 01622 833218

Hillier Nurseries, Ampfield, Hants
Standards
www.hilliertrees.co.uk
tel. 01794 368733

Les Pépinières Minier, 49250 Beaufort-en-vallée, France
Small (<50 cm) potted trees
www.pepinieres-minier.fr
email: gbsales@minier-nurseries.fr tel. 00 33 24179484

'Valley Forge' (from 2011)

Golden Hill Plant, Marden, Kent
10 or 15-litre potted trees.
www.goldenhillplants.com
email: goldenhillplants@hotmail.com tel. 01622 833218