

Mistletoe (*Viscum album* L. subsp. *album*) on the Dawn-redwood (*Metasequoia glyptostroboides* Hu et W.C.Cheng)

Jemioła pospolita (*Viscum album* L. subsp. *album*) na metasekwoi chińskiej
(*Metasequoia glyptostroboides* Hu et W.C.Cheng)

MICHAL RICHTER

Department of Planting Design and Maintenance,
Faculty of Horticulture, Mendel University of Agriculture and Forestry in Brno

Ústav biotechniky zeleně, Zahradnická fakulta,
Mendelova zemědělská a lesnická univerzita v Brně
69 144 Lednice na Moravě, Czech Republic
e-mail: richter.michal@centrum.cz

Received: 22 June 2011; Accepted: 25 July 2011

ABSTRACT: On 19th November 2008 in Lednice, Moravia, in the south of the Czech Republic, six specimens of mistletoe (*Viscum album* L.) were found on one dawn-redwood (*Metasequoia glyptostroboides* Hu et W.C.Cheng). The mistletoe on the *Metasequoia* was found near the parterre in front of the palm house in Lednice castle's famous garden. One of the shrubs was in fruit and was taxonomically identified as *Viscum album* L. subsp. *album*. Herbarium samples were deposited in the herbarium of Nový Dvůr arboretum near Opava. The *Metasequoia* in question was growing in poor light conditions. Another specimen nearby, growing in good light, had not been attacked by mistletoe.

Key words: hemiparasite, Lednice in Moravia, Taxodiaceae, Viscaceae, Cupressaceae *sensu lato*

Introduction

On 19th November 2008, during conservation work on the castle grounds in Lednice, Moravia, a few plants of *Viscum album* L. were discovered to be growing on one of two *Metasequoia glyptostroboides* Hu et W. C. Cheng growing close to each other. This species had not previously been known to be a host!

Location and description of the site

The mistletoe on the *Metasequoia* was found in the north-east part of the garden – in its later, geometrical section, near the parterre in front of the palm house (12m from the busy Břeclavská Street). GPS coordinates: N 48°48.877' and E 16°48.298' (± 5m); the altitude is 174m above sea level.

The basic climate parameters for Lednice are: average annual temperature of +9°C (average January temperature

–1,9°C; July +19,1°C), annual rainfall 480mm, of which 306mm falls during the April–September growing season (Vybrané klimatické..., 2009). In comparison, the current Chinese refuge for *Metasequoia glyptostroboides* (Lichuan, 1959–1978): average annual temperature +13°C, in the coldest month the temperature varies between –6,1°C and +1,7°C (with an absolute minimum of –15,4°C), and in the warmest month the average varies between +23,3°C and +32,3°C (absolute maximum +35,4°C). Annual rainfall oscillates around 1300mm (Ben LePage et al. 2005). So the Chinese climate is warmer and wetter.

The park in Lednice fulfills many of the conditions necessary for mistletoe to naturalise on new, as-yet unknown, host trees: a rich diversity of potential host species; climate which favours the ontogenesis of mistletoe; the presence of birds, which are very significant in the distribution of seed; and, last but not least, adverse environmental conditions which allow the plant to establish itself on its stressed host. The land on which the *Metasequoia* in question grows

has, since World War II, been part of an ornamental tree nursery and is not within the protected part of the park. Near to the *Metasequoia* with the mistletoe, in a dense clump of overgrown trees we find: *Thuja plicata* Donn ex D. Don, *Chamaecyparis nootkatensis* (D. Don) Spach (= *Xanthocyparis nootkatensis* (D. Don) Farjon) 'Pendula', *Taxus baccata* L., *Robinia pseudoacacia* L. (with mistletoe) and *Acer campestre* L. (with mistletoe).

We estimate these trees to be some 50 years' old, given the date of the establishment of the nursery and the study of trees cut down here in November 2008. Therefore the Chinese metasequoia hosting mistletoe was probably planted in Lednice when this species was introduced to the Czech Republic in the 1950s or 60s.

Description of the host plant

The *Metasequoia* is growing in a rather dry place – which is why, for its age, it is relatively poorly developed. The tree is 15m tall, with the upper part of the crown 3–4m across. The girth of the trunk, at 130cm from the ground, is 79cm.

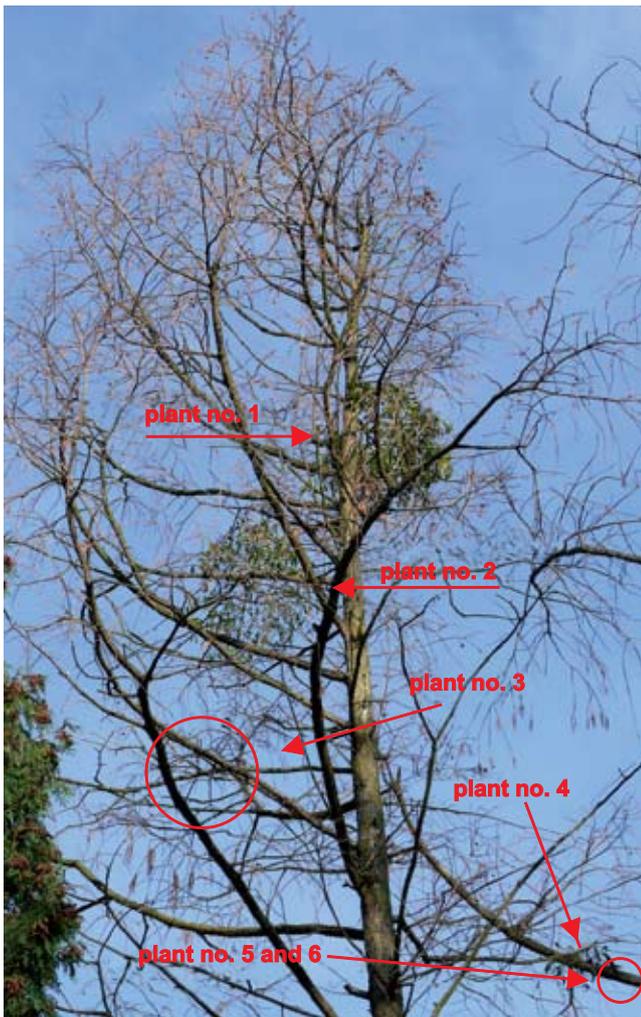


Fig. 1. Part of the crown with each mistletoe plant highlighted (photo M. Richter, 12th December 2008)

The crown is very loose. The branches up to 2/3 of the height of the tree have already dried out and the leader is damaged. All of this is however unrelated to the presence of mistletoe. In addition a young ivy plant *Hedera helix* L. has climbed 3m up the trunk.

Next to this tree is another *Metasequoia*, growing in clearly better conditions, with less competition from the crowns of other trees. It is taller, with a wider and fuller crown and a visibly thicker trunk. There is no mistletoe yet on this tree. Both trees produce cones.

There has been no recorded incidence of mistletoe on any of the other 13 metasequoias growing in the southern part of the castle park, nor on any of the 14 trees growing farther out in the landscape part.

Description of the mistletoe plants

Six mistletoe plants have been found on the *Metasequoia* in question, which I identify as *Viscum album* L. subsp. *album* (Fig. 1):

Plant 1: the highest growing – at 13m – on a branch near the trunk. This plant is in the best condition, densely leaved, but does not fruit (male plant?). Its estimated age in 2008 – as for all the plants – c. 9–10 years old. (The observations were made only from the ground and from photographs).

Plant 2: growing c. 1m below the first, also on a branch near the trunk. Slightly smaller than plant 1 (60×30cm). Female plant, fruiting heavily (Fig. 2). Around 10 years old. The host-tree branch is almost dry and the mistletoe already shows signs of weakness, with thinner leaf cover. Beneath the first branching one finds ± three segments; while there



Fig. 2. Fragment of the fruiting plant no. 2, after removal from the branch of the *Metasequoia* (photo M. Richter, 14th December 2008).

can be up to 5 internodes above the 1st branching. The flower buds are found on the last internodes and the fruits on the 3rd and 4th internodes (The material was obtained by breaking it off the branch of the *Metasequoia*).

Plant 3: about 1m below plant no. 2, much further from the trunk of the *Metasequoia* (more or less half way along the radius of the crown of the host tree, on a dead branch). The plant is dead, dark, leafless, c.6 years old (assessed on the basis of photographs).

Plant 4: growing on a thinner branch, at the edge of the crown of the *Metasequoia*, at around 11m high (Fig. 3). The section beneath the first branching has \pm three segments; age c. 6-8 years old (material obtained from part of the branch of the host tree).



Fig. 3. Plant no. 4 collected later together with part of the branch from the host tree as herbarium material; ringed is the two year old plant no. 6 (photo M. Richter, 12th December 2008)

Plant 5: found on the recovered branch with plant no. 4, it was a seedling with an adhesive disc on the upper part of the branch of the *Metasequoia*, 8cm from plant no. 3, around 2 years old.

Plant 6: c.1cm from plant no. 5. This germinated \pm on the side of the branch, which here has a diameter of 1.4cm (this plant can be seen with the naked eye and in the photographs – in the form of an adhesive disc and the first 2 leaves; c. 2 years old. Plants no. 5 and 6 may have come from the same seed with two embryos?

The herbarium material was gathered by the author, on 14th January 2009. The specimens were deposited at the herbarium of the Nový Dvůr arboretum near Opava (a department of the *Slezské zemské muzeum*, Opava). The identifications were made on the basis of the morphological features of the fruit. Having removed the internal parts of

the fruit (namely the seed and the surrounding endo- and mesocarp) and having attempted to separate them from the exocarp, the latter forms long sticky strings a few centimeters long. For comparison, similar tests were conducted on the fruit of *Viscum album* L. subsp. *album* from other broad-leaved host trees in the parks at Lednica and Kravaří in Silesia and also on the fruit of *V. album* subsp. *abietis* (Wiesb.) Janch. from the Nový Dvůr arboretum. The results show that on the *Metasequoia* in Lednice we are dealing with a type subspecies of mistletoe – *Viscum album* L. subsp. *album* (nomenclature for subspecies after Erhardt et al. 2008).

Also considered was the possible presence nearby of pine mistletoe (*Viscum album* subsp. *austriacum* (Wiesb.) Vollm.); plants of this subspecies were not however found on any gymnosperm within 300m.

The internal structure of the fruit of each subspecies is fundamental to its strategy for establishing itself on a host. The sticky inside of the false berries of *V. album* subsp. *album* allow it to settle on *Metasequoia* and other deciduous trees in the cold months of the year, in contrast to *V. album* subsp. *austriacum* and *V. album* subsp. *abietis*, which are not sticky and can therefore only reach the branches of conifers. The false berries of the type, as a rule, would run the risk of sticking ‘prematurely’ to needles, before reaching the surface of the shoot.

Summary and discussion

The presence of *Viscum album* subsp. *album* on *Metasequoia glyptostroboides* widens the range of information on the adaptive abilities of this subspecies of mistletoe and suggests there is quite a broad spectrum of host trees within which the type subspecies differs from the narrowly specialised remaining two subspecies. This report documents for the first time, the settlement of *V. album* subsp. *album* on a gymnosperm from the class Pinopsida. This is in contrast to the previously known host species which are dicots from the class Magnoliopsida, and which are, most often, trees seasonally shedding their leaves for winter. It is worth highlighting however, that this newly-discovered host species, *Metasequoia glyptostroboides*, also loses its leaves in winter, resting between the two vegetative seasons.

Mistletoe and *Metasequoia glyptostroboides* could not come into contact with each other in the wild, since their ranges are too far apart. In regions where *Metasequoia* grows, other species of the genus *Viscum* grow (Kubát 1997, Qiu, Gilbert 2008b). Within the range of *Viscum album* grow members of the genus *Larix* – gymnosperms with a similar seasonal growth pattern to *Metasequoia glyptostroboides* (shedding their leaves for winter). From cultivation (Kubát l.c.) we know of examples of the successful establishment of both *V. album* subsp. *austriacum* and *V. album* subsp. *abietis* on *Larix kämpferi* (Lamb.) Carrière.

Close to the *Metasequoia*'s natural range, growing on representatives of the family Taxodiaceae one can very occasionally find the hemiparasites *Taxillus sutchuenensis* (Lecomte) Danser and *T. levinei* (Merrill) H. S. Kiu, from the family Loranthaceae (Qiu, Gilbert 2008a). In North and Central America members of the genus *Taxodium* Rich.

are in turn hosts for the genus *Phoradendron* (Viscaceae s. str.). In Mexico both *Phoradendron rhipsalinum* Rzed. and *Struthanthus palmeri* Kuijt from the family Loranthaceae (Geils et al. 2002) appear on *Taxodium mucronatum* Ten.

Acknowledgements

For his help in gathering sources of information, checking the manuscript and for verifying, on 26th January 2009, the herbarium samples deposited by the author, my thanks go to Eng. Miroslav Frank, and for his help in gathering plant material, I thank Dr. Pavel Bulíř.

Bibliography

- BEN LE PAGE A., YANG H., MATSUMOTO M. 2005. The Evolution and Biogeographic and History of *Metasequoia*. Topics in Geobiology 22: 4–114.
- ERHARDT W., GÖTZ E., BÖDEKER N., SEYBOLD S. (eds.) 2008. Zander – Handwörterbuch der Pflanzennamen, 18. Auflage. Eugen Ulmer Verlag, Stuttgart.
- GEILS B. W., TOVAR J. C., MOODY B. 2002. Mistletoes of North America Conifers. General Technical Report, US Department of Agriculture, Forest Service, Rocky Mountain Station.
- KUBÁT K. 1997. Viscaceae Batsch – jmelovitě. In: Květena české republiky, 5. Slavík B. (ed.). Akademie věd ČR, Praha, pp. 468–473.
- QIU H., GILBERT M. G. 2008a. Loranthaceae A. L. Jussieu. In: Flora of China, 5. <http://www.efloras.org/> [accessed 27.01.2009].
- QIU H., GILBERT M. G. 2008b. Viscaceae Batsch. In: Flora of China, 5. <http://www.efloras.org/> [accessed 27.01.2009].
- Vybrané klimatické údaje lokality Lednice na Moravě. <http://www.amet.cz/klima/> [accessed 27.01.2009].