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Fruits and leaves of *Ailanthus* Desf. from the Tertiary of Hungary

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ABSTRACT. Fossil collections made from the Middle Miocene at Magyaregregy have yielded several impressions of fruits and asymmetrical leaves with toothed or rarely entire margins that belong to the genus *Ailanthus*. A detailed study of size ranges and morphology suggests that fossil fruits from Magyaregregy are identical to a single fruit known from Erdőbénye and also with the type specimens of *A. confucii* Unger, but differ from those recorded from the Tard Clay Formation. Since fruits and leaflets occurring at Magyaregregy are not attached, the latter are described as *Ailanthus mecsekensis* sp. nov. Fruits from the Tard Clay Formation differ by size ranges and morphological details from other fossil species of *Ailanthus* and are described as a new species, *Ailanthus tardensis* sp. nov.

KEY WORDS: *Ailanthus*, fruits, leaves, Lower Oligocene, Miocene, Hungary

INTRODUCTION

In Hungary, two formations of different age have provided large quantities of fossil fruits assigned to the genus *Ailanthus* Desf. From the Tard Clay Formation Rásky (1956) documented a flora from the Nagybátony-Újlak brickyard in Óbuda, Budapest, that is rich in winged fruits. *Raskya vetusta* Manchester & Hably (Manchester & Hably 1997), *Tetrapterys harpyiarum* Unger (Rásky 1956, Hably & Manchester 2000) and several other types of winged fruits including *Ailanthus* Desf., *Hooleya hermis* (Unger) Reid & Chandler, *Engelhardia orsbergensis* (Wessel & Weber) Jähnichen, Mai & Walther and "*Embothrites borealis*" Unger (*sensu* Rásky 1956, i.e. *Cedrelospermum* Saporta) occur at this site. In spite of abundant fruits, leaf remains corresponding to *Ailanthus* Desf. have not been found in association. As the flora of the Tard Clay Formation has not been fully revised to date, *Ailanthus* Desf. leaves may be indentified in the course of subsequent studies. The fossiliferous layers are of marine to brackish facies (Báldi 1983) and are dated on the basis of nannoplankton to the NP23 zone (Báldi-Beke 1977).

Miocene localities from the Mecsek Mts were first documented by Staub (1882) who recorded the fruit and leaf remains of *Ailanthus* from the valley of the Rák Brook situated between the villages of Abaliget and Ó-Falu. Staub's figure of the fragmented fruit is rather simplified but there is no doubt that it corresponds to *Ailanthus* fruits occurring at the other Miocene site Magyaregregy of the Mecsek Mts. On the other hand, Staub's figure of the fragmented leaf impression described as *Ailanthus confucii* does not show any characters typical of *Ailanthus*. Pálfalvy (1953, 1964) mentioned *Ailanthus* remains from Magyaregregy but did not provide any description nor figures of these materials.

CHARACTERIZATION OF THE MATERIAL AND LOCALITY

Since 1989 the largest and most complete palaeobotanical collection from Magyaregregy has been gathered and is stored in the Hungarian Natural History Museum, Budapest.

Leaves from this locality are preserved in the so-called clay marl containing fish-scales that belongs to the Komló Member of the Budafa Formation. They are well preserved but leaf cuticles are rarely observable. Besides leaf impressions, also winged fruits and legumes have been found. In comparison of frequency of *Ailanthus* remains with other taxa, *Ailanthus* was an accessory element in the fossil forests. Among leaflet remains, some are well preserved and almost complete. In the absence of attached fruits and leaflets even after several years of collecting, both organs are described as separate species.

The clay marl containing fish-scales is a lagoonal deposit, not containing nannoplankton, and thus its precise dating has not been possible (Nagymarosy pers. comm.). An analysis of regional stratigraphy suggests a Middle Miocene age. Since the formation attains a considerable thickness, it presumably comprises more than one stage (Ottnangian and Karpatian).

At the third locality at Erdőbénye (Sarmatian), only a single fragmented *Ailanthus* fruit was recorded (Andreánszky 1959). On the basis of its dimensions, Andreánszky concluded that the fossil from Erdőbénye can be conspecific with those occurring in Magyaregregy and differs from the remains recorded from the Oligocene of Budapest (Fig. 1).

All fossils of *Ailanthus* Desf. described from the Tard Clay Formation, as well as from the Miocene sediments by Andreánszky, Pálfalvy and Rásky from Hungary were studied and revised in this investigation although specimens from Staub's investigations were unavailable. The inventory number the specimens of the old collection starts with BP 55, 56, 62, that of the new material start with BP 97, 99, 2000.

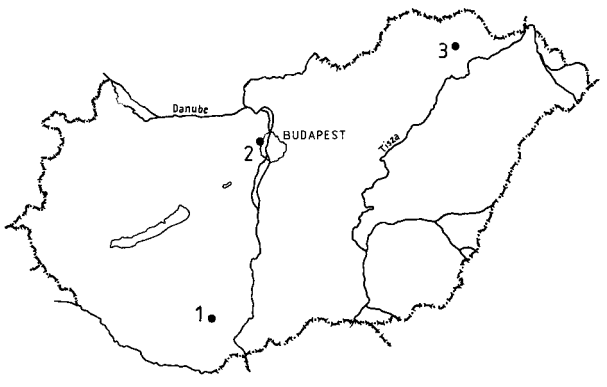

Fig. 1. Location of the plant fossil localities investigated. **1** – Magyaregregy (Middle Miocene), **2** – Budapest, Nagybátony-Újlak brickyard (Lower Oligocene), **3** – Erdőbénye (Miocene, Sarmatian)

SYSTEMATIC DESCRIPTIONS

Simaroubaceae

Ailanthus Desf.

Ailanthus confucii Unger

Pl. 1 figs 1–10

1850 *Ailanthus confucii* Unger, p. 23, nom. nudum.
1859 *Ailanthus confuci* Unger in Heer, p. 87, Pl. 127 fig. 36.
1862 *Rhopalospermites strangeaeformis* Saporta, p. 258, Pl. 8 fig. 7.
1866 *Ailanthus confucii* Unger, p. 54, Pl. 17 figs 6, 7.
1867 *Ailanthus oxycarpa* Saporta, p. 111, Pl. 14 fig. 2.
1882 *Ailanthus confucii* Unger; Staub, p. 39, Pl. 4 fig. 2 (non 3).
1953 *Ailanthus confucii* Unger; Pálfalvy, p. 175.
1959 *Ailanthus confucii* Unger; Andreánszky, p. 155, Pl. 67 fig 2, text-fig. 181.
1964 *Ailanthus confucii* Unger; Pálfalvy, p. 187.

Material. Erdőbénye: BP 55.876.1. Magyaregregy: BP 97.63.2., BP 97.64.2., BP 97.65.1., BP 97.66.1., BP 97.67.1., BP 97.68.1. (2 specimens), BP 97.69.1., BP 97.70.1., BP 97.72.1., BP 97.73.2., BP 97.74.2., BP 97.75.2., BP 97.76.1., BP 97.77.1., BP 97.78.1., BP 97.79.2., BP 97.80.2., BP 97.81.1., BP 97.82.2., BP 97.83.1., BP 97.84.1., BP 97.85.1., BP 97.86.2., BP 97.87.1., BP 97.88.2., BP 97.89.2., BP 97.90.2., BP 97.91.2., BP 97.92.1., BP 97.93.2., BP 97.94.2., BP 97.95.2., BP 97.96.2., BP 97.97.1., BP 97.152.2., BP 97.153.1., BP 97.178.1., BP 97.179.1., BP 97.180.2., BP 97.181.2., BP 97.182.1., BP 97.183.1, BP 99.413.2., BP 99.414.1., BP 99.415.2., BP 99.416.2., BP 2000.199.1., BP 2000.200.1., BP 2000.201.2., BP 2000.202.2., BP 2000.203.2., BP 2000.205.2., BP 2000.401.1., BP 2000.402.1., BP 2000.403.2., BP 2000.404.1., BP 2000.405.1., BP 2000.406.2., BP 2000.407.2., BP 2000.408.1., BP 2000.409.1., BP 2000.410.1., BP 2000.458.1.

Description. Samaras elongated ovate, elliptic to obovate, 17–29 mm long and 4–8 mm wide. Apex and base acute. A single seed is situated more or less in the middle of the fruit, seeds of the ovate samaras are 3–5 mm nearer to the base. Samaras are not or only slightly emarginate in the seed region. Seeds are more

or less ovate. Longitudinal axis of the seed is parallel with that of the samara. A strong vein running from the base up to the seed can be seen only on some specimens. Some fruits (Pl. 1 fig. 9) have another strong vein in the middle of the samara. Starting from the seed several thin veins run towards the apex and base and some of them anastomose.

Discussion. The fruits described above differ from those of *Ailanthus gigas* Unger (1850, Oligocene of Socka) regrading their dimensions and shape. The apices of the fruits of *A. confucii* are more acute and generally not emarginate near the seed. The lower half of the samaras is usually much narrower than the other, so that the fruits are commonly obovate in shape. As regards their dimensions these fruits are most comparable to the fruit of *Ailanthus microsperma* Heer (1859, Pl. 127 fig. 35). Heer described this species on the basis of a single specimen of fruit from the region of the mountain "Hohen Rhonen". It is a narrow and roughly symmetrical samaroid fruit which does not exhibit the obovate shape characteristic of most of the *A. confucii* fruits.

A. confucii also shows similarities to *A. oxycarpa* Saporta (1867, Pl. 14 fig. 2), the single type specimen of which is obovate on the whole, just as the most fruits from Magyaregregy. Under the same name Saporta (op. cit., Pl. 14 fig. 3) also described a leaf remain, which is similar to smaller leaflets of *Ailanthus* from Magyaregregy.

Since both Heer and Saporta published only a single specimen each, it cannot be ruled out that these fruits may represent additional forms of *A. confucii*. This is supported by the fact that obovate and elongated elliptical fruits with all the transitional forms have been found in Magyaregregy.

***Ailanthus mecsekensis* sp. nov.**

Pl. 2 figs 1–6, Pl. 3 fig. 8

Holotype. No. BP 97.104.2 (Pl. 3 fig. 8).

Type locality. Magyaregregy, Mecsek Mts, Southern Hungary.

Type strata. Budafa Formation, Komló Member, Middle Miocene.

Etymology. After the name of the Mecsek Mts.

Material. Magyaregregy: BP 97.98.1., BP 97.100.2., BP 97.101.1., BP 97.102.1., BP 97.103.1., BP 97.104.2., BP 97.184.2., BP 97.185.2., BP 2000.204.1., BP 2000.416.2., BP 2000.457.1., BP 2000.484.2.

Diagnosis. Leaflets 65–105 mm long and 17–35 cm wide with 7–20 mm long petiole. Lamina lanceolate and very asymmetrical, with acute apex and base also very asymmetrical and decurrent. Margin toothed, exceptionally undulate (No. BP 97.101.1) except the concave side of asymmetrical leaflets, which is entire margined at the basal part. Teeth obtuse to acute, irregular, coarser at the convex basal part than at the apical part. Venation semicraspedodromous, along entire or undulate margin brochidodromous. Midvein strong, slightly curved, situated always asymmetrically. Secondary veins thin, straight, hardly visible, nearly perpendicular or under wide angles to the midvein.

Discussion. Fossile leaves of *Ailanthus* Desf. have been mentioned several times in the literature. From the Late Oligocene flora of Rott, Weyland (1938) described a leaf as *A. ailanthifolia* (Web.) Weyland (= *Rhus ailanthifolia* Weber 1851–1852). This leaflet differs from the leaflets of *A. mecsekensis* by the shape, base, venation, margin, and might not belong to this genus. On the other hand, very asymmetrical toothed leaflets strongly recalling those of *Ailanthus* were described in the flora of Socka as *Quercus urophylla* Unger (1850, Pl. 9 figs 9–14), and *Sapindus pythii* Unger (1860, Pl. 14 figs 6–17; 1866, Pl. 16 fig. 7). Also Saporta (1867, Pl. 14 fig. 3) published an asymmetrical leaf with toothed margin from southeastern France and included it into *A. oxycarpa* Saporta, i.e. under the same name as the fruit. This leaf belongs undoubtedly to *Ailanthus*. Since attachment of the fruit and leaf remains have not been determined, according to the current practice, a different name should have been employed for the foliage.

The specimen, described by Walther (1999) as *Ailanthus prescheri* is very fragmented, and represented only by one leaflet without the basal part and the apex. Thus, the exact morphology as well as the variation of the species are not known. The base of *Ailanthus mecsekensis* leaflets is always very asymmetric, and the margin at the basal part, mostly at the "inner part" of the lamina, is entire.

From Hungary, leaflets of *Ailanthus* have not been safely documented so far. From the Lower Oligocene of the Tard Clay Formation, where fruits of *A. tardensis* occur, *Ailanthus*-like leaves have not been described (although the entire flora has not yet been researched in detail). In Magyaregregy, the above described leaflets have come to light together with the fruits of *A. confucii*.

Ailanthus tardensis sp. nov.

Pl. 3 figs 1–7

1938 *Ailanthus confucii* Unger; Weyland, p. 100, Pl. 12 fig. 14, text-fig. 40.
1956 *Ailanthus confucii* Unger; Rásky, p. 172, Pl. 27 figs 2, 3.

Holotype. No. BP 55.2114.1 (Pl. 3 fig. 6).

Type locality. Budapest, Nagybátony-Újlak-brickyard in Óbuda, Hungary.

Type strata. Tard Clay Formation, Lower Oligocene.

Etymology. After the name of the formation.

Material. Budapest-Nagybátony-Újlak-brickyard: BP 55.1738.1.,BP 55.1739.1.,BP 55.1740.1., BP 5.1741.1., BP 55.1742.1., BP 55.1743.1., BP 55.1744.1., BP 55.1748.1., BP 55.1749.1., BP 55.1750.1., BP 55.2002.1., BP 55.2003.1., BP 55.2005.1., BP 55.2006.1., BP 55.2007.1., BP 55.2009.1. (two specimens), BP 55.2010.1., BP 55.2011.1., BP 55.2012.1., BP 55.2013.1., BP 55.2014.1. (two specimens), BP 55.2015.1., BP 55.2016.1., BP 55.2017.1., BP 55.2018.1. (two specimens), BP 55.2019.1., BP 55.2020.1., BP 55.2021.1., BP 55.2022.1., BP 55.2023.1., BP 55.2024.1., BP 55.2025.1., BP 55.2026.1., BP 55.2027.1., BP 55.2029.1., BP 55.2030.1., BP 55.2031.1., BP 55.2032.1., BP 55.2033.1., BP 55.2034.1., BP 55.2035.1., BP 55.2036.1., BP 55.2040.1., BP 55.2041.1., BP 55.2042.1., BP 55.2043.1., BP 55.2044.1., BP 55.2046.1., BP 55.2047.1., BP 55.2048.1., BP 55.2050.1., BP 55.2051.1., BP 55.2052.1., BP 55.2054.1., BP 55.2057.1., BP 55.2058.1., BP 55.2060.1., BP 55.2062.1., BP 55.2063.1., BP 55.2064.1., BP 55.2067.1., BP 55.2068.1., BP 55.2070.1., BP 55.2072.1., BP 55.2074.1., BP 55.2076.1., BP 55.2077.1. (two specimens), BP 55.2078.1., BP 55.2079.1., BP 55.2080.1., BP 55.2082.1., BP 55.2083.1., BP 55.2084.1., BP 55.2085.1., BP 55.2086.1., BP 55.2087.1., BP 55.2088.1., BP 55.2089.1., BP 55.2092.1., BP 55.2093.1., BP 55.2094.1., BP 55.2095.1., BP 55.2096.1., BP 55.2097.1., BP 55.2098.1., BP 55.2100.1., BP 55.2101.1., BP 55.2102.1., BP 55.2103.1., BP 55.2104.1., BP 55.2105.1., BP 55.2106.1., BP 55.2108.1., BP 55.2109.1., BP 55.2110.1., BP 55.2111.1., BP 55.2112.1., BP 55.2113.1., BP 55.2115.1., BP 55.2116.1., BP 55.2117.1., BP 55.2118.1., BP 55.2119.1., BP 55.2120.1., BP 56.89.1., BP 56.90.1., BP 62.93.1., BP 2000.191.1., BP 2000.192.1., BP 2000.193.1., BP 2000.194.1., BP 2000.195.1., BP 2000.196.1., BP 2000.197.1., BP 2000.198.1.

Diagnosis. Samaras elongated elliptic, 35–41 mm long, 6–11 mm wide. Apex and base acute. A single seed situated asymmetrically in the medial part of the fruit about 5 mm nearer to the base. Shape of the seed ranges from roundish to narrow ovate, usually wide ovate. Diameter of seeds variable, usually 7×5, 6×5 mm. Samara slightly emarginate on one side near the seed. Venation consists of a strong vein running along the margin from the base up to the seed, and several thinner, more or less parallel veins starting from the seed and running towards the apex and base.

Discussion. 115 specimens have been studied from the Budapest-Nagybátony-Újlak-brickyard that is the type locality. As all the fruits attain bigger dimensions than most of the other records from the European Tertiary, there is no doubt that they all belong to the same above described species. The fruits differ in size considerably from those of *Ailanthus confucii*. Numerous impressions of *Ailanthus* fruits were recorded in the Oligocene flora of Rott (Weyland 1938) and these are identical with *A. tardensis* occurring in the Tard Clay Formation. Their dimensions have similar values and range. The fruits do not correspond to the *A. gigas* described by Unger (1866, Pl. 17 fig. 10) from Socka, which is much larger than fruits of *A. tardensis*.

COMPARISON OF *AILANTHUS TARDENSIS* SP. NOV. AND *AILANTHUS CONFUCII* UNGER

As it is shown in the Tab. 1 and Fig. 2, the fruits of *Ailanthus tardensis* and *A. confucii* differ from each other in respect to both shape and size. The largest specimen of *A. confucii* (29 mm) is smaller than the smallest specimen of *A. tardensis* (30 mm). Most of the fruits of *A. tardensis* possess a length of 35–45 mm,

whereas most specimens of *A. confucii* range from 18–24 mm. The width of *A. confucii* is usually 5–7 mm and does not exceed 9 mm, while the width of most of the *A. tardensis* fruits varies between 7–10 mm.

Table 1. Frequency of various seed forms in *Ailanthus tardensis* vs. *A. confucii*

Species	Roundish	Wide ovate	Ovate	Narrow ovate	Lanceolate
A. tardensis	14%	54%	25%	6%	1%
A. confucii	4%	45%	28%	23%	–

These two species differ also in the position and form of the seeds. In 74% of the specimens of *A. confucii* the seed is siuated more or less in the middle of the fruit, whereas in *A. tardensis* the seeds are always situated asymmetrically. The shape of the seeds of both species is quite variable ranging from roundish to narrow-ovate or lanceolate (Tab. 1). Most of the seeds of both species are wide-ovate. Seeds with ovate shape are also frequent. The seed shape of *A. tardensis* tends towards roundish forms, whereas that of *A. confucii* is more often elongated narrow-ovate. Finally, it can be concluded that more than 90% of *A. tardensis* seeds are roundish to ovate, whereas those of *A. confucii* seeds are wide-ovate to narrow-ovate.

THE STRATIGRAPHIC RANGE AND OCCURRENCE OF FOSSIL *AILANTHUS* IN EURASIA

Krichheimer (1957) and Rüffle (1963) identified all the remains of fruits occurring in the Tertiary as *A. confucii*. In Europe and Asia, *Ailanthus* fruits were recorded mostly from Oligocene and Miocene floras.

A group of fossil records includes smaller fruits like those figured by Unger (1866, Pl. 17 figs 6, 7) as *A. confucii* was reported from the Miocene flora of Radoboj. The length of these samaras – according to the drawings – are 29 mm (incomplete specimen) and 33 mm (complete specimen). The following specimens from other Miocene sites identified as *A. confucii* Unger: from Magyaregregy (Pálfalvy 1964), Erdőbénye (Andreánszky 1959), Mydlovary (Knobloch & Kvaček 1996), Randecker Maar (Rüffle 1963), Cheb Basin (Bůžek et al. 1980), Kinjak (Zhilin 1974).

From the Oligocene flora of Ashutas (Kazakhstan) Krishtofovich (Krishtofovich et al. 1956) recorded fruits, which undoubtedly rep-

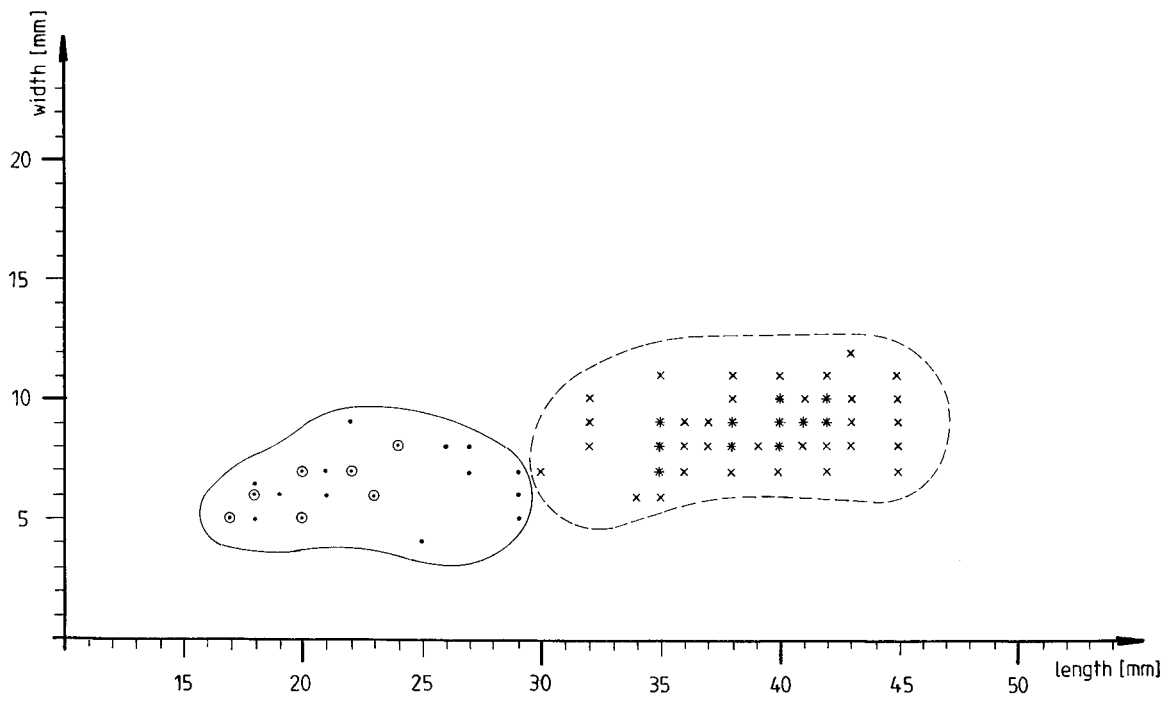

Fig. 2. Size variation of *Ailanthus* fruits in the Hungarian Tertiary (*Ailanthus confucii* Unger from Magyaregregy: • – single specimen, ⊙ – more specimens, *Ailanthus tardensis* sp. nov. from Budapest: × – single specimen, ∗ – more specimens)

resent *Ailanthus* remains. Based on their description and dimensions, they also presumably belong to *A. confucii*. Dimensions of these fruits are identical with those of the fruits from Radoboj. The symmetrical position of seeds and the lack of an emargination on fruits also suggest this species. Presumably, *A. confucii* existed in Kazakhstan as early as the Oligocene and immigrated into Europe during the Miocene.

Leaf remains interpreted as *Ailanthus* sp. from the Early Oligocene floras of the České Středohoří Mts in North Bohemia (Kvaček & Walther 1998) are similar of coarsely toothed leaflets of some exotic *Ailanthus* species. Walther (1999) described a new species as *Ailanthus prescheri* on the basis of one fragmented leaflet with cuticle preserved, from the Upper Oligocene of Kleinsaubernitz. It is similar to the *Ailanthus* sp. leaflet from the České Středohoří Mts mentioned above. However, they have not been found associated with typical fruits of *Ailanthus*.

From the Miocene (Karpatian) flora of Moskenberg (Leoben, Steiermark) Ettingshausen (1888) described a fruit and a leaf as *Ailanthus apollinis*. The leaflet of *A. mecsekensis* is much more asymmetric, its margin is longer toothed and teeth are much sharper, than that of *A. apollinis*. The fruit of *A. apollinis* presumably does not belong to the genera *Ailanthus*.

Krishtofovich and Baykovskaya (1965) mentioned some leaf impressions as belonging to *A. confucii* from the Sarmatian flora of Krynka. These specimens differ even from each other and do not exhibit any similarities to the leaflets of *Ailanthus*. Since fruits were not recorded from this site, the occurrence of *Ailanthus* is uncertain there.

Fruits of the type of *A. confucii* were detected in the Early Miocene Cypris Shale flora of western Bohemia from the Cheb Basin (Bůžek et al. 1980). From the Early – Middle Miocene Mydlovary Formation of South Bohemia, Knobloch and Kvaček (1996) described fruits of *Ailanthus confucii*.

From the Sarmatian flora of Erdőbénye, Andreánszky (1959) described a single fragmented impression of a fruit as *A. confucii*. He mentioned in the description that this fruit is of the same size as the fruits in Magyaregregy and much smaller than those recorded from the Oligocene of Budapest. So Andreánszky (op. cit.) was certain that more than one species of *Ailanthus* existed in the Tertiary of Hungary. The present evaluation of *Ailanthus* remains of Hungary supports this idea. Based on its size and venation, the fragmented fruit from Erdőbénye belongs to *A. confucii*.

PALAEOECOLOGY OF *AILANTHUS*

Taking into consideration its occurrence and associated floras, fossil species of *Ailanthus* did not require a special environment. It was obviously a rare tree element with localised distributions, bound to mesophytic habitats. The sites, where *Ailanthus* occurs, show several floristic similarities to one another. Although the age of the localities of Magyaregregy and Budapest is quite different, they have provided common genera, such as *Daphnogene*, *Engelhardia*, some of them have not been recorded in other floras of Hungary, e.g. *Zizyphus*, *Cedrelospermum*. The Middle Miocene flora of Magyaregregy and the Sarmatian flora of Randecker Maar (Rüffle 1963) are much more similar to each other in the respect of their age and exhibit several common features. Some genera are shared in these floras, e.g. *Cedrelospermum*, *Daphnogene*, *Engelhardia*; some of them are characteristic of younger floras, e.g. *Podocarpium*, *Acer*, *Nyssa*, *Ulmus*. Naturally, numerous species occur in these floras, which are not shared. An overall comparison of the floras will be possible only after a detailed and complete study of the flora from Magyaregregy.

In addition to the remains of *Ailanthus*, some sites provided swampy elements, e.g. Magyaregregy (*Glyptostrobus*, *Nyssa*), Socka (*Myrica*), whereas the other floras do not include them, e.g. the Tard Clay Formation in Budapest. It is interesting to note that *Ailanthus* has not been recorded in other sites of the Tard Clay Formation, e.g. in Eger-Kiseged.

Several thermophilous species have been recorded in most of the floras providing *Ailanthus* (e.g. *Engelhardia*, *Daphnogene*, *Cedrelospermum*, *Zizyphus*). In Hungary, the occurrence of this genus is always associated with thermophilous vegetation.

Ailanthus has about fifteen recent species distributed in South India, South Asia and North Australia. After the study of the herbarium at the Hungarian Natural History Museum it can be stated that no extant species

represented in the collection possesses fruits smaller than 30 mm, comparable to *A. confucii*. The length of winged fruits of *A. altissima* Swingle is similar to that of *A. tardensis* fruits (30–40 mm) on the whole. Its seeds are relatively small and, as compared to *A. confucii*, they occupy a smaller part of the fruit. In this respect the situation is similar to *A. tardensis*. A distinct emargination of the fruit is expressed in *A. altissima* Swingle as well as in *A. tardensis*. Nevertheless, an affinity of the two species cannot be suggested since no attached nor associated leaflets of *A. tardensis* have been recorded so far. The length of the fruits of *A. giraldii* Dode and *A. vilmoriniana* Dode is about 50 mm. These are only slightly larger than the biggest fruits of *A. tardensis*. No living species can thus match the fossil representatives in Eurasia and it is difficult to draw any conclusion of the climatic requirements on such a basis.

The mass occurrence of *Ailanthus* fruits is not followed by a great number of leaflets, though, generally leaflets provide a high percentage of the remains in leaf floras. Up to now our attempts for recording its leaflets have all failed. Presumably climatic and taphonomical conditions are to be mentioned as possible reasons for it. From the Miocene site of Magyaregregy in addition to the smaller record of fruits several leaflets came to light.

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PLATES

Plate 1

Ailanthus confucii Unger, fruits from Magyaregregy

1. BP 97.96.2.
2. BP 97.74.2.
3. BP 97.95.2.
4. BP 97.63.2.
5. BP 97.79.2.
6. BP 97.71.2.
7. BP 97.86.2.
8. BP 97.77.1.

Ailanthus confucii Unger, fruit from Erdőbénye

9. BP 97.93.2.
10. BP 55.876.1. (Andreánszky 1959, Pl. 67 fig. 2, text-fig. 181)

Scale bar – 1 cm

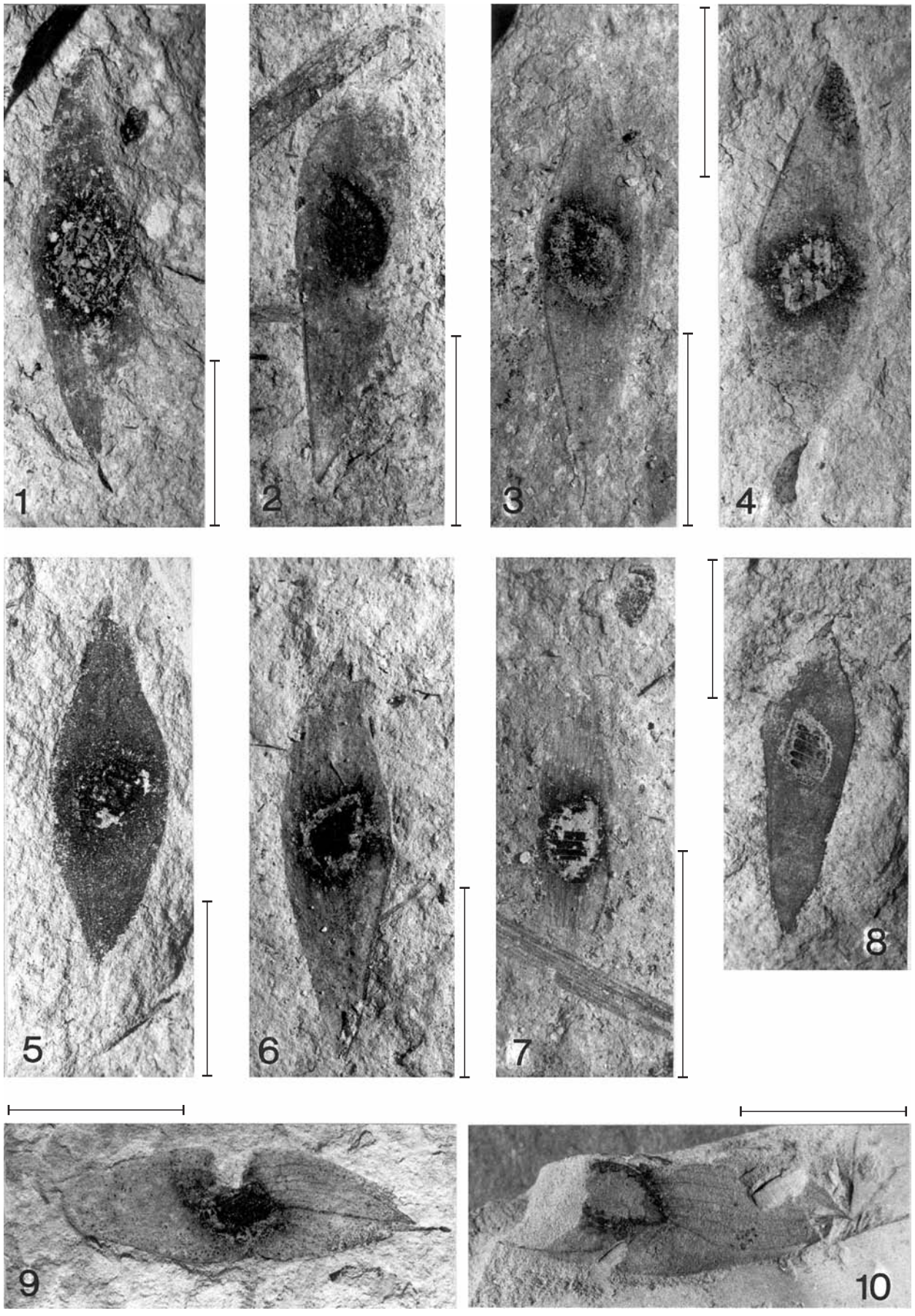
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Plate 2

Ailanthus mecsekensis sp. nov., leaflets from Magyaregregy

1. BP 97.102.2.
2. BP 97.103.1.
3. BP 97.100.2.
4. BP 97.101.2.
5. BP 97.98.1.
6. BP 97.102.2.

Scale bar – 1 cm

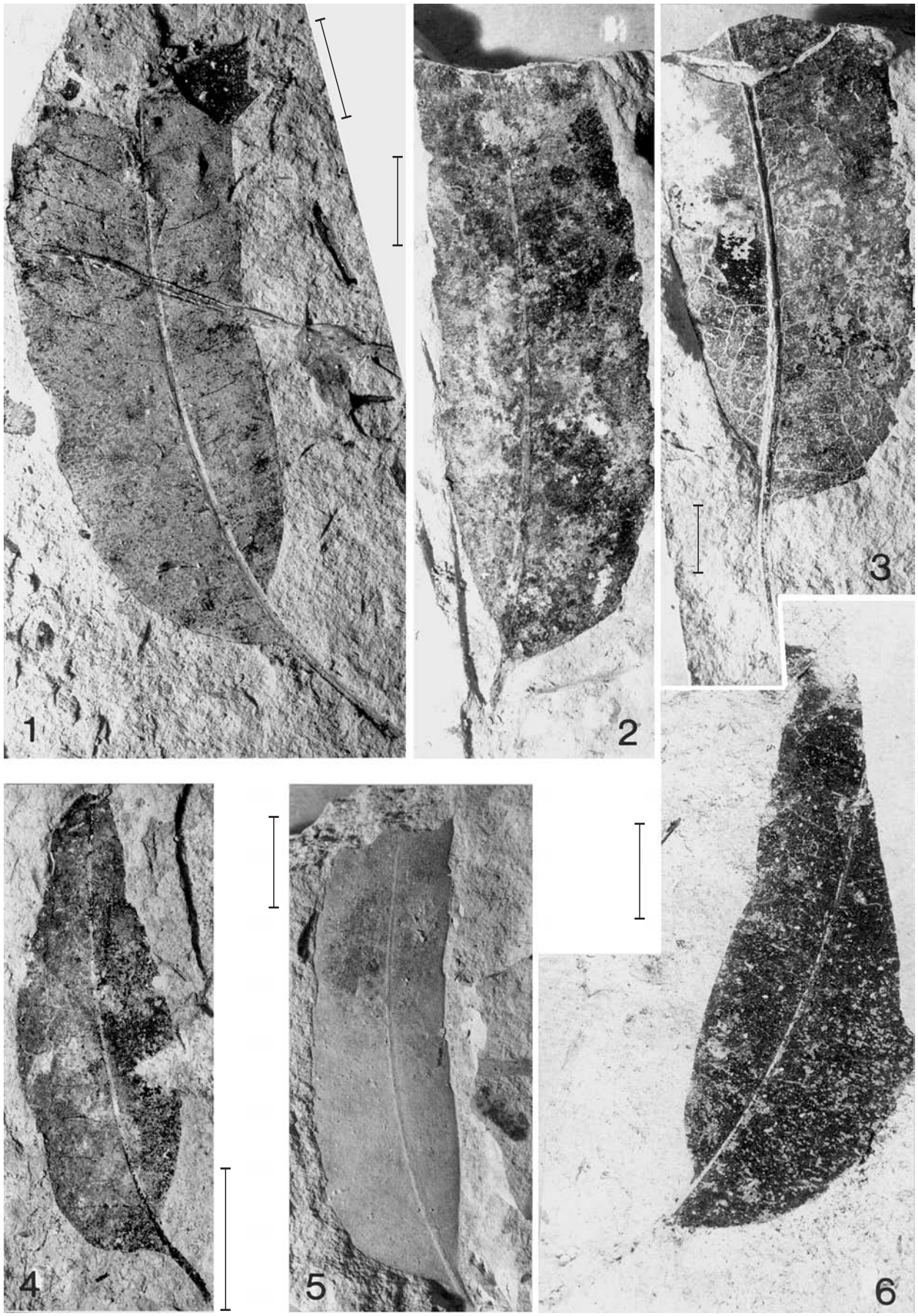
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Plate 3

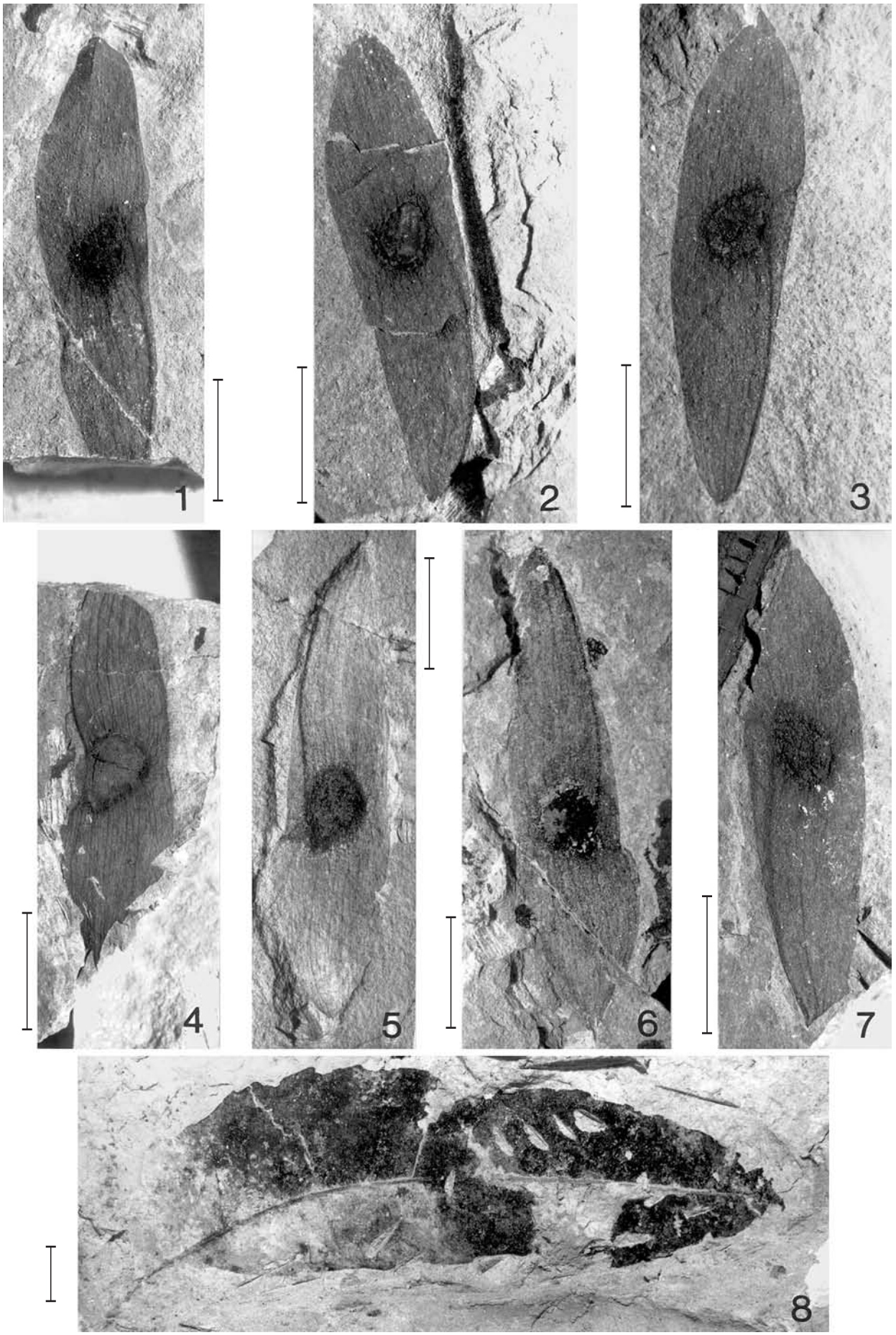
Ailanthus tardensis sp. nov., fruits from Budapest

1. BP 55.2099.1.
2. BP 55.2096.1.
3. BP 55.2108.1.
4. BP 55.1050.1.
5. BP 55.2041.1.
6. Holotype, BP 55.2114.1.
7. BP 55.2089.1.

Ailanthus mecsekensis sp. nov., leaflet from Magyaregregy

8. Holotype, BP 97.104.2

Scale bar – 1 cm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