The **Juglandaceae**

Carya Nutt.
Cyclocarya Iljinsk.
Juglans L.
Platycarya Siebold & Zucc.
Pterocarya Kunth

Identification key to the species of the genera,
based on vegetative features, from specimens in West-European collections.

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This key is based on characteristics, visible during the longest possible period of the year.

Although some species are seldom seen in culture, these are discussed here. Taxa under such names often have another identity (e.g. ***Juglans californica*** and ***Pterocarya tonkinensis***).
Rare and less known species are not included in the key (e.g. ***Carya cathayensis***, ***C. floridana***, ***C. hunanensis***, ***C. kweichowensis***, ***C. tonkinensis*** and ***Juglans sigillata***).

To improve accuracy:

- Use a hand lens to judge glands, scales and hairiness in general.
- Features like glands and hairiness can decrease during Autumn.
- Look at the entire plant. Young specimens and strong shoots give a distorted view.
- Beware of hybridisation, especially with plants raised from seed gathered in collections.

Features based on:

- JDL herbarium specimens.
- living specimens, in various arboreta, botanic gardens and collections.
- literature:

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http://www.plantentuin.ugent.be

1 a Mature shoot with septate pith at longitudinal section. **2**

b Mature shoot with continuous pith at longitudinal section. **20**

2 a Terminal bud stipitate (no leaf petioles present at base of bud). Nut winged, disc-like or two-winged. **3**

b Terminal bud sessile or almost so (leaf petioles present near base of bud). Nut in a husk, like common walnut. **4**

3 a Leaf rarely more than 25 cm long and almost as wide. Rachis never winged. Number of leaflets 7-9 (rarely 5-11). Nut, a disc-like winged nutlet. ..... ***Cyclocarya paliurus***

b Leaf to 45 cm (occasionally >60 cm) long and obviously longer than broad. Rachis sometimes winged. Number of leaflets 5-27. Nut, a two-winged nutlet. **14**

4 a Leaflet entire, or partly entire and sinuous serrate with distant, shallow teeth, also towards apex (lens). **5**

b Leaflet always serrate, at least towards apex (lens). **8**

5 a Number of leaflets 5-11(-15). Leaflet >4 cm broad. **6**

b Number of leaflets 15-25. Leaflet <2 cm broad. **13b**

6 a Terminal leaflets variable in size: +/- as large as the largest lateral leaflets, to much smaller or absent. Margin variable: partly entire and serrate with distant, shallow teeth. Hybrid between *J. nigra* and *J. regia*. ..... ***Juglans* ×*intermedia***

b Terminal leaflets well developed, always present: +/- as large or larger than the largest lateral leaflets. Margin entire. **7**

7 a Number of leaflets 5-7(9-11), shortly pointed (occasionally some leaflets taper-pointed). Surfaces abaxially glabrous or almost so. Peduncle + rachis <10 cm, not pendulous. ..... ***Juglans regia***

- Form with leaflets cut into deep, narrow lobes. ..... ***Juglans regia* 'Laciniata'**
- Form with dark wine-red foliage and husks. ..... ***Juglans regia* 'Purpurea'**

b Number of leaflets 7-11(-13), taper-pointed. Surfaces abaxially with glandular hairs (particularly on venation), sometimes stellate hairs. Peduncle + rachis >15 cm, pendulous. Hybrid between *J. mandshurica* and *J. regia* (see also "Different" under 10)**.** . …….. ***Juglans* ×*sinensis***

8 a Leaf (30) 40-90 cm (and more). Leaflet >3,5 cm broad. **9**

b Leaf <40 cm. Leaflet <3,5 cm broad. **11**

9 a Terminal leaflet variable in size: often both leaves present with small as with reduced, or without terminal leaflet. Lateral leaflets often falcate. Not sticky to the touch. Husk globose and 3,5-8 cm broad, 1-2 (rarely 3-5) in a short raceme, peduncle + rachis <10 cm. Nut globose; 3-4 cm, with numerous warty ridges. ..... ***Juglans nigra***

b Terminal leaflet well developed, always present. Lateral leaflets not falcate. Very sticky to the touch, in all parts due to glandular hairs, in particular in spring and early summer (fading in autumn). Husk ovoid, 3-20 in a long raceme, peduncle + rachis 10-15 cm (25 cm). Nut +/- ovoid; 3-6 cm long, and smooth or with up to 8 +/- sharp longitudinal ridges. **10**

10 a Bud beige to pale brown, broad at base. Leaflet serrate at margin, incisions adjacent. (Leaf scar emarginated at upper margin). Husks 5-20 in a raceme. Nut smooth or ridged. …….. ..... ***Juglans mandshurica*** **(sensu lato)**

* Husk ellipsoid-ovoid, 5-13 in a raceme. Nut ellipsoid-ovoid and obviously ridged. ..... ……..... ***Juglans mandshurica***

* Husk globose-ovoid to 20 in a raceme. Nut ovoid to heart-shaped, smooth to ridged.

- Husk globose-ovoid. Nut ovoid and ridged: ..... ***Juglans ailantifolia***

- Husk globose. Nut more heart-shaped, with almost smooth thin shell. ..... ……. ..... ***Juglans ailantifolia*** var. ***cordiformis***

- Different: hybrid between ***J. ailantifolia*** and ***J. regia***, with intermediary features. ..... ***Juglans* ×*notha***

b Bud white to greyish, oblong and flattened, narrow at base. Leaflet serrate at margin, incisions not adjacent. (Leaf scar flat at upper margin!). Husks 3-5 in a raceme. Nut with razor-sharp ridges (at least initially). …….. ..... ***Juglans cinerea***

- Different: hybrid between ***J. cinerea*** and ***J. regia***, with intermediary features. ..... ***Juglans* ×*quadrangulata***

11 a Leaflet with apex rounded to acute, glabrous in vein axils abaxially. Leaf <25 cm. ..... ……..... ***Juglans californica***

b Leaflet with apex acuminate, often with tufts of hairs in vein axils abaxially. Leaf to 45 cm. …….. .....**12**

12 a Terminal leaflet always present. Leaflets not hairy between the veins abaxially (lens). Husk 3,5-5 cm broad, nut smooth or shallowly ridged and 2,4-3,2 cm broad. ..... ……. ..... ***Juglans hindsii***

b Terminal leaflet often absent or obviously reduced. Leaflets hairy between the veins abaxially (lens). Husk <3,5 cm broad, nut ridged and <2,7 cm broad. **13**

13 a Number of leaflets 9-15. Leaflet sharply serrate, broader than 1,5 cm. Husk 2-3,5 cm broad. Nut to 2,7 cm broad. Tree to 18 m. ..... ***Juglans major***

b Number of leaflets 15-25. Leaflet entire to serrate and narrower than 1,5 cm. Husk 1,4-2,3 cm broad. Nut to 1,7 cm broad. Shrub or tree to 10 m. ..... ***Juglans microcarpa***

- Different: plant larger in all parts: hybrid between ***Juglans microcarpa*** and ***Juglans major*** or ***Juglans nigra***.

14 a Terminal bud with 2-4 caducous bud scales (+/- covering each other at first). **15**

b Terminal bud naked, without bud scales. **16**

15 a Number of leaflets 11-21. Petiole and rachis finely pubescent (fading feature). Wings of nut +/-orbicular, to +/-2 cm long. ..... ***Pterocarya rhoifolia***

b Number of leaflets 7-13. Petiole and rachis tomentose (fading feature). Wings of nut +/-orbicular, ovate to rhombic, to +/- 3 cm long. ..... ***Pterocarya macroptera***

16 a Rachis winged over its total length, or winged at least in part. **17**

b Rachis terete or almost so, wingless. **18**

17 a Terminal leaflet often absent. Rachis obviously winged over its total length, with flat wings. Nut with narrow to linear wings (obviously longer than broad). ..... ***Pterocarya stenoptera***

b Terminal leaflet present, sometimes absent. Rachis irregular or partly winged, with erect ridges or reduced wings. Nut with rounded to (oblong) ovate wings. Hybrid between *P. fraxinifolia* and *P. stenoptera*. ..... ***Pterocarya* ×*rehderiana*** *(P. fraxinifolia × P. stenoptera)*

- Different: Leaf fern like cut. Leaflets often cut, lobes coarsely serrate. ..... ***Pterocarya stenoptera*** **'Fern Leaf'**

18 a Leaf <30 cm. Leaflets 5-11 (15), with base not overlapping the rachis. ..... ***Pterocarya hupehensis***

b Leaf to 60 cm (occasionally more). Leaflets 9-21, with base often overlapping the rachis. **19**

19 a Terminal leaflet usually present. Nut with broad, orbicular wings. ..... ***Pterocarya fraxinifolia***

- Different: shrubby, with short trunk, broad crown and smaller leaf. ..... ***Pterocarya fraxinifolia*** var. ***dumosa***

b Terminal leaflet rarely present. Nut with narrow to linear wings. ..... ***Pterocarya tonkinensis***

20 a Terminal bud small, pale green, <0,5 cm long, <u>AND</u> imbricate (with more scales, partly overlapping). Nut winged +/- 0,5 cm long, many together between the bracts of a +/- 6 cm cone-like structure. ..... ***Platycarya strobilacea***

b Terminal bud usually >0,5 cm, or if not so, then valvate (with two scales meeting by the edges, not covering). Nut in a husk, similar to the common walnut, but segments partly or completely dehiscing. **21**

21 a Closed bud valvate. <u>OR</u> all buds emerged and difficult to judge. Husk with 'winged' sutures where segments meet. **22**

b Closed bud imbricate. Husk grooved where segments meet. **25**

22 a Terminal bud ovoid. Leaflet abaxially obviously densely scaly (also adaxially densely scaly at first). ..... ***Carya myristiciformis***

b Terminal bud oblong. Leaflet abaxially not so densely scaly. **23**

23 a Leaf <40 cm long. Leaflets 7-9 (rarely 5-13); and rarely falcate. ..... ***Carya cordiformis***

b Leaf often 40-70 cm long. Leaflets 7-13 (rarely 5-17); often falcate. **24**

24 a Leaflets 9-11 (rarely 5-13), rarely broader than 4 cm. Serrate or (partly) entire, glabrous (mature leaf). Petiolule often red, to 2 mm long at most. Leaf not or slightly aromatic when crushed. ..... ***Carya aquatica***

b Leaflets 9-13 (rarely 7-17), often broader than 4 cm. Margin serrate, never entire, scilliate hairy (mature leaf). Petiolule yellow-green, usually 2 to 7 mm long (examine several leaves). Leaf aromatic when crushed. ..... ***Carya illinoinensis***

25 a Margins hairy or +/- glabrous, and teeth with tufted hairs just below the apex (lens). Number of leaflets usually 5, rarely 3-7 never >7. ..... ***Carya ovata***

b Margins hairy or glabrous, but teeth without such tufted hairs just below the apex (lens). Number of leaflets 3-9, sometimes to 11. ..... **26**

26 a Annual shoots thick, >4 mm, terminal bud to 20 mm long. Number of leaflets (5)7-9(11). **27**

b Annual shoots thin, <4 mm, terminal bud to 15 mm long. Number of leaflets (3)5-7(9). **28**

27 a Leaf to 90 cm. Surface abaxially, petiole and rachis softly pubescent to the touch (only visible with a lens). Leaf without aromatic smell when crushed. ..... ***Carya laciniosa***

b Leaf to 50 cm. Surface abaxially, petiole and rachis densely pubescent, visible to the naked eye. Leaf with very aromatic smell when crushed (in particular during spring and summer). ..... ***Carya tomentosa***

28 a Petiole and rachis obviously pubescent with fasciculate hairs. Leaf with very aromatic smell when crushed (in particular during spring and summer). Number of leaflets (5)7(9). ..... ***Carya pallida***

b Petiole and rachis glabrous or almost so (hardly visible with lens). Leaf not with such an aromatic smell, vaguely like walnuts. Number of leaflets (3)5-7(9). **29**

29 a Terminal bud with brown to red-brown bud scales. Shoot usually glabrous. Pubescence on rachis, petiole and (base) midvein of leaflet absent or fine and soft, not coarse and stiff. Number of leaflets (3)5-7(9). ..... ***Carya glabra***

b Terminal bud with rusty-brown bud scales. Shoot often hairy. Pubescence on rachis, petiole and (base of) midvein of leaflet coarse and stiff. Number of leaflets (5) 7 (9). .... ***Carya texana***

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	cm