Two new combinations in Adenostyles (Asteraceae, Senecioneae), a conspectus of the genus and key to its species and subspecies

Authors: Dillenberger, Markus S., and Kadereit, Joachim W.

Source: Willdenowia, 42(1) : 57-61

Published By: Botanic Garden and Botanical Museum Berlin (BGBM)

URL: https://doi.org/10.3372/wi.42.42105

MARKUS S. DILLENBERGER[1*] & JOACHIM W. KADEREIT[1]

Two new combinations in *Adenostyles (Asteraceae, Senecioneae),* a conspectus of the genus and key to its species and subspecies

Abstract

Dillenberger M. S. & Kadereit J. W.: Two new combinations in *Adenostyles (Asteraceae, Senecioneae)*, a conspectus of the genus and key to its species and subspecies. – Willdenowia 42: 57–61. June 2012. – Online ISSN 1868-6397;

Stable URL: http://dx.doi.org/10.3372/wi.42.42105

Based on a molecular phylogeny (using ITS, ETS and the *rpl32-trnL, psbA-trnH* and *ndhF-rpl32* plastid spacer sequences) of all species and subspecies of the European genus *Adenostyles* currently recognised, and supported by the morphology of the leaf margin, we transfer two subspecies of *A. alliariae* to *A. alpina* and provide the new combinations *A. alpina* subsp. *macrocephala* and *A. alpina* subsp. *pyrenaica*. A revised key to the species and subspecies and a conspectus of the genus are presented.

Additional key words: *Compositae,* Alps, European Alpine system, taxonomy, molecular phylogeny

Adenostyles Cass. of the tribe *Senecioneae* of the sunflower family *(Asteraceae)* is an endemic genus of Europe, where it is distributed in the Alps and in other high mountain ranges at montane to subalpine altitudes (for distribution maps see Meusel & Jäger 1992). Within *Senecioneae,* it is part of the 'Quadridentate group' (Jeffrey 1992; Nordenstam 2007; Pelser & al. 2007) together with the SW Asian *Caucasalia* B. Nord., *Dolichorrhiza* (Pojark.) Galushko, *Iranecio* B. Nord. and *Pojarkovia* Askerova.

In the only revision available of *Adenostyles,* three species with six subspecies and several varieties were recognised (Wagenitz 1983). These species and subspecies are: 1. *Adenostyles alliariae* (Gouan) A. Kern. with subsp. *alliariae,* subsp. *macrocephala* (Huter & al.) Wagenitz & I. Müll. and subsp. *pyrenaica* (Lange) P. Fourn.; 2. *A. alpina* (L.) Bluff & Fingerh. (= *A. glabra* (Mill.) DC.) with subsp. *alpina,* subsp. *briquetii* (Gamisans) Tutin and subsp. *nebrodensis* (Wagenitz & I. Müll.) Greuter; 3. *A. leucophylla* (Willd.) Rchb.

A molecular phylogenetic analysis of 46 samples of all species and subspecies of *Adenostyles* as recognised by Wagenitz (1983) and using nuclear ribosomal internal transcribed spacer (ITS) and external transcribed spacer (ETS) sequences as well as three different plastid (*rpl32-trnL* spacer, *psbA-trnH* spacer, *ndhF-rpl32* spacer) sequences (Dillenberger & Kadereit in prep.) resulted in phylogenetic relationships (Fig. 1) which are clearly incongruent with Wagenitz's (1983) classification: *A. alliariae* subsp. *alliariae* and *A. leucophylla* were found to be well-supported sister species, which in turn were well-supported sister to *A. alpina* with subsp. *alpina,* subsp. *briquetii* and subsp. *nebrodensis,* but also including *A. alliariae* subsp. *macrocephala* and *pyrenaica*.

Wagenitz (1983), as already earlier authors (back at least to Fiori 1903), distinguished *Adenostyles alpina* and *A. alliariae* by the absence *(A. alpina)* and presence *(A. alliariae)* of more or less distinctly auriculate upper leaves. The inclusion of subsp. *macrocephala* and *pyrenaica* in *A. alliariae* was based on this charac-

1 Institut für Spezielle Botanik und Botanischer Garten, Johannes Gutenberg-Universität Mainz, 55099 Mainz, Germany; *e-mail: dillenbe@uni-mainz.de (author for correspondence).

ter. While auriculate upper leaves were explicitly described for subsp. *pyrenaica* by Wagenitz (1983), he omitted subsp. *macrocephala* from his key and did not describe the upper leaves of this taxon. However, the isotype of subsp. *macrocephala* illustrated in Wagenitz (1983) clearly shows upper leaves with auricles. This character thus supports the classification of subsp. *macrocephala* and subsp. *pyrenaica* in *A. alliariae* and is incongruent with our molecular results.

On the other hand, the placement of *Adenostyles alliariae* subsp. *macrocephala* and subsp. *pyrenaica* in *A. alpina* rather than in *A. alliariae,* as suggested by our molecular results, is supported by the structure of the leaf margin (Fig. 2). Whereas the leaf margin of *A. alliariae* is irregularly dentate with large and small teeth (Fig. 2g), leaf margin dentation in all subspecies of *A. alpina* and also in *A. alliariae* subsp. *macrocephala* and subsp. *pyrenaica* is much more regular and mostly teeth of only one size class are present (Fig. 2b–e). The regularly dentate leaf margin of subsp. *macrocephala* and subsp. *pyrenaica* had also been noted and described by Wagenitz (1983). On the basis of the molecular evidence supported by leaf margin morphology, we here transfer subsp. *macrocephala* and subsp. *pyrenaica* from *A. alliariae* to *A. alpina*. Subspecies *macrocephala* had been treated before as a variety of *A. alpina* by Fiori (1903).

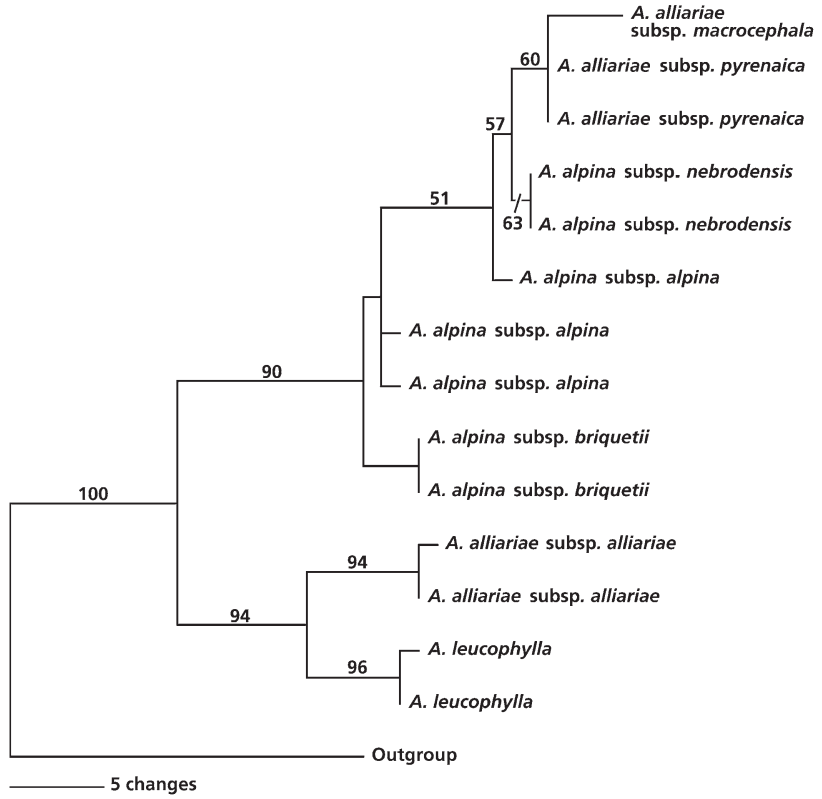

Fig. 1. Simplified Maximum Parsimony phylogram of *Adenostyles* (modified from Dillenberger & Kadereit in prep.). – Values above branches are bootstrap support values. *Adenostyles alliariae* subsp. *macrocephala* and subsp. *pyrenaica* are shown with their old names.

We here provide a key to the species and subspecies of *Adenostyles* and a conspectus of the genus in order to accommodate our results.

1. Involucral bracts tomentose; leaves usually densely hairy below and above . . . . . 2. *A. leucophylla*
– Involucral bracts glabrous to densely hairy; leaves at the most densely hairy below and sparsely hairy above 2
2. Leaf margin regularly dentate with teeth of one size class (Fig. 2a–e) 3
– Leaf margin irregularly dentate, with small and large teeth (Fig. 2g) . . . . . 1. *A. alliariae*
3. Upper leaves auriculate; capitula with 10–25 florets 4
– Upper leaves exauriculate; capitula with 3–12 florets 5
4. Capitula with 10–20 florets . . . . 3b. *A. alpina* subsp. *pyrenaica* (Spain, France)
– Capitula with 20–25 florets . . . . . 3d. *A. alpina* subsp. *macrocephala* (Aspromonte, Italy)
5. Plants completely glabrous; on siliceous rock . . . . . 3e. *A. alpina* subsp. *briquetii* (Corsica)
– Plants pubescent at least in inflorescence; on calcareous rock 6
6. Capitula with 3–6 florets; leaves chartaceous . . . . . 3c. *A. alpina* subsp. *nebrodensis* (Sicily)
– Capitula with 8–12 florets; leaves coriaceous . . . . . 3a. *A. alpina* subsp. *alpina*

1. *Adenostyles alliariae* (Gouan) A. Kern. in Österr. Bot. Z. 21: 12. 1871 ≡ *Cacalia alliariae* Gouan, Ill. Observ. Bot.: 65. 1773.

= *Adenostyles albida* Cass. in Cuvier, Dict. Sci. Nat. 1, Suppl. 60. 1816, nom. illeg.

Wagenitz (1983) recognised three varieties in *Adenostyles alliariae*. We here do not assess their justification: (1) *Adenostyles alliariae* var. *alliariae;* (2) *A. alliariae* var. *kerneri* (Simonkai) Malý in Glasn. Zemaljsk. Muz. Bosni Hercegovini 35: 123. 1923; (3) *A. alliariae* var. *orientalis* (Boiss.) Wagenitz in Phyton (Horn) 23: 153. 1983.

The species is found in the Alps, Carpathians, Dinarid Mountains, Apennines, Massif Central, eastern Pyrenees, the central Spanish Sierra de Gredos and several small-

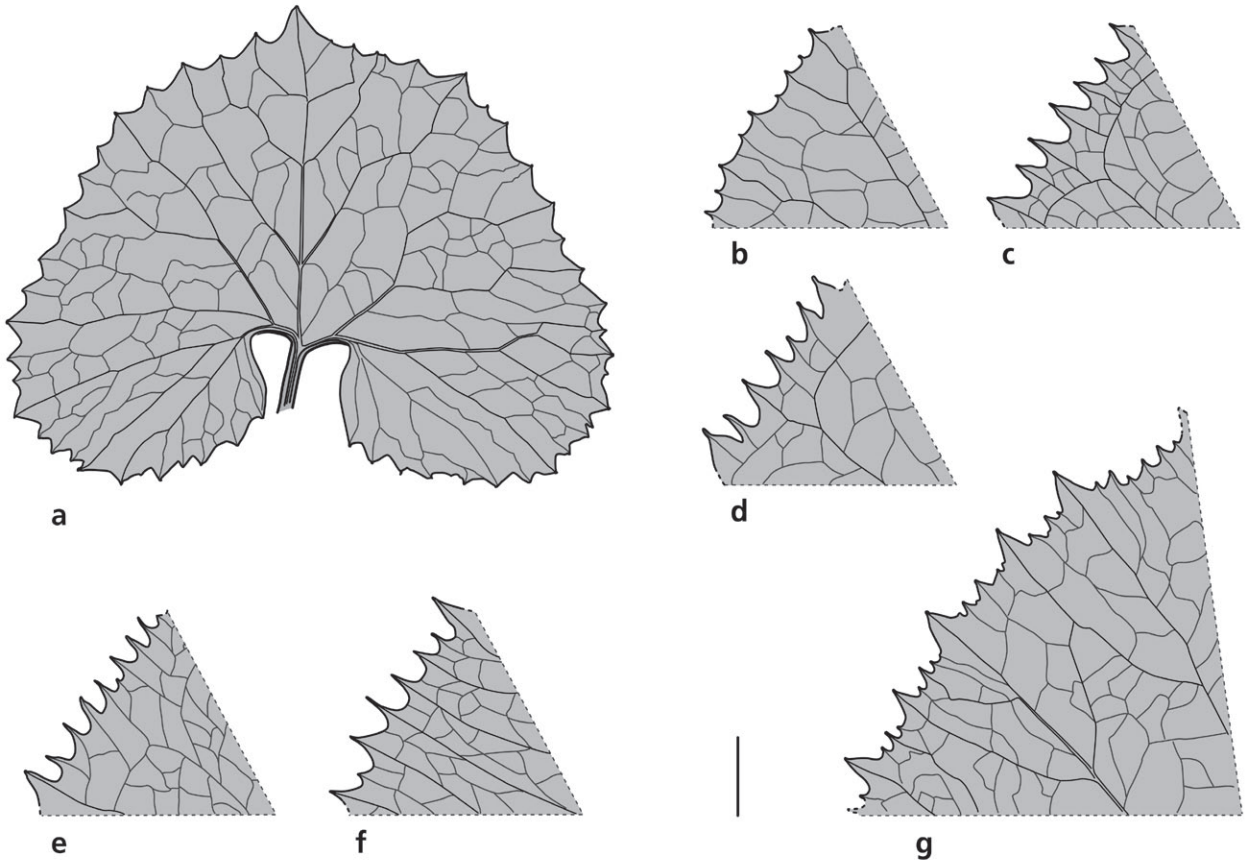

Fig. 2. a: Leaf shape and leaf margin of *Adenostyles alpina* subsp. *alpina;* b–g: leaf margins of *A. alpina* subsp. *pyrenaica* (b), subsp. *briquetii* (c), subsp. *macrocephala* (d), subsp. *nebrodensis* (e), *A. leucophylla* (f) and *A. alliariae* (g). – Scale bar = 1 cm.

er mountain ranges in Central Europe (Meusel & Jäger 1992).

2. *Adenostyles leucophylla* (Willd.) Rchb., Fl. Germ. Excurs.: 278. 1830 ≡ *Cacalia leucophylla* Willd., Sp. Pl. 3(3): 1736. 1803 ≡ *Adenostyles tomentosa* (Vill.) Schinz & Thell. in Bull. Herb. Boissier, ser. 2, 7: 578. 1907, nom. illeg.

This species is restricted to the western Alps.

3. *Adenostyles alpina* (L.) Bluff & Fingerh., Comp. Fl. German. 2: 329. 1825 ≡ *Cacalia alpina* L., Sp. Pl. 2: 836. 1753.
= *Adenostyles glabra* (Mill.) DC., Prodr. 5: 203. 1836.

In recent European Floras, this taxon is either called *Adenostyles glabra* (Fournier 1961; Heß & al. 1972; Pignatti 1982; Lauber & Wagner 1996; Wisskirchen & Haeupler 1998; Aeschimann & al. 2004; Eggenberg & Möhl 2009; Seybold 2009) or *A. alpina* (Tutin 1976; Rollán 1985; Rameau & al. 1993; Jeanmonod & Gamisans 2007; Fischer & al. 2008; Greuter 2008). These two names were extensively discussed by Wagenitz (1983) who argued for the preference of *A. glabra* over *A. alpina*. However, considering that the lectotype of *Cacalia alpina* L. (Herb. Burser X: 155, UPS!) chosen by Jeffrey (in Jarvis 1992) clearly belongs to the same taxon as *A. glabra, A. alpina* is the correct name to be used for this taxon.

3a. *Adenostyles alpina* subsp. ***alpina***
= *Adenostyles glabra* (Mill.) DC. subsp. *glabra*

Within *Adenostyles glabra* subsp. *glabra,* Wagenitz (1983) recognised three varieties. We here do not assess their justification: (1) *A. glabra* subsp. *glabra* var. *glabra;* (2) *A. glabra* subsp. *glabra* var. *calcarea* (Brügger) J. Braun & Thell. in Vierteljahrsschr. Naturf. Ges. Zürich 58: 93. 1913; (3) *A. glabra* subsp. *glabra* var. *australis* (Ten.) Wagenitz in Phyton (Horn) 23: 148. 1983.

The subspecies is distributed in the Alps, northern Dinarids, Jura and Apennines.

3b. *Adenostyles alpina* subsp. ***pyrenaica*** (Lange) M. Dillenberger & Kadereit, **comb. nov.**
≡ *Adenostyles pyrenaica* Lange in Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn, ser. 2, 3: 64. 1862 ≡ *Adenostyles alliariae* subsp. *pyrenaica* (Lange) P. Fourn., Quatre Fl. France: 994. 1940 ≡ *Adenostyles albida* subsp. *pyrenaica* (Lange) Rouy, Fl. France 8: 351. 1903.

This subspecies occurs in the western Pyrenees and the Cordillera Cantabrica.

3c. ***Adenostyles alpina*** subsp. ***nebrodensis*** (Wagenitz & I. Müll.) Greuter in Willdenowia 37: 140. 2007 ≡ *Adenostyles hybrida* Guss., Fl. Sicul. Syn. 2: 449. 1844 ≡ *Adenostyles nebrodensis* Strobl in Flora 65: 196. 1882, nom. illeg. ≡ *Adenostyles glabra* subsp. *nebrodensis* Wagenitz & I. Müll. in Phyton (Horn) 23: 149. 1983.

Adenostyles alpina subsp. *nebrodensis* is only known from one population in the Madonie on Sicily.

3d. ***Adenostyles alpina*** subsp. ***macrocephala*** (Huter & al.) M. Dillenberger & Kadereit, **comb. nov.** ≡ *Adenostyles macrocephala* Huter & al. in Österr. Bot. Z. 56: 110. 1906 ≡ *Adenostyles alliariae* subsp. *macrocephala* (Huter & al.) Wagenitz & I. Müll. in Phyton (Horn) 23: 154. 1983 ≡ *Adenostyles alpina* var. *macrocephala* (Huter & al.) Fiori in Fiori & Béguinot, Fl. Italia 3: 205. 1903.

The subspecies is restricted to the Aspromonte in Calabria, southern Italy.

3e. ***Adenostyles alpina*** subsp. ***briquetii*** (Gamisans) Tutin in Bot. J. Linn. Soc. 70: 18. 1975 ≡ *Adenostyles briquetii* Gamisans in Candollea 28: 75. 1973 ≡ *Adenostyles glabra* subsp. *briquetii* (Gamisans) Wagenitz & I. Müll. in Phyton (Horn) 23: 150. 1983.

Adenostyles alpina subsp. *briquetii* is an endemic of Corsica.

Acknowledgements

We gratefully acknowledge W. Greuter (Berlin) for nomenclatural advice, M. Thulin and M. Hjertson (Uppsala) for making available an image of the lectotype of *Cacalia alpina,* D. Franke (Mainz) for help in preparing the figures, and B. Nordenstam (Stockholm) and an anonymous reviewer for helpful comments on an earlier version of the manuscript.

References

Aeschimann D., Lauber K., Moser D. M. & Theurillat J.-P. 2004: Flora alpina **2.** – Bern: Haupt.

Bluff M. J. & Fingerhuth C. A. 1825: Compendium florae germaniae. Sect. I. – Nuremberg: L. Schneg.

Braun J. 1913: Zur Kenntnis der schweizerischen *Adenostyles*-Arten. Beitr. Kenntn. Schweizer Flora von R. Keller u. H. Schinz XIV. – Vierteljahrsschr. Naturf. Ges. Zürich **58:** 92–97.

Cassini H. 1816: L'Adénostyle Blanchatre. – Suppl. p. 60 in: Cuvier G. (ed.), Dictionnaire des sciences naturelles **1.** – Paris: Le Normant.

Eggenberg S. & Möhl A. 2009: Flora vegetativa. – Bern: Haupt.

Fiori A. 1903: 4. *Compositae.* – Pp. 195–506 in: Fiori A. & Beguinot A., Flora analitica d'Italia **3.** – Padova: Tipografia del Seminario.

Fischer M. A., Oswald K. & Adler W. 2008: Exkursionsflora für Österreich, Liechtenstein und Südtirol. – Linz: Biologiezentrum der Oberösterreichischen Landesmuseen.

Fournier P. 1940: Les quatre flores de la France **1.** – Poinson-lès-Grancey: Lechevalier.

Fournier P. 1961: Les quatre flores de la France **2.** – Strassbourg: Levrault & Paris: Lechevalier.

Gamisans J. 1973: Contribution à l'étude de la flore de la Corse. – Candollea **28:** 39–82.

Greuter W. 2008: Med-Checklist **2.** – Palermo: OPTIMA.

Greuter W. & Raab-Straube E. von 2007: Euro+Med Notulae 3. – Willdenowia **37:** 139–189.

Gouan A. 1773: Illustrationes et Observationes Botanicae, ad specierum historiam facientes **65.** – Tiguri: Orell, Gessner, Fuesslin & Socios.

Gussone G. 1844: Florae siculae synopsis **2.** – Naples: Tramater.

Heß H. E., Landolt E. & Hirzel R. 1972: Flora der Schweiz **3.** – Basel: Birkhäuser.

Huter R. 1906: Herbar Studien. – Österr. Bot. Z. **56:** 110–119.

Jeanmonod D. & Gamisans J. 2007: Flora Corsica. – Aix-en-Provence: Édisud.

Jarvis C. E. 1992: Seventy-two proposals for the conservation of types of selected Linnaean generic names, the report of subcommittee 3C on the lectotypification of Linnaean generic names. – Taxon **41:** 552–583.

Jeffrey C. 1992: Notes on *Compositae* VI: The tribe *Senecioneae (Compositae)* in the Mascarene Islands with an annotated world check-list of the genera of the tribe. – Kew Bull. **47:** 49–109.

Lange J. 1862: Pugillus plantarum imprimis hispanicarum, quas in intinere 1851–52 legit Joh. Lange. – Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn, ser. 2, **3:** 33–117.

Lauber K. & Wagner G. 1996: Flora helvetica. – Bern: Haupt.

Malý K. 1923: Prilozi za floru Bosne i Hercegovine. – Glasn. Zemaljsk. Muz. Bosni Hercegovini **35:** 123–162.

Meusel H. & Jäger E. J. 1992: Vergleichende Chorologie der zentraleuropäischen Flora **3.** – Jena: Fischer.

Nordenstam B. 2007: Tribe *Senecioneae* Cass. – Pp. 208–241 in: Kadereit J. W. & Jeffrey C. (vol. ed.), The families and genera of vascular plants **8.** – Berlin: Springer.

Pelser P. B., Nordenstam B., Kadereit J. W. & Watson L. E. 2007: An ITS phylogeny of tribe *Senecioneae (Asteraceae)* and a new delimitation of *Senecio* L. – Taxon **56:** 1077–1104.

Pignatti S. 1982: Flora d'Italia **3.** – Bologna: Edagricole.

Rameau J. C., Mansion D. & Dumé G. 1993: Flore forestière française **2.** – Paris: Institut pour le développement forestier.

Rollán M. G. 1985: Claves de la flora de España (Península y Baleares) **1.** – Madrid: Mundi-Prensa.

Rouy G. 1903: *Adenostyles*. – Pp. 349–352 in: Rouy G., Foucaud J. & Camus E.-G., Flore de France, ou Description des plantes qui croissent spontanément en France en Corse et en Alsace-Lorrain **8.** – Tours: Deslis Frères.

Schinz H. & Thellung A. 1907: Beiträge zur Kenntnis der Schweizerflora. – Bull. Herb. Boissier **2(7):** 559–584.

Seybold S. 2009: Flora von Deutschland und angrenzender Länder. – Wiebelsheim: Quelle & Meyer.

Strobl P. G. 1882: Flora der Nebroden. – Flora **65:** 193–201.

Tutin T. G. 1975: *Compositae* (238) *Adenostyles alpina* subsp. *briquetii* (Gamisans) Tutin. – [In: Heywood V. H. (ed.), Flora Europaea: Notulae systematicae ad Floram Europaeam spectantes 16]. – Bot. J. Linn. Soc. **70:** 18.

Tutin T. G. 1976: *Adenostyles* Cass. – P. 189 in: Tutin T. G., Heywood V. H., Burges N. A., Moore D. M., Valentine D. H., Walters S. M. & Webb D. A. (ed.), Flora europaea **4.** – Cambridge: Cambridge University.

Wagenitz G. 1983: Die Gattung *Adenostyles* Cass. *(Compositae-Senecioneae).* – Phyton (Horn) **23:** 141–159.

Wisskirchen R. & Haeupler H. 1998: Standardliste der Farn- und Blütenpflanzen Deutschlands **2.** – Stuttgart: Ulmer.