

CHEMISTRY AND TAXONOMY OF *HIERACIUM* L. AND *PILOSELLA* HILL

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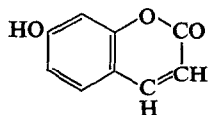
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Abstract—Umbelliferone has been found to be a useful chemical marker in *Hieracium*. Its presence in nine of thirty taxa examined confirms the separation of the genus *Pilosella* previously proposed on morphological and genetical grounds.

IN THE genus *Hieracium* L. *sensu lato*, as in the Compositae generally (cf. Hegnauer¹), the flavonols quercetin and kaempferol occupy rather a background position. In *Hieracium* L. *sensu lato* the most conspicuous flavonoid constituent is the flavone luteolin, recorded in *H. pilosella* L. (= *Pilosella officinarum* C. H. & F. W. Schultz)^{2, 3} and *H. speluncarum* A.-T. (= *Hieracium* sect. *Amplexicaulia* Zahn) (as *H. pulmonarioides* Vill.³). Caffeic and *p*-coumaric acids are regularly, and ferulic acid is frequently, present in the family. Chemically related to *p*-coumaric acid is the rather uncommon coumarin umbelliferone (I) and this has been



(I) Umbelliferone

reported to be present in *H. pilosella* L. (= *Pilosella officinarum* C. H. & F. W. Schultz)^{3, 4} and *Hieracium peleteranum* Mérat (= *Pilosella peleterana* (Mérat) C. H. & F. W. Schultz),⁵ but not in *Hieracium speluncarum* A.-T. (= *Hieracium* sect. *Amplexicaulia* Zahn) (as *H. pulmonarioides* Vill.³).

On morphological and other grounds, Sell and West,⁶ have accepted the genus *Pilosella* of Hill,⁷ and later defined by C. H. and F. W. Schultz,⁸ for the group of species now usually

¹ R. HEGNAUER, *Chemotaxonomie der Pflanzen*, Bd. 3, p. 524. Birkhäuser Verlag, Basel and Stuttgart (1964).

² M. HAAG-BERRURIER and P. DUQUÉNOIS, *Compt. Rend.* **254**, 3419 (1962).

³ E. C. BATE-SMITH, *J. Linn. Soc. (Bot.)* **58**, 95 (1962).

⁴ P. DUQUÉNOIS and A. GREIB, *Compt. Rend.* **237**, 135 (1953).

⁵ ANON, verbal communication.

⁶ P. D. SELL and C. WEST, 'Taxonomic and nomenclatural notes on the British flora' *Watsonia* **6**, 313 (1967).

⁷ J. HILL, *The British Herbal*, p. 441. London (1756).

⁸ C. H. and F. W. SCHULTZ, 'Pilosella als eigene Gattung', *Flora (Regensb.)* **45**, 417, 433 (1862).

placed as subgenus *Pilosella* of *Hieracium*, which includes *Hieracium pilosella* and *H. peleteranum*. It seemed possible that the possession of umbelliferone might be a distinctive feature of the genus *Pilosella*, and with this in mind leaf material of a selection of species in both the genus *Pilosella* and the genus *Hieracium* was examined for the constituent. It happens that umbelliferone is an exceptionally easy substance to identify by paper chromatographic methods, since it has an intense, bright blue fluorescence in u.v. light. The results of this examination are, therefore, quite clear-cut and can be presented simply in the form of presence or absence of umbelliferone in the material examined. A list of the material examined, with its origin and positive or negative results, is given below.

The genus *Hieracium* L., as here understood, contains several thousand microspecies, the great majority of which have little or no pollen, and reproduce apomictically. It is characterized by its non-stoloniferous habit, by its achenes being (2.5-) 3.0-4.5 (-5.0) mm long, with the ribs apically confluent in an obscure, not crenulate ring, and by the pappus hairs being sub-biseriate and unequal. It can be seen that representatives of nine sections of the genus do not contain umbelliferone.

The genus *Pilosella* produces copious pollen, and intermediates (which may or may not be hybrid) are recorded between nearly all of the known forms. Many of them can also reproduce apomictically, and there is much vegetative spread. The genus is thus very difficult to classify; hence the presence or absence of umbelliferone is of great interest as regards the grouping of taxa. It differs from *Hieracium* by its stoloniferous habit, by its achenes being (1.0-) 1.5-2.0 (-2.5) mm long with the apex crenulate owing to the ribs expanding into very short, spreading projections, and by the pappus hairs being uniseriate and equal.

On morphological grounds the genus has been divided by many authors (i.e. Naegeli and Peter⁹) into two main groups, the *Acaulia* and the *Cauligera* (though these have never been given a recognized formal rank). Four taxa of the *Acaulia* have been examined. In three of them, *P. hoppeana*, *peleterana* and *officinarum* umbelliferone is present, while in the fourth, *Hieracium niveum*, it is absent. Eight taxa within the group *Cauligera* have been examined and in all of them umbelliferone is absent. Seven other taxa examined are usually considered to be intermediate between the two groups, and probably of hybrid origin. In fact, in the two cases of *P. aurantiaca* × *officinarum* we are reasonably certain that the plants actually arose from hybridization between the given parents. In six of the seven taxa umbelliferone is present. One other taxon, *P. castellana*, which is usually placed in the *Acaulia*, and which was found not to possess umbelliferone, is a very diverse form of *Pilosella*, which should probably be placed in a group of its own.

Hieracium L.

Section *Amplexicaulia* Zahn

- N./L. *H. speluncarum* Arv.-Touv. Shady roadside walls, near Kenmore, south of Loch Tay-side, Mid-Perth, v.c. 88, G.R. 27/767458, 3/9/1953, J. E. Raven, cult. Hort. Cantab. as *H. 56* (material from this gathering used by Bate-Smith³ as *Hieracium pulmonarioides*).

Section *Alpina* F. N. Williams

- N./L. *H. hanburyi* Pugsl., Glen Fiagh, Clova, Forfar, v.c. 90, 22/7/1953, M. C. F. Proctor No. 358, cult. Hort. Cantab. as no. *H. 107*.

⁹ C. NAEGELI and A. PETER, *Die Hieracien Mittel-Europas*. R. OLDENBOURG, München (1885).

Section *Cerinthoidea* Koch

- N./L. *H. flocculosum* Backh., near Luckentyre, Outer Hebrides, v.c. 110, 7/1955, C. West, cult. Hort. Cantab. as no. H. 68.

Section *Oreadea* Zahn

- N./L. *H. subrude* (Arv.-Touv.) Arv.-Touv., The Dhoon, Isle of Man, v.c. 71, 22/9/1952, D. E. Allen, cult. Hort. Cantab. as no. H.7.

Section *Vulgata* F. N. Williams

- N./L. *H. pollinarioides* Pugsl., Lochinver, W. Sutherland, v.c. 108, 28/8/1953, J. E. Raven, cult. Hort. Cantab. as no. H. 62.

Section *Alpestris* F. N. Williams

- N./L. *H. praethulense* Pugsl. Rocky ledges on the north of Ronas Voe, about 1 mile west of Feal, Northmaven, Zetland, v.c. 112, 1953, C. West, cult. Hort. Cantab. as no. H. 29.

Section *Tridentata* F. N. Williams

- N./L. *H. gothicoides* Pugsl., Glen Shee, E. Perth, v.c. 89, 8/1955, C. West, cult. Hort. Cantab. as no. H. 80.

Section *Foliosa* Pugsl.

- N./L. *H. latobrigorum* (Zahn) Roffey, Flodigarry, Isle of Skye, v.c. 104, 24/8/1953, J. E. Raven, cult. Hort. Cantab. as no. H. 61.

Section *Umbellata* F. N. Williams

- N./L. *H. umbellatum* L. subsp. *umbellatum*, Bearstead, E. Kent, v.c. 15, 12/9/1959, C. West, cult. Hort. Cantab. as no. H. 174.
- N./L. *H. umbellatum* L. subsp. *bichlorophyllum* (Druce & Zahn) Sell & C. West, Launceston Road, Tavistock, S. Devon, v.c. 3, 1/9/1959, C. West, cult. Hort. Cantab. as no. H. 176.

Pilosella Hill*Acaulia*

- P./H. *P. hoppeana* (Schultes) C. H. & F. W. Schultz (*Hieracium hoppeanum* Schultes), Rhaetia; in monte supre Sufers (Hinterrheim), 2110 m alt., 19/8/1867, C. Naegeli, *Hieracia Naegeliana* ed. A. Peter no. 261 as *Hieracium hoppeanum* Schult. subsp. *hoppeanum* a. *genuinum* l. *striatum*. in CGE.
- P./H. *P. peleterana* (Mérat) C. H. & F. W. Schultz (*Hieracium peleteranum* Mérat), in collibus et rupibus apricis, praesertim maritimis. Suec. Uddevalla. Julio. Lindeberg, *Hieracia Scandinavica Exsiccata* no. 2. as *Hieracium pilosella* L. v. *peleteranum* Monn. in CGE.
- P./L. *P. officinarum* C. H. & F. W. Schultz (*Hieracium pilosella* L.), Jersey, 1950, T. G. Tutin, cult. Hort. Cantab. as no. 139/50.

Intermediate between Acaulia and Cauligera

- P./L. *P. flagellaris* (Willd.) Sell & C. West subsp. *flagellaris* (*Hieracium flagellare* Willd.) Edinburgh, D. McClintock, cult. Hort. Cantab. as no. H. 264.

- P./L. *P. flagellaris* (Willd.) Sell & C. West subsp. *bicapitata* Sell & C. West, north-west of Hoove, Whiteness, Zetland, v.c. 112, 7/1964, C. West, cult. Hort. Cantab. as no. H. 235.
- P./H. *P. brachiata* (Bertol. ex Lam. & DC.) C. H. & F. W. Schultz (*Hieracium brachiatum* Bertol. ex Lam. & DC., ? *P. officinarum* × *praealta*) Bavaria: in turfosis Dachauer Moor prope Lochhausen (München), leg. C. Naegeli, cult. Hort. Bot. Monacensi, Hieracia Naegeliana ed. A. Peter no. 104 in CGE.
- P./H. *Hieracium candollei* Monnier, Massif du Carlit, Pyrenees Orientales, rocailles eboulis, dans le Cirque des Fouras, alt. 2350 m., B. de Retz, no. 39136 as *Hieracium candollei* Monn. var. *genuinum* N.P. ± subv. *pauciflorum* N.P. in CGE. (This is a *Pilosella* without a validly published combination).
- P./L. *P. aurantiaca* (L.) C. H. & F. W. Schultz × *officinarum* C. H. & F. W. Schultz (*Hieracium aurantiacum* L. × *pilosella* L.), garden, Tonbridge, W. Kent, v.c. 16, 13/10/1967, K. E. Bull.
- P./L. *P. aurantiaca* (L.) C. H. & F. W. Schultz × *officinarum* C. H. & F. W. Schultz (*Hieracium aurantiacum* L. × *pilosella* L.), garden, Cribbenden House, Matfield, W. Kent, v.c. 16, G.R. 51/6743, 20/11/1967, B. Thompson.
- N./H. *Pilosella schultesii* (F. W. Schultz) C. H. & F. W. Schultz (? *P. lactucella* × *officinarum*; *Hieracium schultesii* F. W. Schultz), parmi une grande quantite de *H. auricula* et *H. pilosella* sur un talus pierreux aux bords des vignes, pres de Landau (Palatinat, Baviere), 5 Juin 1860, F. Schultz as *Hieracium auricula-pilosella*. det. B. de Retz as *Hieracium schultesii* F. Sch. subsp. *schultesii* var. *genuinum* N.P. s.v. *pilosum* N.P. (*H. auricula* × *pilosella*) in CGE.

Cauligera

- N./L. *Pilosella praealta* (Vill. ex Gochnach) C. H. & F. W. Schultz subsp. *praealta* (*Hieracium praealtum* Vill. ex Gochnach), waste ground, Gadston, Ayrshire, v.c. 75, Oct. 1964, D. McClintock, cult. Hort. Cantab. as no. H. 261.
- N./L. *Pilosella praealta* (Vill. ex Gochnach) C. H. & F. W. Schultz subsp. *arvorum* (Naeg. & Peter) Sell & C. West (*Hieracium arvorum* (Naeg. & Peter) Pugsl.), railway embankment, Hungerford, Berks., v.c. 22, 1964, D. McClintock, cult. Hort. Cantab. as no. H. 259.
- N./L. *Pilosella praealta* (Vill. ex Gochnach) C. H. & F. W. Schultz subsp. *spraguei* (Pugsl.) Sell & C. West (*Hieracium spraguei* Pugsl.), roadside by Chorley Wood, Bucks., v.c. 24, 1964, R. F. Turney, cult. Hort. Cantab. as no. H. 263.
- N./L. *Pilosella caespitosa* (Dumort.) Sell & C. West subsp. *colliniformis* (Naeg. & Peter) Sell & C. West (*Hieracium colliniforme* (Naeg. & Peter) Roffey), railway embankment near Appersett, N. W. Yorks, v.c. 65, 9/6/1964, D. McClintock, C. M. Rob and C. West, cult. Hort. Cantab. as no. H. 260.
- N./L. *Pilosella lactucella* (Wallr.) Sell & C. West subsp. *lactucella*, garden weed, Harrow, Middlesex, v.c. 21, 27/6/1965, C. West, cult. Hort. Cantab. as H. 262.
- N./L. *Hieracium islandicum* (Lange) Dahlst., amongst grass, by a lake in Hankadalur, 65° 3' N., 21° 40' W., Iceland, 31/7/1958, H. L. G. Stroyan, cult. Hort. Cantab. as no. H. 135. (This belongs to *Pilosella*, but its taxonomic rank in that genus is still questionable and it has no published combination in that genus.)

- N./L. *Pilosella aurantiaca* (L.) C. H. & F. W. Schultz subsp. *aurantiaca* (*Hieracium aurantiacum* L.) roadside near Bear Swamp, Ashfield, Massachusetts, U.S.A., 26/8/1963, S. M. Walters, no. 63/113, cult. in Hort. Cantab. as no. 313/63.
- N./H. *Pilosella echioides* (Lumn.) C. H. & F. W. Schultz (*Hieracium echioides* Lumn.), Moravia: in saxosis micaceo-schistosis utriusque ripae flum. Thaya prope Znaim. Junio, Julio 1878, leg. A. Peter, Hieracia Naegeliana ed. A. Peter no. 233 as *Hieracium echioides* Lumn. subsp. *echioides* var. *genuineum* l. *adpressipilum* d. *minoriceps* in CGE.

Species not fitting into the above grouping morphologically and chemically

- N./H. *Hieracium niveum* (Muell.-Arg.) Zahn, Vallee de Taurynya, Vernet les Bains, Pyrenees Orientales, 900–1000 m alt., 23/7/1955, B. de Retz no. 38950 as *Hieracium niveum* (Muell.-Arg.) Zahn subsp. *niveum* Zahn var. *genuinum* Zahn in CGE. (This certainly belongs to the genus *Pilosella* in which it has no published combination.)
- N./H. *Pilosella castellana* (Boiss. & Reut.) C. H. & F. W. Schultz (*Hieracium castellanum* Boiss. & Reut.), regnum granatense, in pascuis arenos ad pedem Sierra Jejeda et in Sierra de Alfacar, 9–1300 m, 1879, Huter, Porta, Rigo, ex itinere hispanico 1879 no. 607 in CGE.

P. = Positive N. = Negative L. = Living material H. = Herbarium material