Some palynological observations on the genus *Echinops* (*Asteraceae*) and their taxonomic implications

Některá palynologická zjištění v rodu *Echinops* a jejich taxonomické důsledky

Pavel Tomšovic

Institute of Botany, Academy of Sciences of the Czech Republic, CZ-252 43 Průhonice, Czech Republic

Dedicated to the 90th birthday of Prof. K. H. Rechinger fil., Wien, Honorary Member of the Czech Botanical Society

Tomšovic P. (1997): Some palynological observations on the genus *Echinops* (*Asteraceae*) and their taxonomic implications. – Preslia, Praha, 69: 31–33.

Based on pollen grain morphology and having regard to other characters the following recommendations concerning the taxonomy of the genus *Echinops* are made: (i) The genera *Echinops* and *Acantholepis* are not so closely related as it may appear; the former genus represents a monotypical tribe *Echinopae* Cass. [emend.]; the latter genus and species (*Acantholepis orientalis* Less.) belongs to the tribe *Cardueae* Cass., subtrib. *Carlinineae* Cass. The tendency of the anthodia to be reduced to one flower only can evidently appear in different parts of the *Asteraceae*. (ii) In *Echinops*, the species *E. strigosus* is very different and should be classified as a separate genus *Psectra* (Endlicher) Tomšovic including one species *Psectra strigosa* (L.) Tomšovic.

Keywords: *Acantholepis*, *Echinops*, division of *Asteraceae*, pollen morphology

The main observations in this paper are based on my thesis (Tomšovic 1955), which has remained unpublished until now. Nevertheless, I have not found any more recent publication solving these problems.

The conference of the Czech Botanical Society in 1996 was devoted to the family *Compositae (Asteraceae)*. On several occasions it was stated that this is one of the evolutionarily most advanced families of dicots *(Magnoliophyta)*. Besides other characteristics, a tendency for single flowers to aggregate into more complicated dense inflorescences (anthodia) imitating individual flowers can be observed. As the presumed function of this aggregation – to attract insects – is analogous to a single flower, we can speak about a second degree flower.

Still another way of flower organisation in *Asteraceae* exists, when the anthodium is reduced to a single flower and supported by corresponding bracteoles and aggregated into a more or less dense capitulum. These capitula also resemble false separate flowers and they could be denoted as a third degree inflorescence.

Only two genera with this latter organization can be found in the *Asteraceae*: *Acantholepis* Less. and *Echinops* L. The two genera used to be placed together within a suprageneric taxon (trib. *Echinopeae* Cass., subtrib. *Echinopsidinae* Hoffmann). The genus *Acantholepis*, containing a single species *A. orietalis* Less., occurs in the Near East and in West Asia as far east as Pakistan and Afghanistan. The genus *Echinops* contains – according to present knowledge (Rechinger 1979) – cca 120 species distributed in the temperate, subtropical and tropical zones of the Old World. Both genera have a more or

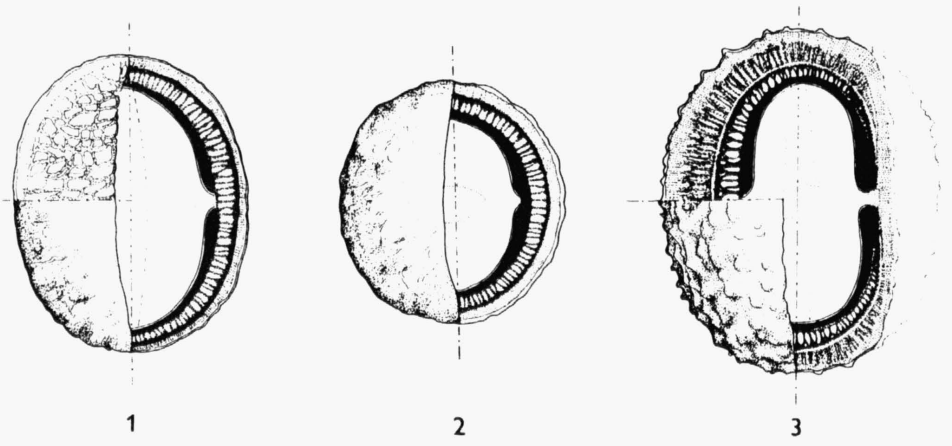

Fig. 1. Pollen grains of the genera considered in this paper. 1 – *Acantholepis orientalis*; 2 – *Psectra strigosa*; 3 – *Echinops sphaerocephalus*. Del. A. Skoumalová-Hadačová

less similar organisation of their vegetative parts (Kruse et Meusel 1969, 1972), but differ in the construction of their synflorescences (Dittrich 1967). In addition, the serological composition shows the isolated position of *Echinops* from other members of the tribe *Cardueae (Cynareae)* (Fischer et Jensen 1990).

In *Acantholepis* the capitula are more or less semiglobular and are supported by an involucrum which is often longer than the one-flowered anthodia. In the genus *Echinops* the one-flowered anthodia with many involucral bracts form a dense ± rounded capitulum; the main involucrum for the whole capitulum consists of very fine bracts reduced to a setaceous form.

These characters show certain differences between the two genera. Still more conspicuous is the difference in their pollen grain morphology.

The pollen grains of *Echinops* (e.g. Tomšovic 1955, Stix 1971, Blackmore 1990) have a very special structure. They are conspicuously large in comparison to other *Asteraceae* genera. Their form is more or less prolate (polar axis up to ca 110 μm, diameter up to 60 μm). Being tricolporate, they show a double-tectate structure, i.e. the inner part of the sexine has large, mostly branched (in some cases they may be shortened) columellae and the outer part has columellae which are much shorter and dense (Fig. 1/3).

The pollen of *Acantholepis* (Fig. 1/1) is tricolporate, prolate (ca 32–37 μm), with a thin nexine and columellae – structured endosexine 2.5 μm thick, as is usual in the trib. *Cardueae*, and psilate.

The fundamental differences between *Echinops* and *Acantholepis* show that it is incorrect to place them together in one suprageneric taxon. The genus *Echinops* evidently forms a monotypic tribus of its own, which deviates markedly within the family *Asteraceae*. The genus *Acantholepis*, in contrast, should belong to the trib. *Cardueae (Cynareae)* subtrib. *Carlininae* Cass. together with *Carlina* L., *Xeranthemum* L., *Atractylis* L., *Amphoricarpus* Vis. etc. It must be accepted that the reduction to a one-flowered anthodium can occur in different parts of the *Asteraceae* independently.

The species of *Echinops* are similar in their main characters. Nevertheless one of them is an exception: *Echinops strigosus* L., distributed in the Mediterranean. Its pollen grains

are almost rounded, ca 40 μm in diameter (relatively small in the genus), and the ectosexine is simple with unbranched baculae (Fig. 1/2). This species differs also in the form of the leaves which are deeply divided, with strip-like segments covered with dense spinules on the upper surface; similar leaves are not known in the whole genus. It is my opinion that all the facts just mentioned justify considering this species as a separate genus, *Psectra*, containing one species only.

Conclusions

A new taxonomic division of part of the *Asteraceae* is suggested as follows:

A. *Asteraceae* trib. *Echinopseae* Cass. Bull. Soc. Philom. 1815: 173, 1815; in Dict. Sci. Natur. 14: 157, 1819
(trib. *Cynareae* subtrib. *Echinopsidineae* Hoffmann in Engler et Prantl Natürl. Pfl.-fam. 4/5: 313, 1894 p.p.)
Asteraceae trib. *Cynareae* Less. subtrib. *Carlininae* Hoffmann in Engler et Prantl Natürl. Pfl.-fam. 4/5: 313, 1894
(trib. *Carlineae* Cass. l. c. 1819)

B. *Psectra* (Endlicher) Tomšovic, status novus
(*Echinops* sect. *Psectra* Endlicher Gen. Pl. 467, 1838)
Psectra strigosa (L.) Tomšovic, comb. nova
(*Echinops strigosus* Linnaeus Sp. Pl. 815, 1753)

Souhrn

S přihlédnutím k výsledkům studia morfologie pylu i dalších znaků byly zjištěny tyto výsledky: (1) Rody *Echinops* a *Acantholepis*, obvykle spojované do společného supragenerického taxonu na základě jednokvětých úborů, nejsou tak blízké, jak by se zdálo. První rod představuje samostatný monotypický trib. *Echinopeae* Cass., druhý patří do trib. *Cardueae*, nejspíš do subtrib. *Carlininae*. Z toho je patrné, že tendence redukovat úbory na jednokvěté se zřejmě objevuje na různých místech čeledi *Asteraceae*. (2) V rodě *Echinops* se od ostatních druhů značně liší *E. strigosus* L., který by měl být klasifikován jako samostatný rod *Psectra* (Endlicher) Tomšovic s jediným druhem *Psectra strigosa* (L.) Tomšovic.

References

Blackmore S. (1990): Sporoderm homologies and morphogenesis in land plants, with a discussion of *Echinops sphaerocephala* [sic!] *(Compositae)*. – In: Hesse M. et Ehrendorfer F. [red.], Morphology, development and systematic relevance of pollen et spores, Pl. Syst. Evol., Wien, Suppl. 5: 1–12.

Dittrich M. (1977): *Cynareae* – systematic review. – In: Heywood V. H., Harborne J. B. et Turner B. L. [red.], The biology and chemistry of the *Compositae*, p. 999–1038, Academic Press, London.

Fischer H. et Jensen U. (1990): Phytoserological investigation of the tribe *Cardueae (Compositae)*. – In: Mabry T. J. et Wagenitz G. [red.], Research advances in the *Compositae*, Pl. Syst. Evol., Wien, Suppl. 4: 87–391.

Kruse J. et Meusel H. (1969): Zur Blattfolge und Blattbildung einiger Cynareen-Gattungen. 1. *Echinops*. – Feddes Repert., Berlin, 80: 339–356.

Kruse J. et Meusel H. (1972): Zur Blattfolge und Blattbildung einiger Cynareen-Gattungen. 2. *Acantholepis, Xeranthemum, Chardinia, Siebera, Amphoricarpus*. – Feddes Repert., Berlin, 83: 289–308.

Rechinger K. H. fil. (1974): Neue orientalische *Echinops*-Arten. – Candollea, Geneve, 29: 121–133.

Rechinger K. H. fil. (1979): Tribus *Echinopeae*. – In: Rechinger K. H. [red.], Fl. Iran. 90: 1–85, Akademische Druck – Verlagsaustalt, Graz.

Stix E. (1971): Beitrag zur Morphogenese der Pollenkörner von *Echinops banaticus*. – Grana, Stockholm, 10: 240–242.

Tomšovic P. (1955): Morfologie pylu čeledí *Ranunculaceae* a *Asteraceae*. [Pollen morphology of the families *Ranunculaceae* and *Asteraceae*.] – Ms. [Diss., depon. in: Library Dept. Bot., Charles University Prague.]

Received 10 January 1997
Accepted 3 March 1997