



Petroravenia (Brassicaceae), a New Genus from Argentina

Ihsan A. Al-Shehbaz

Missouri Botanical Garden, P.O. Box 299, St. Louis, Missouri 63166-0299, U.S.A.

ABSTRACT. *Petroravenia esepitata* Al-Shehbaz, an Argentinean new genus and species, is described and illustrated. Its relationships to *Draba* L., the North American *Cusickiella* Rollins, and the South American *Eudema* Humboldt & Bonpland, *Onuris* Philippi, *Sarcodraba* Gilg & Muschler, and *Dactylocardamum* Al-Shehbaz are discussed.

One of the Brassicaceae collections sent to MO by Stephan G. Beck (LPB) for determination was

an Argentinean plant that I put aside as a novelty in *Draba*. Although the plant has almost fully developed fruits, I did not dissect any of these to examine the seeds. A loan of undetermined mustards from Instituto de Botánica Darwinion (SI), Argentina, included another collection of the same species but with dehiscent fruits and mature seeds. It was immediately evident, for reasons given below, that the species cannot be accommodated in *Draba* or in any other known genus.

KEY TO *PETRORAVENIA* AND SIMILAR GENERA

- 1a. Cotyledons accumbent; septum complete *Draba*
- 1b. Cotyledons incumbent; septum absent or perforate, if complete then flowers solitary, filament bases pubescent, or seeds 1 or 2 per fruit.
 - 2a. Flower 1 per branch; plants with numerous, fragile, fingerlike branches; fruit indehiscent, completely hidden between densely imbricate leaves; internodes rarely to 0.2 mm long; fruiting pedicels to 0.4 mm long *Dactylocardamum*
 - 2b. Flowers few to numerous at the branch apex; plants unbranched or with stout, non-fingerlike branches; fruit dehiscent, readily visible; internodes more than 1 mm long; fruiting pedicels more than 1 mm long.
 - 3a. Septum absent; sepals tomentose inside, ca. 2 × as long as petals; filaments flattened at least along the basal half; petals and filaments persistent even after fruit dehiscence *Petroravenia*
 - 3b. Septum perforate or complete; sepals glabrous inside, much shorter than petals; filaments terete; petals and filaments caducous soon after anthesis.
 - 4a. Flowers solitary, borne on peduncles originating from the center of rosette; nectar glands 4 separate teeth, 1 on each side of the 2 lateral stamens *Eudema*
 - 4b. Flowers in (2-)6-25-flowered inflorescences; nectar glands in a ring.
 - 5a. Seeds 1(-4) per fruit; plants of western United States *Cusickiella*
 - 5b. Seeds 8-20 per fruit; plants of Argentina and southern Chile.
 - 6a. Inflorescences bracteate; filaments glabrous at base; septum perforated *Onuris*
 - 6b. Inflorescences ebracteate; filaments pubescent at base; septum complete .. *Sarcodraba*

The new genus, hereafter known as *Petroravenia*, is named in honor of Peter H. Raven, director of the Missouri Botanical Garden, in recognition of his inspiration, encouragement, and continuous support of the author's research.

Petroravenia esepitata Al-Shehbaz, gen. et sp.

nov. TYPE: Argentina. Prov. Salta/Jujuy: San Antonio de los Cobres, 27 km hacia paso Huaitiquina, Abra Chorrillos, conjines de *Calamagrostis* sobre la arena, 4,560 m, 30 Dec. 1986, S. G. Beck 14136 (holotype, MO; isotype, LPB). Figures 1, 2.

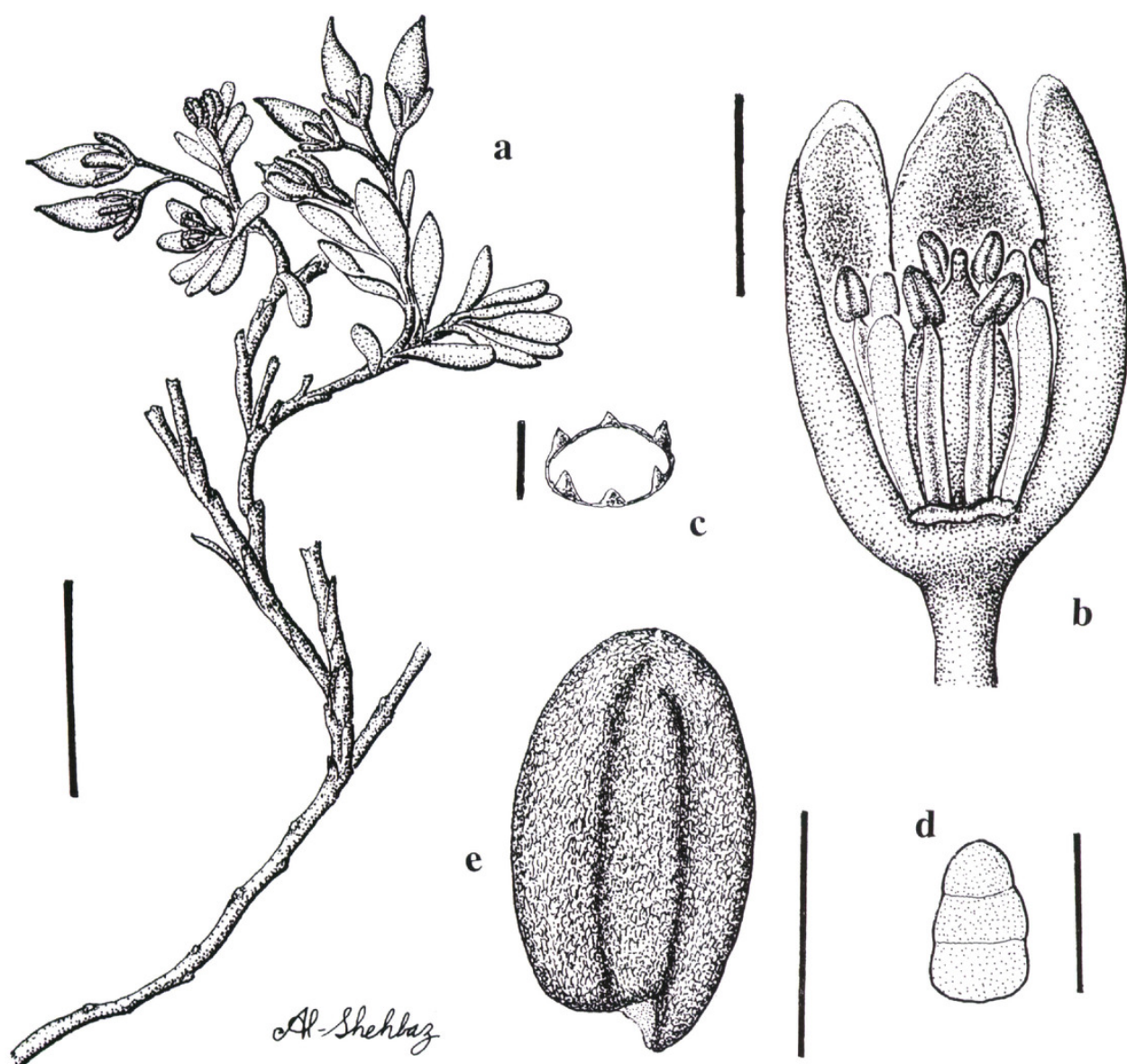


Figure 1. *Petroravenia esepata* Al-Shehbaz. —a. Portion of plant. —b. Flower with 1 sepal removed leaving a horizontal scar. —c. Nectar glands. —d. Cross section of seed. —e. Seed. Scale: a = 1 cm, b = 1 mm, c-e = 0.5 mm. a-c drawn from holotype; d, e from paratype.

Herba rhizomatosa perennis, dense tomentosa trichomatibus brevistipitatis dendriticis tenue ramosis radiis 2-5-furcatis. Folia rosulata, sessilia, oblonga vel ovata, 2-4 mm longa, 0.6-1.7 mm lata. Inflorescentia scapo 0.7-2.0 cm longo insidens, ebracteata, 2-4-flora, subumbellata. Flos sepalis oblongis, (1.2-)1.5-2.0 mm longis, (0.5-)0.7-0.9 mm latis, persistentibus, utrinque tomentosis; petalis albis, linearibus, 0.6-1.1 mm longis, 0.2-0.3 mm latis, persistentibus; filamentis linearibus, 0.7-1.0 mm longis, 0.17-0.30 mm latis, persistentibus. Fructus pedicello (1.0-)1.3-2.6(-3.0) mm longo insidens, lanceolatus vel ovoideus, (2.0-)2.6-4.0(-5.0) mm longus, 1.3-1.8 mm latus, dense tomentosus, esepatus; seminibus 8-18, oblongoideis, 0.8-1.0 mm longis, 0.5-0.6 mm latis, biseriatis; cotyledonibus incumbentibus.

Plants rhizomatous perennials, all aboveground parts except for petals, stamens, and seeds densely tomentose with short-stalked, finely branched den-

dritic trichomes with 2-5-forked rays. Rhizomes slender, to 1 mm diam., not scaly. Stems 1 to several from the rhizome, 1-2.5 cm long, often covered with persistent leaf bases of previous years, terminating in rosettes. Leaves rosulate, sessile, oblong to ovate, 2-4 mm long, 0.6-1.7 mm wide, canescent, margin entire, apex obtuse to rounded, trichomes with a bulbous base. Scapes 0.7-2 cm long, leafless; inflorescences ebracteate, 2-4-flowered, subumbellate racemes, not or hardly elongated in fruit. Sepals oblong, (1.2-)1.5-2 mm long, (0.5-)0.7-0.9 mm wide, densely tomentose outside, moderately to sparsely so inside, only narrowly membranous at and just below apex, persistent well after fruit dehiscence. Petals white, linear, 0.6-1.1 mm long, 0.2-0.3 mm wide, persistent. Filaments white,

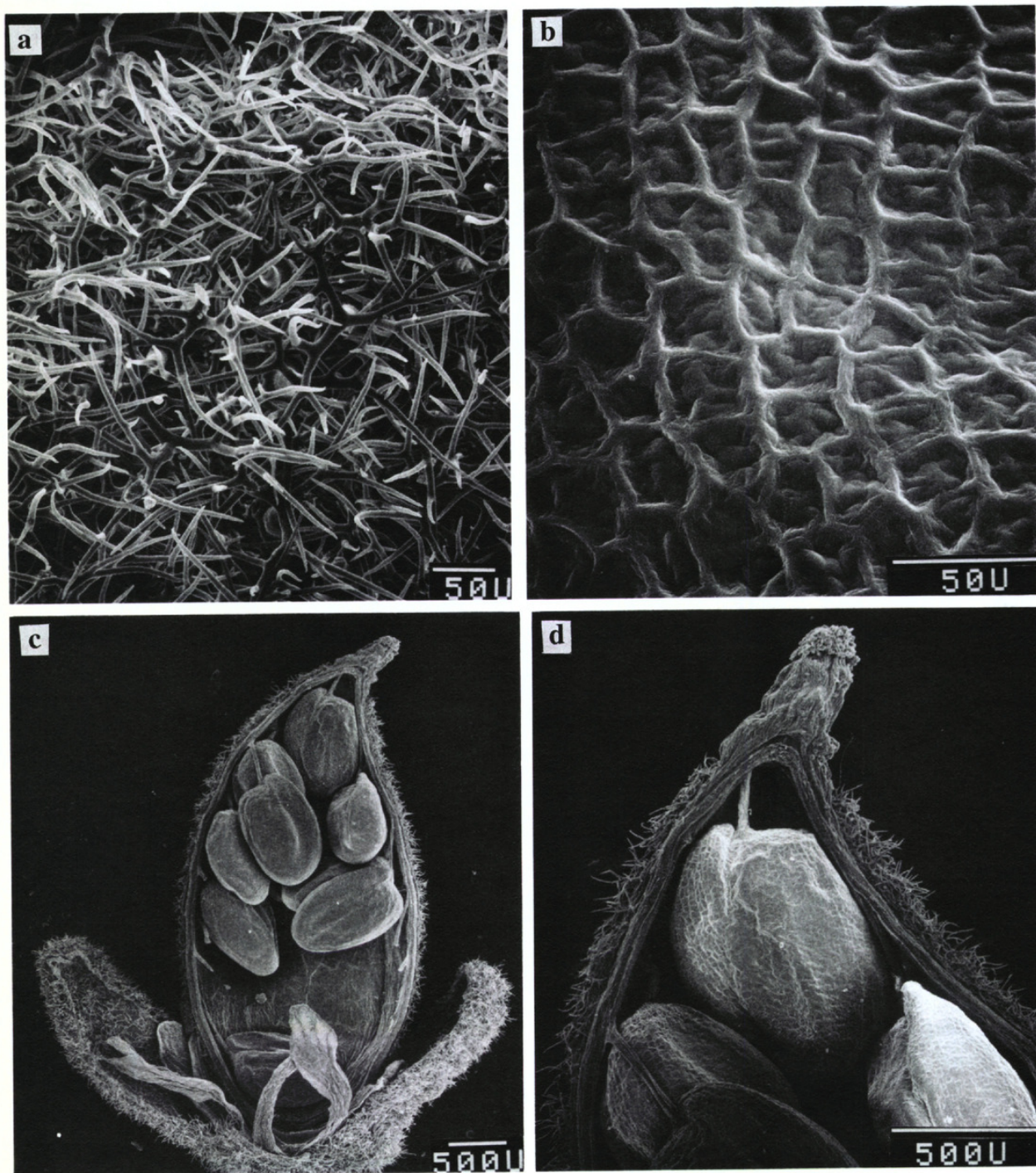


Figure 2. *Petroravenia esepitata*. —a. Trichomes of adaxial leaf surface. —b. Seed surface. —c. Fruit with 1 valve and 1 sepal removed (note pubescent inner surface of sepals and persistent petals and stamens). —d. Upper part of fruit with valve removed (note absence of septum). a drawn from holotype; b–d from paratype.

linear, 0.7–1 mm long, 0.17–0.3 mm wide, persistent, flattened; anthers oblong, 0.2–0.3 mm long. Nectar glands connate into a narrow ring subtending the bases of all filaments and extending between them into 6 triangular teeth to 0.15 mm long. Fruiting pedicels (1–)1.3–2.6(–3) mm long, straight. Fruit lanceolate to ovoid, (2–)2.6–4(–5) mm long, 1.3–1.8 mm wide, not compressed, valves rounded at base, subacute at apex, densely tomentose outside,

glabrous inside; replum glabrous; septum absent; style usually subconical, 0.2–0.3 mm long; stigma entire. Seeds 8–18 per fruit, biseriate, oblong, plump, yellowish brown, 0.8–1 mm long, 0.5–0.6 mm wide, shallowly reticulate, non-mucilaginous when wet; cotyledons incumbent.

Paratype. ARGENTINA. **Prov. Jujuy**: Depto. Susques, Abra Chorrillos, *Cabrera, Bacigalupo, Botta, Deginani, Ezcurra & Zuloaga* 31763 (SI; fragment, MO).

TABLE 1. Comparison of *Petroravenia* to selected genera.

	<i>Petroravenia</i>	<i>Eudema</i>	<i>Onuris</i>	<i>Sarcodraba</i>	<i>Draba</i>	<i>Dactylocardamum</i>	<i>Cusickiella</i>
Cotyledons	incumbent	incumbent	incumbent	incumbent	accumbent	incumbent	incumbent
Septum	absent	perforated or complete	perforated	complete	complete	absent	complete
Sepals inside	tomentose	glabrous	glabrous	glabrous	glabrous	glabrous	glabrous
Petal to sepal ratio	$\frac{1}{2}$ - $\frac{3}{4}$ as long	much longer	much longer	much longer	much longer, rarely shorter	much longer	much longer
Seeds per fruit	8-18	1-60	8-16	10-20	(1-2)2-60	1	1(-4)
Flowers per inflorescence	2-4	1	(6-10)10-25	20-25	2-100	1	(2-5)5-20
Nectar glands	ring with 6 teeth	4 separate teeth	toothless ring	toothless ring	toothless ring or 2 or 4 teeth	4 separate teeth	toothless ring
Trichomes	dendritic	simple, branched, or absent	papillate or absent	simple or forked	simple, forked, stellate, or dendritic	simple	simple and forked
Filaments	flattened, glabrous	terete, glabrous	terete, glabrous	terete, pubescent	terete, glabrous	terete, glabrous	terete, glabrous
Number of species	1	6	5	3	± 350	1	2
Distribution	Argentina	Ecuador, Peru, Bolivia, Argentina	Argentina, S. Chile	Argentina	all continents except Australia & Antarctica	Peru	western U.S.A.

A superficial examination of *Petroravenia esep-tata* suggests some resemblance to *Draba*, especially in the shape of the fruit. However, this is where the important similarities end, and even in fruit shape *Draba* shows a very wide range of variation. This feature alone can hardly justify the placement of a given species in that genus.

As shown in Table 1, *Petroravenia* differs from *Draba* in the cotyledonary position, septum, sepals, petals, and stamens. First, and perhaps most important, is the cotyledonary position. *Petroravenia* has incumbent cotyledons, whereas all of the approximately 350 species of *Draba* have accumbent cotyledons. Although the cotyledonary position sometimes varies from accumbent to incumbent in a few genera, as in *Erysimum* L. (Al-Shehbaz, 1988a; Price, 1987) or, in one case (*Lepidium virginicum* L.) even in the same species (Al-Shehbaz, 1986), it is a remarkably stable character in all species of *Draba* (Al-Shehbaz, 1987; Hedge, pers. comm.; Rollins, 1988; Schulz, 1927, 1936). Two North American species previously placed in *Draba* have been segregated to *Cusickiella* (Rollins, 1988) primarily because they have incumbent instead of accumbent cotyledons and often 1-seeded fruits. In almost all *Draba* many-seeded fruits are produced, but in the South American *D. pseudocheiranthoides* Al-Shehbaz the fruits are 1- or 2-seeded (Al-Shehbaz, 1989a).

The second important difference between *Petroravenia* and *Draba* is the total lack of the fruit septum in the former and its presence as a complete partition in all species of the latter. Among the genera of Brassicaceae with dehiscent fruits, the total lack of the septum is very rare indeed and has been reported in the Peruvian *Dactylocardamum* (Al-Shehbaz, 1989b), the North American *Aphragmus eschscholtzianus* Andrzejowski ex DC. (Rollins, 1993), the Afghanistanean *Arabidopsis esep-tata* Hedge (Hedge, 1968), and the Australian *Menkea* Lehmann (Shaw, 1970). Evidently, esep-tate fruits have evolved independently in the family. The occurrence in the Brassicaceae of fruits without septa is far less uncommon than that of fruits with perforated septa.

The flowers of *Petroravenia* and *Draba* are also different. In the former the sepals are tomentose inside, the petals are about half as long as the sepals, and the filaments are strongly flattened and petaloid at least along the basal half. In the latter the sepals are glabrous inside, the petals (when present) are much longer than or rarely shorter than the sepals, and the filaments are usually terete throughout. In conclusion, *Petroravenia* is not closely related to *Draba* or *Cusickiella*.

Perhaps the closest relatives of *Petroravenia* are the South American *Eudema* (Ecuador, Peru, Bolivia, Argentina), *Sarcodraba* (Argentina), and *Onuris* (Patagonia). All four have incumbent cotyledons, several- to many-seeded fruits, and fruits to $3\times$ as long as broad. *Petroravenia* differs from these genera by the same flower features that distinguish it from *Draba* (see above). The septum is lacking in *Petroravenia*, either perforated or complete in *Eudema*, perforated in *Onuris*, and complete in *Sarcodraba* (Al-Shehbaz, 1990; Boelcke & Romanczuk, 1984). Furthermore, *Petroravenia* differs from these three genera in having 2-4-flowered inflorescences and dendritic trichomes. *Eudema* species have solitary flowers borne on peduncles originating from the center of a rosette and are either glabrous or simple hairy. Two of the six *Eudema* species have branched trichomes and latiseptate fruits, but their placement in the genus has recently been questioned by Al-Shehbaz (1990), who suggested that they ought to be placed in an independent genus. Both *Onuris* and *Sarcodraba* have well-developed, (6-)10-25-flowered inflorescences and glabrous or papillate (rarely minutely forked-pubescent) leaves.

The nectar glands in *Petroravenia*, *Onuris*, and *Sarcodraba* form a ring that subtends the bases of all filaments, but in *Petroravenia* it further develops into six teeth between the filaments. In *Eudema* the median nectar glands are absent, and the lateral four are distinct teeth, one on each side of the two lateral stamens. Further differences include the presence of bracts in the inflorescences of *Onuris*, the presence of hairs on the filament bases in *Sarcodraba*, and the lack of both bracts or filament hairs in *Petroravenia*. Because of the significant differences in the inflorescences and nectar glands, it appears that *Petroravenia* is more closely related to *Onuris* and *Sarcodraba* than it is to *Eudema*.

In his account of the tribe Sisymbrieae, Schulz (1924) placed *Onuris* and *Sarcodraba* in subtribe Pachycladinae O. E. Schulz and *Eudema* in subtribe Brayinae Hayek. He separated the two subtribes primarily on the basis of the former's having a confluent nectar gland and the latter's lacking median nectar glands. As argued by Al-Shehbaz (1988b), however, Schulz's (1924, 1936) subtribal account of the Sisymbrieae needs a major revision.

Although both have incumbent cotyledons and lack the septum, *Petroravenia* apparently is not closely related to *Dactylocardamum*. The latter is unique in the entire Brassicaceae in having few individual fruits that are completely concealed between the densely imbricated leaves. It is also quite different in producing one flower per branch, in

forming dense cushions, and in having fingerlike fragile branches (Al-Shehbaz, 1989b). *Petroravenia* has few-flowered inflorescences, forms no cushions, and has leafy nonfragile branches.

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