

# The Crassulaceae of Cusco Peru

## part II: subfamily Sedoideae

**Abstract.** In this second part, two taxa, one *Sedum* and one *Villadia* species (Crassulaceae) were found around the Sacred Valley in the Department of Cusco, Perú. (7) *Sedum berillonanum* from Ayacucho is reported for the first time in the Department of Cusco. Some slight differences in leaf shape are pointed out. (8) *Villadia virgata*, a species described from Chiquián, Ancash is found in Cusco but plants are somewhat different, though not enough to describe a new variety.

**Keywords:** Crassulaceae, *Sedum*, *Villadia*.

### 7. *Sedum berillonanum* Raymond-Hamet

*Sedum berillonanum* Raymond-Hamet. in Engler's Botan. Jahrbuch 1914, 1. Beiblatt, 112:9

**Holotype:** PERU. Dept. Ayacucho, Prov. Huamanga, Near Ayacucho, rocky ravines, hidden among a mixed perennial grassy bush and herb formation, 3000–3200 m, May 1910, Weberbauer, Flora v. Peru 1910/5501- B (Fig. 7a).

**Synonyms:** *Altamiranoa berillonana* Berger  
*Villadia berillonana* Baehni & MacBride

A succulent glabrous herb growing on moss, forming dense mats up to 30–40 cm diam., basally branching, 10–15 cm tall. **Basal stem** decumbent, 8–15 cm long, 3.5–6 mm diam., gray brownish, with fibrous roots 1–4 cm long, 0.2–0.8 mm diam., grayish. **Primary branches** 4–8, born every 1.5–2 cm, decumbent or curved upwards, rooting along the sides, 2.5–4 mm diam. at base, 4–15 cm long, gray-brownish. **Secondary branches** many, vegetative shoots erect, 1–6 cm long, stem 1.5–2.2 mm diam., flowering shoots 10–18 cm long, erect or pendent then curved upwards at apex, stem 1–1.8 mm diam., reddish green (Fig. 7b). **Leaves** succulent, spirally attached, densely imbricate at proximal half and on young shoots, spaced 0.5–1 cm towards tip, sessile, semi-aplexicaul, ovoid to oblong, 4–7.5 mm long, 3–4 mm wide, 2.5–3.5 mm



7a. *Sedum berillonanum* at its type locality in Ayacucho (G.P.)

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7b. From left to right, young vegetative shoot, old vegetative shoot, young flowering shoot, flowering shoot of *Sedum berillonanum*. (G.P.)

thick, obtuse to subacute, upper side flat to convex in the dry season, both sides convex in the rainy season, dull green with minute reddish spots where exposed, margins entire (Fig. 7c, 7d).

**Inflorescence** terminal, with 2 distal short cincinnoid branches 1–2 cm long, rachis 1.4–2 mm diam., light green with minute reddish dots or lines, each branch bearing 3–4 flowers. Occasionally 1–5 lateral cincinnoid branches born 1–6 (–10) cm from distal end, each bearing 1–3 flowers (Fig. 7e). Flowers 3–7 (–12) per inflorescence, appearing from May to August, sessile (Fig. 7f). **Flower buds** 5–6 mm × 2.5–3.5 mm, bracteoles ovate, 4–6 mm long, 1.8–2.2 mm wide, obtuse with a hyaline spur. **Sepals** narrowly ovate, obtuse, 2–5 mm long, 1.2–1.5 mm wide, light green with reddish dots at distal half. **Petals** obovate, acute-deltoid at tip, adnate at the base, folded outwards at the distal third, 6–8 mm long, 1.8–2.2 mm wide, induplicate, outer surface white, with a greenish white keel, inner surface pure white, margins entire. **Stamens** 10, the 5 epipetalous 4–5 mm long, the antepetalous 5–5.5 mm long, filaments pure white. **Anthers** globular, yellow, 0.6 mm diam. **Gynoecium** narrowly ovoid, 4–5 × 1.8–2 mm, **Carpels** 5, light green to whitish. Styles 1 mm long, greenish white to white. **Nectary** scales yellowish green, 0.5–0.8 mm diam. (Fig. 7g–i). **Fruit** pentalocular, dehiscent, reddish brown, 4.5 × 5.5 mm.

**Other localities:** PERU. Dept. Cusco, Prov. Quispicanchis, Dist. Lucre, Yanamanchi, trail above the town of Lucre along river canyon, on rocks of the left banks, 3400 m, S13°39'31", W71°46'07", Nov 15, 2014, G. Pino, W.H. Galiano, P. Núñez V. 2706



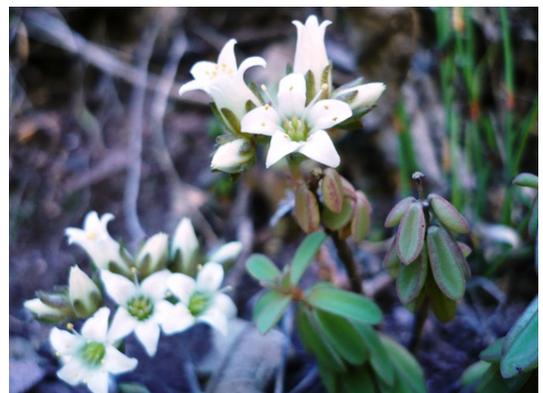
7c. Leaves of *Sedum berillonanum* from Ayacucho. (G.P.)



7d. Leaves of *Sedum berillonanum* from Cusco. (G.P.)



7e. Inflorescence of *Sedum berillonanum* from Cusco. (G.P.)



7f. *Sedum berillonanum* blooming in habitat at Lucre. (W.G.)



**7g.** *Sedum berillonanum* from type locality, Ayacucho: top, from left to right: Flower, bracteole, sepals (2), petals (2). Bottom: from left to right: flower bud, sectioned flower showing gynoecium, petals, gynoecium, petal. (G.P.)

**7h.** *Sedum berillonanum* from Lucre, Cusco: right, distal inflorescence. Top, from left to right: Flower buds, petals (2), sepals (2), bracteoles (2). Bottom: From left to right: flower, sectioned flower showing gynoecium, gynoecium with nectaries, gynoecium with petal attached, dry fruit. (G.P.)

(USM 295251). Dist. Huaró, Huaró Finney, 3800 m, S13°41'15", W71°38'22", Aug 30, 2003, *P. Núñez V. 32146* (CUZ 4808). **Dept. Ayacucho.** Prov. Huamanga. Dist. Chiara, Road from Ayacucho to Toccto, km 402, small canyon on a curve to the right, with a small water stream right of a curve, growing among grasses, *Salvia* sp. and *Calceolaria* sp, 3370 m, S 13°13'41", W 74°13'57", Apr 2, 2012, *G. Pino 2607* (USM). Prov. Cangallo. Dist. Paras. Carhuacampa, gorge with a small woodland of *Polylepis*. 4110 m, S 13°24'24", W 74°54'11" Jun 4, 2001, *J. Roque and C. Arana 3278* (USM 236150)

*Sedum berillonanum* was described by the French physician and botanist specialized in Crassulaceae, Raymond Hamet, based on a plant collected by Weberbauer near Huamanga, the capital of Ayacucho Department in Peru. He dedicated this species to his colleague Dr. Edgard Bérillon, a French psychiatrist known for his research in hypnosis. Since then, this species was not collected again in its type locality until Guillermo Pino found it in 2012 possibly near it in Huamanga, Ayacucho. It had been found in other localities in Ayacucho, though. Washington Galiano and Percy Núñez have found this plant in Cusco Department, Quispicanchis Province, Southeast of Cusco City, where it grows even more abundantly than in the type locality. At first we thought to have found a new species, but careful analysis shows that differences with plants from Ayacucho are very few, like the fact that leaves, bracts and petals of plants from Cusco have a more oblong shape, with an obtuse apex, while the leaves of plants from Ayacucho tend to



**7i.** Dry fruits of *Sedum berillonanum* from Cusco (G.P.)

be ovoid, with an obscurely acute apex. *Sedum berillonanum* is close to *S. isidorum* and *S. decipiens* from the North of Peru (Pino 2006).



8a. *Villadia virgata* growing at Saqsaywaman ruins (W.G.)



8b. Vegetative stem of *Villadia virgata* from P'isaq (G.P.)



8c. Flowering shoot of *Villadia virgata* from P'isaq (G.P.)

## 8. *Villadia virgata* (Diels) Baehni & J. F. Macbride

*Villadia virgata* (Diels) Baehni & J. F. Macbride. *Candollea* 7: 286. 1937. Macbride. *Flora of Peru*. Vol. XIII, Part. II, No. 3: 1012. 1938.

*Cotyledon virgata* Diels in *Englers. Botan. Jahrbuch* 37: 410. 1906

*Altamiranoa virgata* (Diels) Berger in *Engl. und Prantl, Pflanzenfam.*, ed. 2, 18a: 470. 1930.

**Holotype:** Dept. Ancash inter Chiquián et Talenga in muris rupibusque 3300–3600 m, April 1903 (Weberbauer 2853, B) (Fig. 8a).

A succulent erect glabrous herb 5–9 (–18) cm tall, 15–25 (–35) cm tall when in flower. **Roots** fascicular, 1–4 cm long, 1–1.5 mm diam., whitish brown. **Stem** procumbent, 2.5–5 mm diam. at base, grayish brown, branching alternately every 2–8 cm. **Branches** 1–5, erect, vegetative shoots 2–12 cm long, (Fig. 8b) flowering shoots up to 30 cm long, stem 2–3 mm diam.,

light green (Fig. 8c). **Leaves** succulent, sessile, spirally arranged, crowded near the base, spreading in right angle or slightly recurving on young shoots actively growing, incurving in the dry period, more widely spaced (2–3 mm) and in a 45° angle in the flowering shoots, narrowly ovate to narrowly oblong, 5–9 mm long, 2–4 mm wide, 2–2.5 mm thick, obtuse-subacute, upper (inner) side convex to flat, lower (outer) side convex, obscurely keeled, spurred at base, dull green with a lighter reticulate pattern, almost glaucous in the dry period, margins entire (Fig. 8d).

**Inflorescence** a terminal spike (2.5–) 5–9 (–15) cm long. **Flowers** (4–) 12–16 (–20), appearing from November to March. **Bracteoles** 3 per flower, unequal, slightly incurved, the largest, central one opposite the stem, with the two smaller ones on either side of the central one, 2.5–3.5 (–5) mm long, 1.5–2.5 mm wide, ovate, subacute, inner side flat to concave, outer side convex, with a hyaline spur at base, same color as leaves. **Pedicels** absent. **Sepals** narrowly ovoid, 2–2.5 mm long, 1.2–1.5 mm wide, same color as leaves. **Petals** oblong, acute-deltoid at tip, recurved at ½, slightly expanding, 3–3.5 mm long, 1.5–2 mm wide, outside pure white or with a brownish stripe in the sun,



8d. Detail of the leaves of *Villadia virgata*. (G.P.)

8e (below). From left to right: central bracteole, lateral bracteole, sepal, petal with sepal attached (2), sectioned flower showing gynoecium. (G.P.)



8f. Dry fruits of *Villadia virgata*. (G.P.)



inside white or with a green stripe at the center, margins entire. **Stamens** 10, the 5 epipetalous 2–2.5 mm long, the antesealous 2.2–2.5 mm long, filaments white, 0.25 mm diam. at base. **Anthers** ovoid, 0.3–0.4 mm, yellow. **Gynoecium** ovoid, 2 × 2.5 mm. **Carpels** 5, 2.5 mm long, light green. **Style** 0.3 mm diam., 0.4 mm long, green, stigma white. **Nectary** scales oblong-spathulate, 0.6–0.7 mm, white (Fig. 8e). **Fruit** a dehiscent capsule, 3–3.5 mm long, 3.5–4.5 mm diam, dry carpels brown (Fig. 8f). **Seeds** narrowly obovoid, reddish brown, 0.65–0.7 mm long, 0.25–0.3 mm max. diam., apex acuminate (Fig. 8g).

**Other localities:** PERU. Dept. Huánuco; Dept. Cusco, Prov. Urubamba, Dist. Huayllabamba, Hacienda Huayoccarí, on rocks, 3500 m, Dec 30, 1963, *C. Vargas C. 014976 Herbario Vargas 003511 (CUZ 4798)*. Dist. Chinchero, High trail from Chinchero center through Urquillos, through community of Perqa Kachun, “kongoña” 3000–3000 m, S 13°23', W 72°03', Feb 16, 1982, *S. King, E. Franquemont, C. Franquemont, C. Sperling 297 (USM 62344, K)*. Steep wet rock slopes where brook from Pojpoj waterfall meets brook in quebrada, 3330 m, S 13°23', W 72°03', Jan 25, 1982, *W. Davis, E. Franquemont, C. Franquemont,*



**8g.** Seeds of *Villadia virgata*. Square = 1 mm<sup>2</sup> (G.P.)

*S. King, C. Sperling 1811* (USM 58798, F 1900229, K). Dist. Yucay, Madre Iglesias, 3300 m, Feb 26, 1992, *A. Tupayachi H. 2029*, Herbario Vargas 028357 (CUZ 4809). Dist. Ollantaytambo, Pinkuylluna, on the trail from town to the ruins in front of the main Ollantaytambo ruins, along the rocks before first Tambo, 2875 m, S 13°15'27", W 72°15' 42", Nov 18, 2014, *G. Pino 2764* (USM 295255). Prov. Paruro, Dist. Yaurisque, SW Cusco, road from Cusco to Paruro, 3300 m, Mar 7, 1987, *P. Núñez 7386* (CUZ 4803). Prov. Calca, Dist. Pisac, P'isaq, on Rio Urubamba, hillsides around ruins, 3000 m May 23, 1977, *J.C. Solomon 3023* (USM 53214, MO). km 35 on road from Cusco to Urubamba, ca. 2 km NW of P'isaq, steepy rocky slopes mostly covered by shrubs ca. 1 m tall, 3500–4000 m, Jan 10, 1983, *W. Douglas Stevens 22077* (USM 64556, MO). Ruins of P'isaq, on slopes, Oct 3, 1995, *E. Rodríguez 441* (HUT 029240). Road from Cusco to P'isaq, on steepy rocky walls along the left side of the road, 2980 m, S 13°25'16", W 71°50'43", Jun 24, 2013, *G. Pino 2662* (USM 295248). Prov. Quispicanchis, Dist. Lucre, Yanamanchi, trail above the town of Lucre along river canyon, on rocks of the left banks, 3400 m, S 13°39'31", W 71°46'07", Nov 15, 2014, *G. Pino, W.H. Galiano, P. Núñez V. 2701* (USM 295250). Prov. Cusco, Dist. Cusco, Sacsayhuaman Archaeological Park Zone X, 3,700m, S 13°29' 42" W 71°58'26"W, Mar 1, 2014, *W.H. Galiano, E. Galiano, V. Candia 15–221*.(CUZ)



**8h.** Young *Villadia virgata* at P'isaq ruins. (G.P.)

Most *Villadia* species are from Mexico but some of them appear in Peru where they are more abundant in the North of this country, particularly in the department of Cajamarca (Pino & Cieza 2009). *Villadia virgata* — the first Peruvian species to be discovered — was found in Chiquián, Ancash (Cerrate 1979, 1988) and later also in neighboring Huánuco. This species was probably first collected in the Department of Cusco by Julio César Vargas Calderón at Hacienda Huayocari in 1963, and determined as an *Echeveria* in his Herbarium. The lack of leaves of the specimen could have led to confusion in determination but the plants on the sheet have definite terminal (not lateral) inflorescences in spikes, thus belonging to the genus *Villadia*. Since then, it has been found at many localities in different provinces of Cusco, but recently it is surprising that most of the plants have been collected in or very near the famous Inca ruins of P'isaq, (Fig. 8h), Ollantaytambo, and some have even been found by Washington Galiano inside the fortress of Saqsayhuaman, just 1 km away from the famous former capital of the Inca Empire. A review of all *Villadia* species known up to date in Peru, localities of *Villadia virgata* in Ancash and Huánuco, with a discussion of the differences between this genus and *Sedum* has been

**Table III.** Comparison of plants of *Villadia virgata* from Ancash and Cusco.

	<i>Villadia virgata</i> from Ancash and Huánuco	<i>Villadia virgata</i> from Cusco
Height in flower	20–25 cm	15–35 cm
Stem	Mainly erect, 4–8 mm diam. at base	Procumbent, 3–5 mm diam. at base
Branches	Erect 1–3 2–15 cm long, reddish in the sun	Erect 1–5 2–12 cm long, light green or reddish in the sun
Leaves	6–9 mm long, 2–2.5 mm wide, 1–1.5 mm thick.	5–9 mm long, 2–4 mm wide 2–2.5 mm thick
Inflorescence	Terminal spike or raceme when large	Terminal spike
Flowers	10–18, pedicels 2–4 mm long, longer in basal flowers, reddish and sometimes geminate	4–20, always sessile.
Sepals	2.5–5 mm long, 0.8–1 mm wide	2–2.5 mm long, 1.2–1.5 mm wide
Petals	Oblong hexagonal, keeled, straight or slightly curved outwards. 4–4.5 mm long, 2–2.5 mm wide. Both surfaces white with a brown strip in the middle	Oblong, keeled, when grown in the shade always curved outwards, slightly expanding. 3–3.5 mm long, 1.5–2 mm wide. In shade, outside pure white, inside white or with a green strip in the middle. In sun both surfaces white with a brown strip in the middle

published recently, (Pino et al., 2016) following the proposal of Thiede J and H 't Hart (1999).

Although at first we thought we had found a new taxon of *Villadia* from Cusco, all the features shown are not enough to declare the Cusco plants as a new species or variety. The main differences we found with plants of the type locality are size which is a little larger in Cusco plants and the inflorescences. Plants from Ancash and Huanuco can develop short racemes instead of spikes with the pedicels longer at the base, while flowers become subsessile towards the tip. Some of the basal pedicels can bear two flowers. Leaves and sepals look wider in plants from Cusco. Petals of Ancash and Huánuco plants are slightly longer but wider so flowers have a stiff appearance. Plants from Cusco have petals slightly narrower that can be bent outwards in a graceful curve. In both cases petals are keeled, white at both sides and with a brown stripe at keel in both sides. (Table III).

## Acknowledgements

We thank Marie Stephanie Samain and Joël Lodé for logistics and support with data bibliography, Robert Majer from the Netherlands, Ignacio Torres from Michoacán, Mexico and Sidney Novoa for interesting data and collecting plants, Jerónimo Reyes and Esteban Martínez for their support in Mexico, D.F.,

Pablo Carrillo Reyes, of Guadalajara, Mexico, for his help with *Villadia virgata*, Ed Dunin-Wasowicz from England for supplying living plants and bibliography, Silvia Choquehuanca and her daughter Camila for cultivating the new species near habitat at Yanahuara, Urubamba, Luisa Infante and Merly Saavedra for their help with plants cultivated in Lima, Emilio Pereyra Debernardi, Berta Loja Herrera and Julio Ochoa Estrada for their field assistance in Cusco. Key to photographers: G.P. = Guillermo Pino, W.G. = Washington Galiano.

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