WEINGARTIA SANPEDROENSIS SPECIES NOVA

A new species from the province of Charcas, Bolivia (Succulenta 94 (4) 2015:170-183

Johan Pot and Alessandro Gentili

Taxa ought to be recognizable. If one accepts this statement as a *conditio sine qua non*, he will have huge problems with recent classifications in the genus *Weingartia*. Either he recognizes only one or two species, or a large number of *small species*, such as *Weingartia sanpedroensis*.

Between doubts and certainties

In the early nineties one of the authors, Johan Pot (2005), announced to his fellow members of a study group, he was going to find an intermediate between *Sulcorebutia verticillacantha* Ritter (in this article we prefer to use basionyms) and *Sulcorebutia losenickyana* Rausch in the area of San Pedro de Buena Vista, Bolivia. Actually this was bluff. Friedrich Ritter mentioned the mountains "above Sayari" between Cochabamba and Caracollo as the habitat of *S. verticillacantha*. Walter Rausch discovered *S. losenickyana* between Sucre and Ravelo, more than 175 km south-east of Sayari. In those days no map was available, on which any road

Fig. 1: Landscape south of the Rio San Pedro.

between the two locations could be found.

It looked like a miracle, that on Saturday the 18th of July 1992 a brand new road between Cochabamba and Uncia was found. One day later, not far from Acasio, two cactus populations, indicated with field number JK 315 and JK 316, were discovered; they were described many years later by Halda et al (2007) as *Sulcorebutia purpurea* (Donald et Lau) Brederoo et Donald subspecies *gigantea*.

Always in July 1992 some populations of another unknown taxon of cacti, indicated with field number JK 318, JK 319 and JK 320. (Fig.1, Fig. 2, Fig. 3) were discovered south of San Pedro de Buena Vista. They did not represent the announced intermediate between *S. verticillacantha* and *S. losenickyana*. However such plants were found the 23th of July not far from Sacani: JK 321.

Specialists were not really impressed by these discoveries. Apparently JK 321 was supposed to represent *S. losenickyana*, and had therefore nothing to do with *S. verticillacantha*. In the same way JK 318, JK 319 and JK320 were seen to be no more than some ecotype of *Weingartia purpurea*, which had been recombined by Brederoo and Donald (1981) to *Sulcorebutia purpurea*.

After 22 years the other coauthor (Gentili 2015) visited the area, driven by the need to get a better representation of the situation *in situ,* and found new populations on both sides of Rio San Pedro.

While other travellers had already visited the hills surrounding the village

Fig. 2: Weingartia sanpedroensis JK 319.

and had announced other findings similar to JK 320, no one after Pot had crossed the wide bed of the river and explored the inhabited flanks of the hills opposite the town. The discovery of AG 271 (Fig. 4, Fig. 5) and AG 272, with characteristics very close to those of JK 319, and that of other populations not far from the village (AG 267, AG 270), were the incentive to give a clearer definition of this taxon.

The area where the new species grows is characterized by a succession of valleys strongly subject to erosion and by rocky outcrops that in some cases reach 3.500 m altitude. From a geological point of view, the bedrock consists mainly of Ordovician rocks, with prevalence of lutites and limonites and a lesser proportion of quartzites and sandstones. The plant cover is very poor and tends to be further reduced as a result of altered precipitation patterns. As a consequence, the soil is very loose and this intensifies the erosion processes that characterized the region.

Unlike other areas, where cacti living at about the same altitude are

From top to bottom

Fig. 3: Landscape south of the Rio San Pedro. The picture was taken on the site of Fig. 2. Opposite the car is the site of JK 318. Across the river in front AG 271 and AG 272 were discovered.

Fig. 4: Site of AG 272. south of Rio San Pedro

Fig. 5: Weingartia sanpedroensis AG271.

protected from solar excesses by more or less dense shrubs, here the only protection comes from nearby stones which can offer a partial shade. Sometimes the soil is so bare that it's almost impossible to assume the presence of even the simplest plant essences. At a first glance you couldn't expect weingartia's to live in such habitat (Fig. 6, Fig. 7), where only very few plant communities seem to survive: only rarely we have seen cleistocactus spec. associated to our plants.

Probably the poor knowledge of the habitats and a look only apparently similar to that of the neighbouring taxa had discouraged most of the specialists to issue a more precise classification. As already mentioned, some of them were of the opinion that it should be embodied in the wider group of *S. purpurea*. Possibly for the same reason Halda et al. (2007) described *gigantea* as a subspecies of *S. purpurea* (Fig. 8). However there is a problem.

Both Cárdenas (1971) and Donald (1974) described a purple flowering weingartia: *W. torotorensis* (Fig. 9) and *W. purpurea* (Fig. 10). Such flowers were uncommon in this genus. Investigating flowers of the ge-

From top to bottom

Fig. 6: Site of AG 267, north of Rio San Pedro.

Fig. 7: Weingartia sanpedroensis JK 320.

Fig. 8: Sulcorebutia purpurea ssp. gigantea JK 315

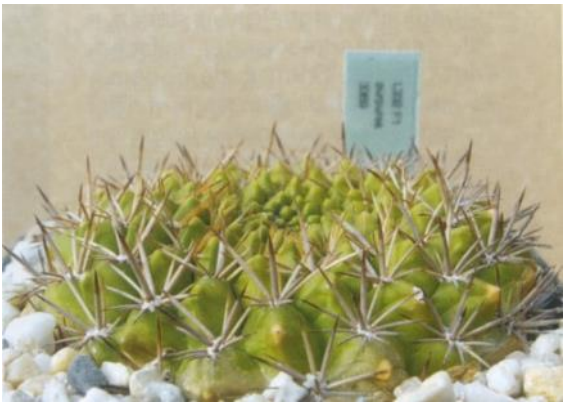


Fig. 9: Weingartia purpurea L 332.

Fig. 10: Weingartia torotorensis L 327

nera *Weingartia* and *Sulcorebutia,* Arnold Brederoo found tiny hairs behind the scales on the pericarp of sulcorebutia's, a property not observed on flowers of weingartia's. In 1981 Brederoo and Donald used this distinctive element to emend the denomination of *W. purpurea* and *Weingartia torotorensis* recombining the names of the two species in Sulcorebutia. The recombination eliminated the anomaly of purple flowering weingartia's offering, at the same time, an easy way to distinguish between the two genera. However, as often happens in cases of major taxonomic changes, the situation didn't remain stable for a long time. When Donald visited the botanical garden of Linz, he saw huge plants of HS 164, which were identified by specialists as *Weingartia neocumingii*. Nevertheless the flowers of these plants showed tiny hairs behind the scales on the pericarp as well. It was hard to accept plants of such size to be sulcorebutia's. Only a few years later nobody believed in the meaning of this characteristic anymore, as behind scales of many sulcorebutia's were not found the tiny hairs.

Was this a good reason to undo the new combination? Obviously not. Specialists still accept the species *Sulcorebutia torotorensis* and *Sulcorebutia purpurea*, maybe because of some other reason.

Hentzschel (1999) found, that the scales on the pericarp of flowers of both *Weingartia* **and** *Sulcorebutia* show quasi small ears. And he discovered, that the funiculi in the fruits of *Sulcorebutia* are single or one time branched, while they are multi-branched in the fruits of *Weingartia*. Again a good characteristic was found, which allowed us to distinguish the two genera.

Two years later the same author radically changed his opinion and stated that the funiculi of weingartia's are not multi-branched, concluding: "On the basis of important shared or similar characters in *Sulcorebutia* and *Weingartia* it is justified to unite both with the older genus *Weingartia*".

Ritz (2007) still mentioned the characteristic of multi-branched funiculi as one of the few important characteristics, neglecting the tiny hairs of Brederoo and Donald. In a paper, using the results of chloroplast DNA investigation, she made

plausible, the unification of *Weingartia* and *Sulcorebutia* (and *Cintia* as well) in one genus. This was done one year later by Augustin and Hentzschel (2008) after a project of artificial crosspollination.

Plants of the genus *Weingartia* as a whole are recognized by the scales on the pericarp of the flowers. It would be strange to accept a taxon, which we cannot recognize. We do not know other characteristics, which justify a finer division. Therefore we classify the new taxon as a weingartia (Fig. 11).

Weingartia sanpedroensis Pot & Gentili, spec. nova
(Figs 12 - 16)

Body solitary, flattened globose, 60 mm wide and 30 mm high, with a grass-green, glossy epidermis. Root system mainly composed of one or two tap roots. Ribs 17, spiralled, divided into 10 mm long tubercles.

Areoles with little creamy felt, 3-4 mm long, ± 3 mm wide, situated on the upper edges of the tubercles; the distance between two areoles on the same rib is 4 -5 mm.

Spines with thickened base, stiff, brown pointed. Central spines up to 4, straw-yellow, 4-7 mm long. Radial spines 16-18, more or less pectinate, sometimes bowed to the body, 4-9 mm long; upper radial spines straw yellow, the lower ones pale brown, epidermis smooth or cracked. Flowers from the base, funnel-form, 40 mm long, 38 mm wide. Pericarp bright green, naked, with auriculate green scales. Perianth segments spathulate, sometimes with a small tip, 18 mm long, 4-5 mm wide, red. Scales on the tube remind of the shape of spades. Throat magenta. Filaments salmon, at the bottom magenta, 7-9 mm long, inserted at the whole inner wall of the receptacle; anthers creamy yellow. Style yellowish, 22 mm long; stigma lobes 6-8, white.

Fruit fattened, thick-walled, greenish.

Seed broadly bag-shaped, 1.3 mm long, 1.1 mm wide, dull black with few yellowish cuticular remnants; hilum weakly depressed, broadly elliptical to pear-shaped, pale yellow.

Habitat San Pedro de Buena Vista, Potosi, Bolivia, at 2900 m altitude.

Holotype deposited in Erbario Centrale Italiano, Florence under JK 319.

Evaluation

As remarked above, south of the Rio Caine between Anzaldo and Acasio magenta flowering cacti have been discovered. By collectors all these plants are called “gigantea” after the described taxon *Sulcorebutia purpurea* subsp. *gigantea*. (Fig. 20)

We cite Hunt (2006): *The type (which does not have to be an average or ‘typical’ specimen of the species or other taxon concerned) gives the botanist an absolutely fixed point of reference from which to judge whether other specimens to which the name had been applied are correctly identified or not*. According to the authoritative source, comparison should be made with the “absolutely fixed point of reference”. However this is not easy since from the description it is not possible to determine which population the authors refer. In the text we find a given altitude

Fig. 11: Weingartia sanpedroensis JK 319

Fig. 12: Weingartia sanpedroensis JK 319

Fig. 13: Weingartia sanpedroensis JK 319

of 2900 m, probably a few km from Acasio, possibly identical with JK315. Horáček (2008) however mentioned LH1466 with 3189 m altitude as a reference to the type location. The habitat of LH1466 is not far from Santa Ana, possibly identical with another finding, JK488. Is it important to establish, which of the habitats is exactly the type locality? We think so since Hunt wrote: "*absolute fixed point of reference*". Unfortunately Halda et al had a different opinion, so we have to guess.

Gigantea was described as a subspecies of *Weingartia purpurea*. Why? It is an interesting phenomenon, that in general authors do not give an explanation. We have simply to believe it is true. If we refer to the habitat of W. purpurea, we can say we have a rather exact knowledge of it, considering L332 as the type of *W. purpurea*.

If we compare L332 (purpurea) with the above mentioned JK315 and JK488 (gigantea) using data of SulcoMania (1996), we find in a table of similarity a percentage of 69% (place 78 of 743) for JK315 and a percentage of 67% (place 110) for JK488. Table 1 shows a part of the result.

Gertel (2010) prefers the name *Sulcorebutia torotorensis* instead of *purpurea* subsp. *gigantea*. Unfortunately, he also does not motivate his choice. If, using SulcoMania again, we compare *gigantea* with HS139 (*torotorensis*), JK315 is located on place 41 in the table of similarity with 66% and JK488 even below 60%. Does this result justify the choice of Gertel?

However if we use JK325 (*torotorensis*) as a reference, JK488 is located on place 2 of the list with 86% similarity. What do we have to accept? Perhaps one of the reference plants

is not really a torotorensis?

Weingartia torotorensis was discovered in November 1969 at an altitude of 2000 m by Dr. Puña, the dentist of the Mina Asientos. The 12th of October 1982, Alfred Lau told Rudolf Oeser, he had come to this Mina because he wanted to find *Parodia punae*. Obviously Lau had got some information. After a walk of 2-3 hours in the direction of Torotoro he found *W. torotorensis*. Is it the habitat of the type plant? We don't know, but anyway it is plausible that Lau was in the neighbourhood.

Therefore, let us compare another time, now with L327 (*torotorensis*) as a reference plant. Although JK315 is found on place 11 of the table of similarity, its percentage is only 76%. JK488 is on place 32 with 72%.

The torotorensis story gets more confusing if we consider other explorations. Erich Haugg discovered a population north of Mina Asientos: EH7137, probably not far from L327. Specialists have classified these plants as *purpurea*. Data in SulcoMania however show much more similarity to *torotorensis*. Should we conclude that it is hard or even impossible to distinguish these two taxa unambiguously?

Are the data in SulcoMania wrong? Or is it not possible to recognize weingartia's by using morphological data? Is there an alternative? We are afraid, it is really difficult or often even impossible indeed to distinguish. We distrust specialists who pretend to be able to classify in this genus. We do not know the method they used to create a small number of species. Even though we have access to a large database, we are not able.

As a consequence we should accept *Weingartia fidana* Backeb. as the one and only species of this genus (on the base of the

Fig. 14: Weingartia sanpedroensis JK 318

Fig. 15: Weingartia sanpedroensis JK 318

Fig. 16: Weingartia sanpedroensis JK 320

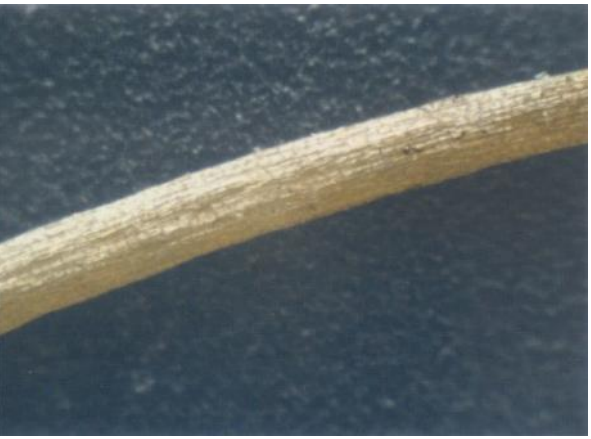
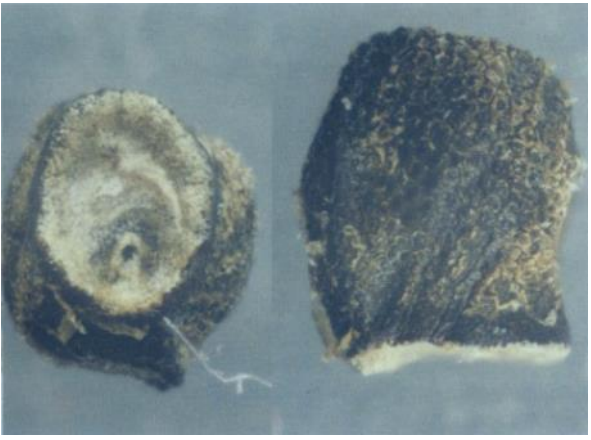


Fig. 17: Radial spine of Weingartia sanpedroensis JK 319

Fig. 18: Flowersection. The scales on the pericarp clearly show quasi small ears



shape of seeds, Cintia knizei could be seen as another species). It might be a good solution for the professional taxonomist, but presumably nobody will be happy with this proposal of a monotypic genus. By accepting it, *Weingartia* would represent the "Law of Conservation of Chaos". We would prefer a system of many recognizable taxa, to which we give provisionally the rank of species. By accepting temporarily such "small species" we will have a better chance to conserve knowledge. However, it is not our ability to modify the ICN. For the same reason, we prefer to refrain from a differential diagnosis, as frequently made in past descriptions, and fix our attention on few essential characters and similitudes.

Using the database of the project CactusData with 1875 records, we can recognize our taxon by checking only a few characteristics: (1) color of the body, (2) shape of the body, (3) color of perianth, (4) color of filaments.

Considering JK319-2 as the (artificial) "most typical plant" in this small environment, 14 most similar plants shown in Table 2 include all 13 members of the taxon *sanpedroensis* present in the database. There is only one stranger in the list: HS125A. We expect the size of this sample is sufficient to predict a result for all plants of the taxon. We expect plants of AG271 and AG272 will fit in this list. Maybe AG268 and AG269 as well, though the only plant of JK514 was not accepted. This is not bothering, as in any population there will be members with unexpected deviation.

In the opinion of some specialists *W. sanpedroensis* and *S. purpurea* ssp. *gigan-*

Fig. 19: Seed. It resembles seeds of HJ 1147 (aff. S. juckeri), LB 2464 (W. westii), HS 118 (S. spec. de Laguna) and HJ 1108 (aff. S. juckeri) most

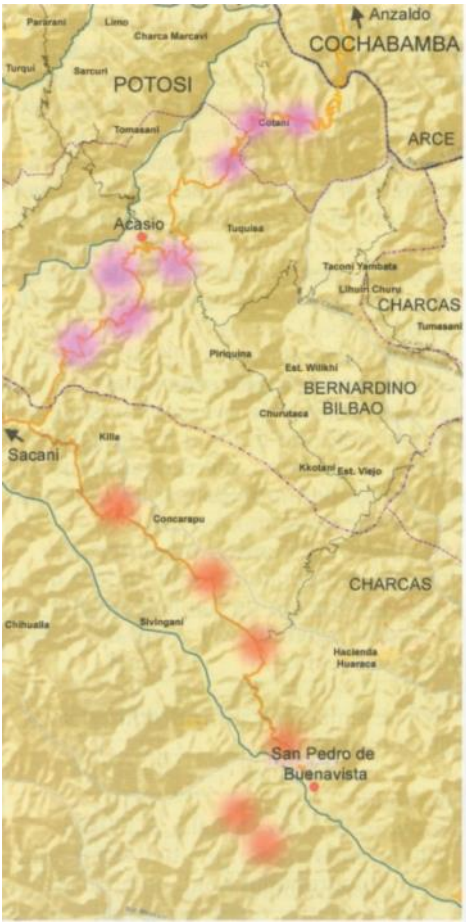


Fig. 20: Magenta spots indicate the presence of gigantea, red spots indicate the presence of sanpedroensis

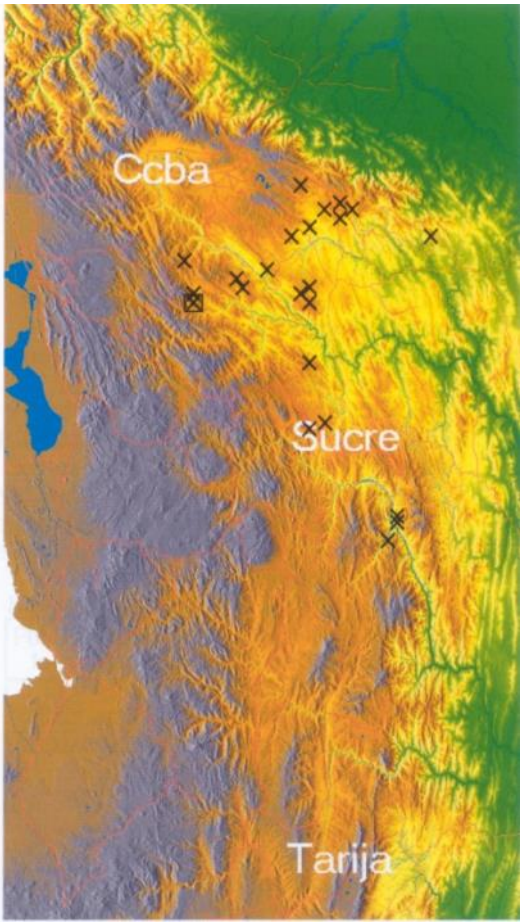


Fig. 21: 25 populations most similar with Weingartia sanpedroensis JK 319 are indicated by X. The reference population has been put in a square

tea only differ because of the color of the flower. However, when we investigated similarities and differences among these plants, we checked, using CactusData, (1) number of offsets, (2) shape of body, (3) shape of tube and (4) shape of scales on the tube.by using. JK315-1 as the plant of reference (Table 3).

If we look at the 28 most similar single plants of 1875 records, we find all available members of *gigantea*, except JK488. Among these 28 plants no *sanpedroensis* is found and surprisingly most of the weingartia's in the list have magenta flowers. Of course one can neglect this phenomena. Yet it stimulates our imagination: *sanpedroensis* and *gigantea* will have at least partially

different descent.

Once more, recognition of a taxon at the rank of species or higher usually occurs by only a few characteristics – after determination of the genus. Nevertheless in the description many more characteristics were used. They will offer information for comparison in a broader sense.

W. sanpedroensis was recognized by only 4 characteristics. Each of them influences the percentage of similarity for at most 25%. In SulcoMania maximally 22 characteristics are selected, which have a value of approximately 5% each.

When *W. sanpedroensis* (JK 319) is selected in *SulcoMania* as a reference, the more similar plants are shown in table 4. It is reassuring to see, that the data of the other two populations are the most similar. At the same time we might be surprised by the similitude of many other populations whose habitats are distributed in not neighbouring areas. (Fig. 21) But this is another story.

We would like to thank Rob Bregman for his advises and Jim Gras for proofreading the English text.

Literature:

Brederoo A.J. en Donald, J. (1981). Blütenuntersuchungen bei Weingartia und Sulcorebutia, Kakt. and. Sukk. 32:273.

Cárdenas, M. (1971). New Bolivian Cactaceae Part XIV, Weingartia torotorensis, C. & S.J. USA, 43:243.

Donald, J.D. (1974). Weingartia purpurea, A new species from Bolivia. Ashingtonia 1:53.

Gentili, A. (2015). Jenseits des Rio San Pedro, Echinopseen 12(1); 1-6.

Gertel, W. en Latin, W. (2010). Sulcorebutien - Kleinode aus Bolivien, Deutsche Kakteen-Gesellschaft e.V., 163,164.

Halda, J., Heřtus, P. & Horáček, L. (2007), Nové popisy a kombinace v čeledi Cactaceae 111, Acta Mus. Richnov. Sect. Natur. 14(4): 93-95.

Hentzschel. G. (1999). Het geslacht Sulcorebutia Backeberg emend., Succulenta 78(3):138.

Hentzschel, G. & Augustin, K. (2008). Weingartia, Sulcorebutia und Cintia, eine untrennbare Einheit, Gymnocalycium 21(2):767-782.

Hentzschel, G. & Hentzschel, K. (2001). Sulcorebutia or Rebutia, C.& S.J. USA 73:237-242.

Horáček, L. (2008). Sulcorebutia 2008, Horáček, 138,139.

Hunt, D. (2006). The New Cactus Lexicon, p. 2, dh books.

Pot, J. (1996). SulcoMania Database dvd, eigen uitgave.

Pot, J. (2005). Sulcorebutia von San Pedro, Echinopseen 2(1): 27-29.

Ritz, C., Martins, L., Mecklenburg, R., Goremykin, V. & Hellwig, F. (2007). Phylogeny of South American Cacti, Am. J. Botany 94(8): 1327.

Tabels

Table 1: List of fieldnumbers with plants similar with *Weingartia purpurea* L 332, created by project SulcoMania after comparison of 20 characteristics. Each characteristic has a value of 5%. Most of the names are provisional.

Perc.	Veld-Nummer	(provisorische) naam
100	L332	purpurea
90	JK324	purpurea
88	L336	purpurea
82	HS070	sp. Laguna
82	HS026	santiaginiensis
81	KK1593	torotorensis
81	JK507	torotorensis
81	JK131	santiaginiensis
81	HS118	sp. Molinero
80	HSO068A	jplantae
79	HS149	totorensis
79	HS115	santiaginiensis

Perc.	Veld-Nummer	(provisorische) naam
78	L337	confusa
78	KA094	hediniana
78	JK130	santiaginiensis
78	EH07133	purpurea
77	JK558	sp. Muna Pata
77	JK515	gigantea
77	JK137	santiaginiensis
77	HS164	sp. Copa Wilkhi
77	HS068	jplantae
77	HS067	sp. Molinero
77	HS042A	longigiba

Table 2: List of single plants similar with *Weingartia sanpedroensis* JK 319-2, created by project CactusData. The comparison was based on (1) colour of the body, (2) shape of the body, (3) colour perianth, (4) colour of filaments

Perc.	Veldnummer
100	JK319-2
95.9	JK318-2
94.7	JK318
93.6	JK319-1
93.3	JK319-5
92.6	JK319-4
91.7	JK318-1
91.4	JK318

Perc.	Veldnummer
91.3	JK521
89.5	JK320-2
88.7	JK320-3
87.6	HS125A
87.5	JK320-1
87.4	JK319-3
86.6	JK319
86.4	JK319-6

Table 3: List of single plants similar with plant labelled as JK 315-1. The comparison was based on (1) number of offsets, (2) shape of body, (3) shape of tube and (4) shape of scales on the tube.

Perc.	Veldnr.	Prov. Naam	Kleur
100	JK315-1	gigantea	▲
98.7	JK316-3	gigantea	▲
97.3	LHPATR	patriciae	▲
96.9	RW063	R. grandiflora	▶
96.4	MB24	gigantea	▲
95.3	JK316-2	gigantea	▲
94.5	JK315-5	gigantea	▲
94.4	JK315-9	gigantea	▲
93.5	JK490.2	gigantea	▲
92.0	MN022	R. senilis	▶
91.7	RH1393	R. berylloides	▶
90.0	KK1267	crispata	▲
89.9	LHPATR	patriciae	▲
89.6	HJ0242	hertusii aff.	▲
89.3	JK316-4	gigantea	▲

Perc.	Veldnr.	Prov. Naam	Kleur
89.2	JK315-A	gigantea	▲
89.1	AG015A	gemmae	▲
89.1	JK316-1	gigantea	▲
89.0	JK315-4	gigantea	▲
88.4	GC08a	sp. Tarabuquillo	▲
88.1	JD170	mentosa	▲
88.0	G165-15	longispina	▲
87.9	JK127-3	mentosa	▲
87.4	JK316-5	gigantea	▲
86.7	G254-2	elizabethae	◀
86.5	HJ0964	cantargalloensis	◀
86.4	AG022-1	sp. Tarabuquillo	▲
86.2	JK454	prantneri	▶
86.0	JK315-6	gigantea	▲

Table 4: List of fieldnumbers with plants similar with *Weingartia sanpedroensis* JK 319, created by project SulcoMania after comparison of 20 characteristics. Each characteristic has a value of 5%. Most of the names are provisional.

Perc.	Veldnr.	Prov. naam
100	JK319	sanpedroensis
89	JK318	sanpedroensis
84	JK320	sanpedroensis
83	HJ1113	juckeri
82	JK152	totorensis
82	HJ1150	juckeri
82	HJ1108	juckeri
81	WR465	oenantha
80	WR189	lepida80
80	L336	purpurea
80	JK507	torotorensis
80	JK503	sp. Torotoro
80	HS212	sp. Torotoro

Perc.	Veldnr.	Prov. naam
80	HS015	mariana
79	OE829	trollii
79	HS164	sp. Copa Wilkhi
79	HS118	sp. Molinero
78	L327	torotorensis
78	JK315	gigantea
78	JK163B	sucrensis
78	JK159	spinosior n.n.
78	JK147	sp. Co Cancholoma
78	JK137	santiaginiensis
78	HS068	jolantae
78	HS014	sp. Mizque

Fig 22 Sulcorebutia juckeri HJ 1113

Johan Pot
Gagarinstraat 17
1562 TA Krommenie

Allessandro Gentili
Via Amola 10
1-40050 Monte S. Pietro (BO)

Article originally published in **Succulenta** 94:4 (2015) (p. 170 - 183)

Reproduced with the permission of the author and the editor.

Translation : Johan Pot