Key for plants of the genus *Weingartia* (*Sulcorebutia*)

Summary
It is not a simple task to find specific characters for plants of the genus *Weingartia*. Or was the understanding of species interpreted rather flexibly during the past decades?

How do I recognize a cactus?
In the early eighties the chairman of Succulenta at that time, Herman Rubingh, established a study group that was going to look into the subject of nomenclature. This was a great opportunity, as I had just obtained some beautiful rebutia's without labels.
With high expectations I went to Soest. In the greenhouse of Rubingh I met a number of fellow students, who might already belong to earth's "greatest minds". Undoubtedly, they would be able to help me. I showed them a folder with colour photos. My disillusionment was hardly describable, when the experts reluctantly admitted that they were not able to identify the plants using these photos. According to them the situation was not that simple.
But, through the years, I discovered that they were right. Eventually, I specialized in sulcorebutia's, and I met Nol Brederoo. He liked to quote some authority, whose name I forgot. Nol asked, "Why is a *steinbachii* a *steinbachii*?" I did not know the answer, and neither did Nol. And slowly I discovered that nobody actually knew the answer to this simple question.

Will the real *steinbachii* get up?

I am not a taxonomist. But yet I feel uncomfortable, if plants in my collection obviously have wrong labels. I asked myself, if this could be prevented. Indeed this was possible.
Some collectors can provide you with cuttings of original plants; sometimes also of described type plants.
Nowadays in circles of sulco collectors it is usual to name plants by using their field numbers. Some cactus hunters provide their sites (fields or location sites) with a number. For convenience the plants of this site get the same coding, and even descendants of these plants are indicated in this way. Of course you may have doubts about this procedure, but it offers a certain guarantee to obtain reliable material, provided with a "field number". In this way all plant labels are correctly identified.

Let him, who knows the truth, speak.
The field numbers, however, are not the final solution. One way or another we like to give these numbered plants a name, which we can find in the literature. And, suddenly we find ourselves in a labyrinth, apparently without exit.
The researched, knowledgeable books were written by experts. They had disposal of the knowledge, necessary to distinguish all of these plants. They were able to judge, if a certain group of plants could be recognized as a single taxon. They could give this taxon a name. They were taxonomists.

But, strangely the same experts frequently engaged in huge struggles to assert their naming decisions, because the opinions of one expert may differ significantly from those of his colleagues. Although they study the same plants, do they struggle because not all taxonomical units are defined unambiguously? Or is it caused by different characters that they see, which were the basis of the concept?
I could not find that these experts used anything other than morphological characters. In that case it should be possible to recognize a species using its specific characters. After all, a species (casu quo subspecies or variety) is described using a single "type" plant from the population, which will eventually be recognized as a taxon. Of course members of the same kind will differ from the type, but within acceptable limits.
If among a population of short-spined, red-flowered plants is found a long-spined, yellow-flowered one, our first thought will probably be that we see members of two taxa.
Yet this remains difficult. According to Hunt (2006) the type plant must not be "typical". So we cannot exclude, that by chance a form is described that deviates rather strongly from the average. In that case it will not be easy to recognize this taxon in spite of the data of the first diagnosis. Experts however seem to be able to do so, though they too will have problems with the question of Nol Brederoo: "Why is a *steinbachii* a *steinbachii*?"

Design of the key
A German cactus friend challenged me to construct a key to identify a particular species. After some hesitation I took up the gauntlet. I'll try to explain here, how I composed this key, and I am hardly bothered by any knowledge of taxonomy.

The key cannot be based upon the data of the first descriptions, because:
- I try to prevent by chance of selecting an odd plant.
- Most of the plants are not from the population of the described plant.
- The same set of characters must be known of all taxa to be compared.
- The author of a species may interpret observations in a different way than I do. For example colours are difficult. But, also I feel embarrassed if in the description, one plant is called "not caespitose" and I find in the same article a picture with a caespitose plant, belonging to the same species.

During the last couple of years I took data of about 1,350 plants, which I put into a database. The habitat of most of these plants is known. Therefore I base my key on plants of the same field or location. In a popular way: I start from "field numbers". One has to be aware, that the connected names are provisional.
With a program the characters of each field number are bundled. You find the result in the third part of the key. Here it becomes clear, what characters of each population are constant (of course, judged from my collection). Sometimes, one finds that single plants may deviate rather strongly from the average.
Now I can select a field number and explore what plants in the whole database have the same constant characters. Following is a possibility:
1. only plants with the selected field number are found.
   One can think of a population, that can be recognized as a taxon. If a plant of this population already was described, then this taxon has a name. In this case I believe to have answered the question of Nol Brederoo in a wider sense.
2. one single plant with another field number is found as well. I speak for the sake of convenience of "polluting plants".
   Perhaps such a plant is an exception within its own population. Or it is impossible to distinguish both populations using the characters in my project.

I left “polluting plants” in the solution.

3. several plants with different fieldnumbers are found.
   It is impossible to distinguish this population from other ones, using the characters in my project. To me it seems difficult to recognize this population as a taxon. This goes, for example, for *S. pampagrandensis* and *S. santiaginiensis*. After a number of experiments I blocked these populations, but sometimes you will find them in the key. I decided to accept this “pollution”, as they will not cause any harm.

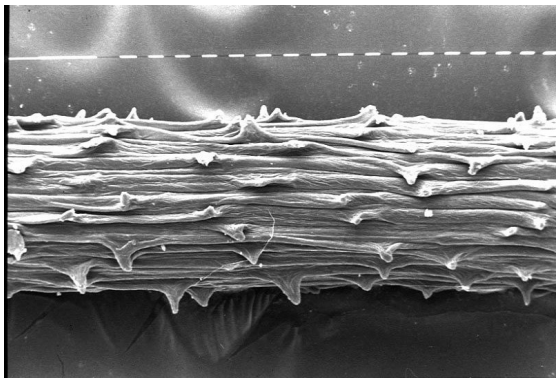
The following characters were used:

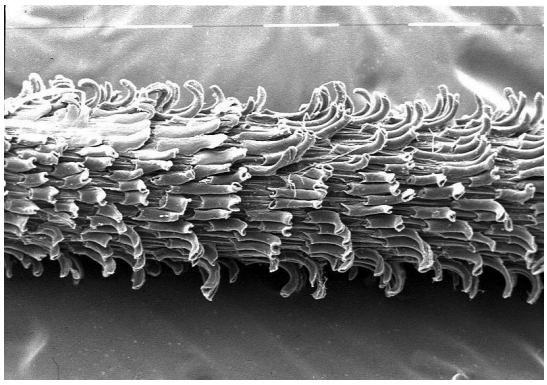
1. Shape of radial spines
2. Colour of the flower
3. Roughness of radial spines
4. Colour of radial spines
5. Colour of the filaments
6. Number of ribs
7. Position of radial spines
8. Number of radial spines
9. Length of radial spines
10. Central spines
11. Radials projecting, yes or no.
12. Shape of the perianth
13. Offsetting
14. Angle 1 (fig. 2)
15. Position of the stigma
16. Shape of scales on the receptacle
17. Colour of the stigma
18. Colour of the epidermis
19. Number of scales of the receptacle
20. Relation of height/width
21. Colour of the flower bud
22. Angle 2 (fig. 3)

Shape of radial spines:
Every time some spines with a strange direction are found. At first I believed, it was due to damage, but that is not true.


Radial spines - a little bit bent + a little irregular

Roughness of radial spines:
Wim Vanmaele (1983) published about different shapes of roughness. He spoke of “lobes” and “fake lobes”. In the key I use “bulges” and “curled”.


Radial spine rough (bulges)


Radial spine rough (curled)

Flower section:
It is not necessary to measure angles exactly. I only used this character in obvious cases. In this project an acute angle is less than 40°, an obtuse angle is more than 90°.

Angle 1

Angle 2

Shape of scales on the receptacle:
Two eye-catching shapes were used:
- "spades", like portrayed on a playing card
- round
other shapes are indicated by "unnamed".
Colour of pistil; colour of flower bud:
Only used in the case "green".

Hoping to obtain a more or less dichotomous key, I sorted the results on the characters used in the upper order. To me, in this sense, the result is not fully satisfying. Yet I assume, the key will be helpful to find a possible name, in the following way:

Use of the key

1	Radial spines: straight		
	↓116	Flower color: violet	
		↓ 4	Roughness radial sp.: smooth
			Radial sp.: white- brown tipped
			Number of radial sp.: 13 -25
			Length of radial sp.: 5 -12 mm
			Position stigma: below upper anthers
			Number of scales receptacle: less then 5
			S.sp.Khara Pusta ref. JK118
2			Radial sp.: brown
			Length of radial sp.: 7 -11 mm
			Central spines: more SP > 5mm
			RS strongly projecting: angle <150°
			S.renatae ref. G109, HE113
3			Number of radial sp.: 8 -12
			Length of radial sp.: 8 -16 mm
			S.sp.Laguna ref. HS118
4		Flower color: dark red/purple	
		↓ 15	Roughness radial sp.: smooth
			Radial sp.: dark brown or black
			Central spines: more SP > 5mm
			S.frankiana ref. FK086, G047a
			S.sp.Molinero ref. HS067
			S.jolantana ref. HS068a
			S.totorensis ref. HS149,JK022
			S.lepida WR189
5			Color stamen: dark red
			Number of ribs: less then 13
			Number of radial sp.: 10 -11
			Length of radial sp.: 3 - 6 mm
			Color pistil: green
			S.sp.Sillani ref. LHSIL

The first question to be answered is the shape of the radial spines.
If not all of the radials are straight, you continue in the same column on line 116.
If all radials are straight, you continue with one position to the right: the colour of the flower. If the colour of the flower is not violet, you continue in the same column on line 4. If the colour of the flower is not dark red or purple as well, you continue in the same column on line 15.
If the colour of the flower is indeed violet, you move one position to the right. Now you find six conditions in the same column. If all conditions are fulfilled, your plant will look like plants with field number "JK118". If this is not the case, the key has no solution.

The latter possibility occurs in case:
- the unknown plant is from a population not admitted in the database.
- the unknown plant is an exception within the population
- the plants used by me are exceptions within the population
- the unknown plant is from a not distinguishable taxon like *S. pampagrandensis*.

If the research was successful, you may assume, your plant looks like plants of the field number to what the key refers: behind a name or an indication of a locality you find "Ref.". The used name is fairly accepted.

Evaluation of the found name
It is possible, that some experts have a very different opinion about the reliability or the status of the found name. Nowadays compositions of more than two elements are in fashion and often we find the concept "subspecies". Indications for this, or often hard to retrieve relationships, are outside the scope of this project.
Yet I suppose, if a name of a species more than once is connected to combinations of different characters, one should worry seriously about the taxonomic reliability. Besides I wonder about the sense when plants with very different characters are put into one taxon. The taxon will have become unrecognizable.
The other possibility may be that innumerable populations are described. I expect experts to say: "Would you really describe a new species because of one spine more or less?" This indeed does not seem wise to me. But I was really surprised how easy I could isolate most **populations** from **all** other plants in this project. This was not due to one spine more or less, but to a combination of characters. Anyway, some postulated **species**, related to more populations are unrecognizable.

Perhaps it is advisable for the amateur to accept many mini taxa. In the meantime, the professional taxonomist can on a very different level think great thoughts, and make every effort to reduce the number of scientific entities to recognize taxa, using all sorts of – to me still unknown – methods and techniques. Meanwhile I stay curious, in what way they will answer the question of Nol Brederoo.

I would like to thank Wim Vanmaele for his contribution of the REM photos of the surface of spines and Dr. Ronald E. Monroe for proofreading the English translation.
If you are interested in the key, you can visit on the internet the site www.sulcopassion.be of Claude Bourleau, or contact me. The key is available in four languages.

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Literature:

Hunt, D. (2006). The New Cactus Lexicon, Dh books: 2,3,4
Vanmaele, W. (1983). Vergelijkende morfologie en taxonomische bruikbaarheid van doornen van enkele cactacea-genera, samenbundeling van de teksten uit Cactus.