

International Rock Gardener

ISSN 2053-7557



Number 131

The Scottish Rock Garden Club

November 2020

---International Rock Gardener---

November 2020

Articles this month bring the description of a new species of tulip from Uzbekistan brought to us by J.J.(Sjaak) de Groot & K.S. Tojibaev.

We follow this with a new combination in *Montiopsis* (Montiaceae) from John and Anita (Ana Rosa Flores) Watson. Zdeněk Zvolánek, with photos by Martijn Jansen, highlights *Dionysia khuzistanica* and a delightful cultivar, which Martijn raised and has named for his son, Thom. This is complemented by photos from Ewelina Wajgert of the dionysias in the garden of Josef Mayr.

Our final article this month is presented here as a tribute to our late proof-reader and the former President of the SRGC, Glassford Sprunt - it is a piece "My Way with Seeds" that Glassford wrote for *The Rock Garden*, print journal of SRGC, in 1993.

Glassford did a powerful amount of work for the Club over decades and he will be sorely missed. Happily we have a show trophy to remember him by – it has been awarded (for the best pan of bulbs in a 19cm pot) at the Stirlingshire Show since 2014 – below are some of the plants to have won it.



Cyril's *Crocus cvijicii* 'Cream of Creams' was awarded the new Glassford Sprunt Trophy for Best pan of Bulbs in a pan not exceeding 19cm.

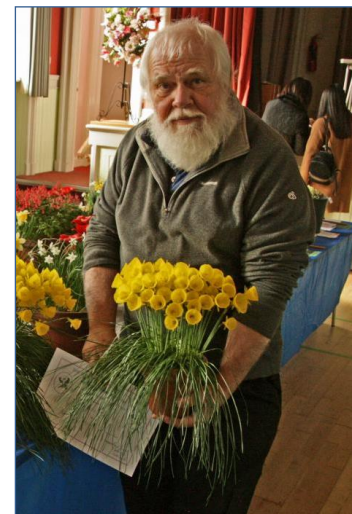


Four winners of the award have been from Cyril Lafong. The *Crocus* was the first, *Fritillaria gibbosa* (twice!) and *Corydalis oppositifolia*.



Narcissus 'Tinkerbell' – a hybrid of *N. triandrus triandrus* and *N. alpestris* was raised by Margaret and Henry Taylor – the plants had grown in the garden for some years before being potted for the show to win the Glassford Sprunt award in 2017.

David Millward (right) won the trophy in 2019 with *Narcissus obesus* 'Lee Martin'.



Now, happily, an event has taken place which called for "something extra" for this edition – we learned that Zdeněk Zvolánek had been

honoured with the most prestigious award of the Alpine Garden Society. The news came from the annual general meeting of our sister society, being held online, because of Covid restrictions. We spread the word via social media as fast as possible - and it has been heart-warming to read the messages of goodwill and congratulations there for Zdeněk from the likes of Panayoti Kelaidis, Paul Spriggs, Jiri Papousek, Bobby Ward and Alan Furness – words of appreciation from around the world, as befits an International Rock Gardener!

[Cover image: *Montiopsis tricolor*, photo Anita (A.R. Flores) Watson]

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---Award for ZZ ---

It was with very great pleasure that we learned at the Alpine Garden Society annual general meeting in November 2020 of the announcement that Zdeněk Zvolánek was to receive its most prestigious honour, the Lyttle Trophy. Quoting from the AGS citation to Zdeněk Zvolánek on the occasion of this award: *“It is given to very few horticulturists to command a prime spot on an international stage over more than four decades, never mind garden on two continents, double up as a part-time nurseryman, edit two influential publications simultaneously, participate in (and sometimes) organise conferences, workshops and practical demonstrations, build significant gardens for others, and also chalk up a series of landmark plant introductions.”*

Zdeněk has been known to UK alpine lovers from early articles in the late 1970s when his travel was restricted by the Iron Curtain. Since those days he has made the most of his chances to travel both to areas of botanical interest around the world as well as to share his expertise in the making of crevice and sand gardens - often for renowned botanical gardens around the world. His organisational skills whether in the matter of seed collecting, garden design and construction of show and conference plans in Czechia (which SRGC has been pleased to support) or sourcing and editing material for *Skalničky* (the Prague Rock Garden Club journal) and the *International Rock Gardener* have all shown him to be a well-rounded maestro in our alpine world. So many gardens now benefit from the exceptional plants that he has helped to introduce to horticulture. The list of outstanding plants we might never have known of, without him, is a long and impressive one which the AGS citation for the Lyttle Trophy happily addresses.

In 2019, forty years after his early work with alpinists, ZZ, as he is fondly known, was part of the international team assembled by SRGC to construct a new crevice bed in the beautiful Inverewe Gardens, a National Trust for Scotland property – his friendship and cooperation with plant lovers in the UK is as strong as ever. In 2010 after conversation with Margaret and Ian Young of SRGC, they formed, in partnership with ZZ, this free magazine, *International Rock Gardener* which brings articles to a wide audience by means of the internet – and which to date includes a long list of articles introducing new plants, both by describing new species or work by hybridists from around the world as well as practical advice for growing plants in different climates. The AGS citation states *“To maintain such a pace for just a few years would astonish: to do so throughout so much of his life astounds.”*

Zdeněk is a man who enjoys life, music and nature, loves his family and friends – and he is generous in sharing all that with us – thank you ZZ - and congratulations on this fine award! M.Y.



Zdeněk Zvolánek – photo by Olga Bondareva



The IRG Team at the Beauty Slope - ZZ's garden.

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---Species Description ---

Tulipa bactriana (Liliaceae), J.J. DE GROOT & K.S. TOJIBAEV

A new species of *Tulipa* from the Surxondaryo province of Uzbekistan

J.J. DE GROOT & K.S. TOJIBAEV

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Published in IRG 131 November 2020. pages 4-11

In 2007 during our yearly tulip-tour to central Asia we visited the Surxondaryo province, Uzbekistan's southernmost province, bordered with Afghanistan, Tajikistan and Turkmenistan. It is an area where several tulip species occur, among them several with red flowers and in many cases these species are difficult to distinguish in the wild. In the direction of Derbent we saw in the hills beside the road several red tulips, there was a bare red sandy place with abundantly growing *Tulipa nitida*, in the low grass around where several *Tulipa tubergeniana* were in flower, all very short plants almost without a visible stem and with very crinkly leaves.



Tulipa tubergeniana near Derbent

Between the individuals of *T. tubergeniana* was a plant that differed: it had a long stem, arched, non-crinkled leaves and on the tepals of the red flower are long cusps almost equal on the inner and outer tepals. When we arrived at our hotel on the outskirts of Baysun, we saw between the grass that surrounded the hotel several red flowering tulips: at first we thought it was also *T. tubergeniana* but, in cultivation when the bulb (that I dug up with permission of the hotel manager) flowered, it was determined to be a form of *T. lanata*, also known from that area.

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Tulipa tubergeniana with black base spot near Vandob, Kugi-Tang Mountains



Tulipa lanata in the garden where we stayed, near Baysun.

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In the sand that came from elsewhere and was used to level the area around the hotel, several non-flowering tulips with single long narrow arched leaves were growing, Wim Lemmers our tour leader, suggested it is *T. hoogiana*, a species that he has seen in NE Iran, as this tulip has similar narrow arched leaves but the distance to its natural growing place in the western Kopet-dag of Iran and Turkmenistan is quite large, so it was not likely to be this species. The next day as we left Baysun, going south to Sherabad, we crossed a hilly area, on a stop to explore the hills near the road. I saw on top of a red rock which was circa 4m high, a tulip with a red flower past its prime, however this tulip had the same narrow arched leaves as the tulips near Baysun.



Tulipa bactriana near Derbent

At the foot of the rock, (the tulip on the top of the rock was inaccessible because the eroded surface was slippery like cheese) I dug up a bulb; in the very woolly bulb tunic I found two small young bulbs, that I cultivated back in the Netherlands to flowering sized bulbs. When in flower, it turned out to be the same tulip that we had seen near Derbent with similar long cusps on the tepals, unfortunately, in contrast to *T. tubergeniana*, the tulip didn't make offsets. Years later during another tour in Uzbekistan, we met the Uzbek botanist Dr. Komiljon Tojibaiev. When I told him about this tulip he mentioned that he has seen the same tulips in the Kugitang Mountains on the border with Turkmenistan. He asked me to describe these tulips as a new species with the name *Tulipa bactriana*, named after the ancient Kingdom Bactria that covered the area where this tulip grows. As I didn't want to offer the only plant that was left for the herbarium, I have not done that up to now. Fortunately, in spring a few years later, in an accident with herbicide that I was spraying over the weeds on the bare land beside my tulips, a gust of wind blew a small amount of this stuff over a row of tulips that never wanted to make offsets. This was not enough to kill the tulips, but to my surprise in the summer when I dug up the bulbs for summer rest, five to six bulbs, all of different species, had formed a daughter bulb. The year after, *Tulipa bactriana* made another daughter bulb after which it grew normally. Now the bulbs had only to grow to flowering size to sacrifice a plant for the herbarium.



Tulipa bactriana in cultivation

Tulipa bactriana J.J. de Groot & K. Tojibaiev sp. nov. TYPE: clonal stock G07-1, grown from a wild collected bulb, and is found in South Uzbekistan in the valley of the Surxondaryo and Sherabad rivers 37.41.57.53 N and 67.26.52.69 E, on an altitude of 420m. The type form (holotype) of cultivated plants G07-1, from the collection of J.J. de Groot is in the National Herbarium Netherlands nr L.3993359

Diagnosis: *T. bactriana* belongs to the section *Tulipanum* Rebol and it can be recognized in the wild by its long cusps on all the tepals, in contrast with other red flowering species in the same growing area that have only long cusps on the outer tepals. It differs from *T. tubergeniana* also by the longer stem with long arched and straight leaves; from *T. lanata* by its more slender habit and the covering of the bulb tunic; *T. lanata* has a thick layer of shaggy long hairs whereas *T. bactriana* has a woolly coating.

Description: The bulb is up to 44mm diameter, covered in a brown coriaceous tunic, with an elongated nose and a thick coat of felted material inside. The stem in cultivation is about 55mm long including a flower-stem of 45mm at start of flowering, extending later, the flower-stem is covered with short hairs.

Leaves: usually four. Basal leaf 156 x 42mm, is on soil level, second 160 x 27mm, third 135 x 17mm, fourth is 133 x 13mm. The glaucous-green leaves with wavy margins are slightly channelled and arched, the margins are partly covered with short hairs.

Flower: the oval outer tepals 75 x 46mm, are tapered to a sharp whitish tip, on the margins near the tip are some short hairs. On the outside is a small pale yellow spot on the base surrounded with dull purple-red, the broad margins are orange-red. The inside is bright orange-red with a black-purple spot on the base of approx. 37% of the tepal length surrounded by a pale yellow margin. The obovate inner tepals are 78 x 39mm, ending in an acute white tip. The outside is bright orange-red; the basal spot over 40% of the tepal length is pale yellow. Inside the colour is similar to the outer tepals. The margins of the inner tepals are commonly inwards curved. The stamens are 20mm long including filaments of 8mm, the triangular filaments are black with a yellowish base and the twisted anthers are black with yellow pollen. The straight ovary is green with a pale yellow stigma; the edge of the lobes is pale purple.

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Location map for *Tulipa bactriana*

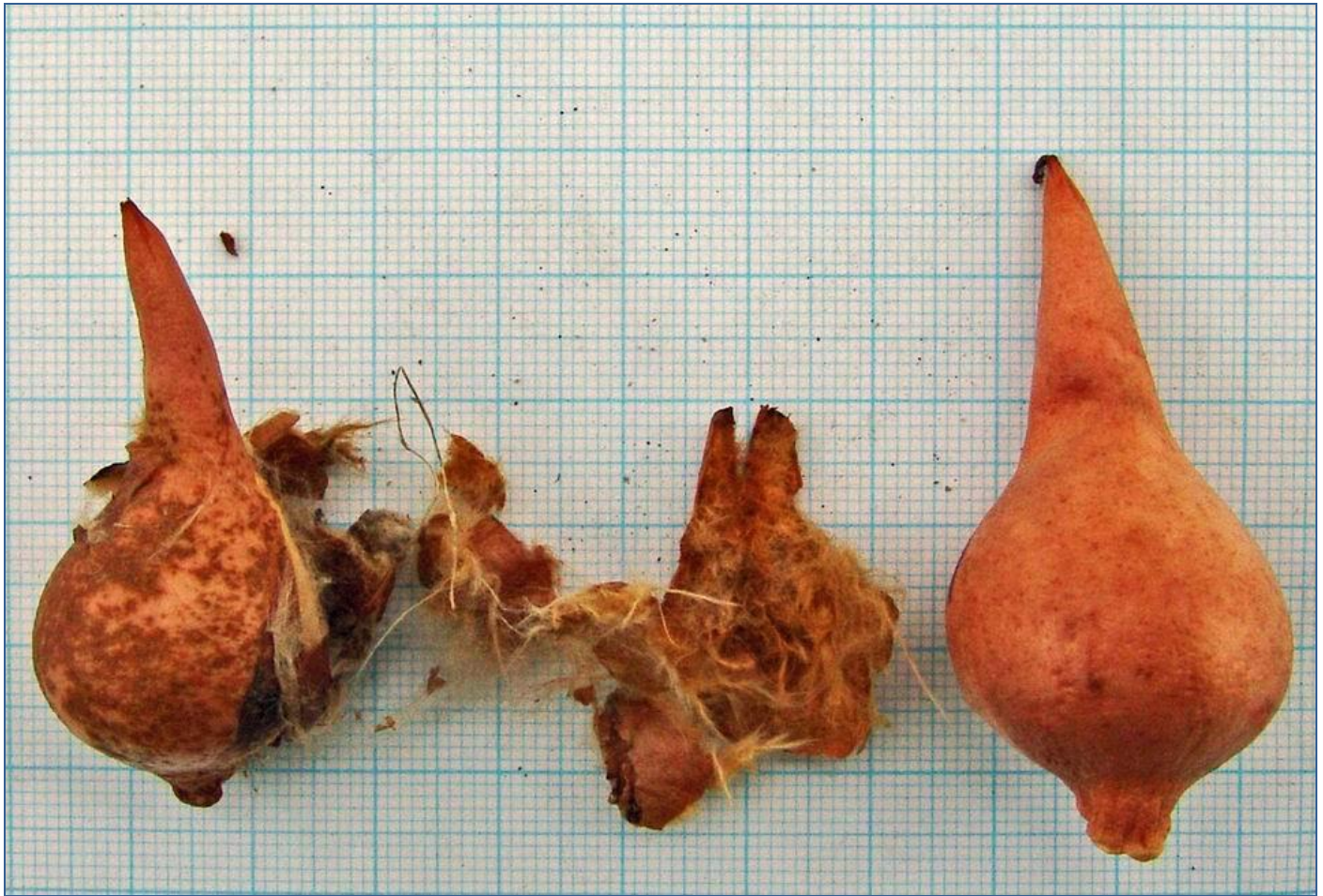


Tulipa bactriana seedpod



Tulipa bactriana seed

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Tulipa bactriana bulbs



Tulipa bactriana floral segments

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Habitat & ecology; *Tulipa bactriana* grows on red clay hills and in grass at the foot of these hills. It grows between short grasses at a depth of about 20cm. Other geophytes on the same location are *Gagea* sp. and a small Juno *Iris*. Most leaves are eaten by cattle.

Value of the nuclear genome size of this tulip is 56,1pg

Differences between *Tulipa bactriana* and related species:

From the *T. tubergeniana* (growing nearby) by its narrower, more arched and longer leaves, *T. tubergeniana* has more adpressed and crinkled leaves and straight anthers with purple-brown pollen. The flower of *T. bactriana* has more pointed and incurved tepals and twisted anthers with yellow pollen. The flower as whole is narrower than *T. tubergeniana*. The bulb has a longer nose than *T. tubergeniana*. The value of the genome size: 56,1pg for *T. bactriana*, and 54,0pg for *T. tubergeniana*.

T. bactriana differs from the larger and later flowering *T. lanata*, also growing in the same area, by cusped flowers and the size of the plants.

T. bactriana flowers 3 weeks earlier in cultivation under the same circumstances than *T. kuschkensis* from Turkmenistan. *T. kuschkensis* is larger; the bulb of *T. kuschkensis* is similar but also larger. The value of the genome size of *T. kuschkensis* 53,8pg.

Both species multiply only by seeds whereas *T. tubergeniana* and *T. lanata* also propagate vegetatively. P. Furse; in the Tulip and Daffodil Yearbook 1964, found similar tulips in NE Afghanistan with the field numbers PF 6145, 6146, 6141 and 8143, which could be the same species.



1-*T. bactriana*, 2-*T. lanata*, 3- with the crinkled leaves, *T. tubergeniana*

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Comparison table:

	<i>T. bactriana</i>	<i>T. tubergeniana</i>	<i>T. lanata</i>	<i>T. kuschkensis</i>
Bulb covering	woolly	woolly	long untidy hairs	woolly
Number of leaves	four	four	three to five	four
Hairs on leaf margins	upper half	near the tip	whole margins	whole margins
Hairs on leaf surface	no	no	yes	yes
Form of the leaves	straight	curled	straight	straight
Flowering time in cultivation	early	mid	late	mid
Long cusps on tepals	all tepals	outer tepals	outer tepals	outer tepals
Inner tepals	incurved	flat	flat	incurved
Anthers	twisted	straight	twisted	straight
Pollen	yellow	purple-brown	purple-brown	purple-grey
Vegetative propagation in cultivation	no	yes	yes	no



T. kuschkensis in Badgiz reserve Turkmenistan

Flow cytometry was done by Dr. B.J.M. Zonneveld.

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--- Taxonomic Clarification ---

A new combination in *Montiopsis* (Montiaceae) : John and Anita (Ana Rosa Flores) Watson

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Published in International Rock Gardener, IRG 131

Botanical background

The species presented here has a long scientific history dating back beyond its original protologue to Carl Linnaeus, and over time its relevant related taxonomy has changed several times. We follow below with an outline of its scientific history.

The first historical taxon of note in its relationships was the family Portulacaceae (Linnaeus 1754), a name still well recognised in both scientific and horticultural spheres. Over time it accumulated a large number of species from its familiar genera - *Calandrinia*, *Claytonia*, *Portulaca* and others.

However, recent molecular analysis (e.g. Applequist et al. 2001) revealed that these are polyphyletic, that is to say they do not share the same original ancestor, but have evolved from various. This meant that to order them systematically with accuracy they could not all be retained within the same family. The ancestors had to be evaluated and all the genera that were assigned to each of them had to be monophyletic (that is, originate from the same single ancestor). That not only resulted in a proliferation of subsequent genera, but greatly reduced the contents of the Portulacaceae itself (when known as Portulacaea sensu strictu), so that now it consists largely of the familiar genus *Portulaca*, the best known of whose species, *P. oleracea*, is used in salads, and can also become a bit of a garden pest. The species number is uncertain at present, but given as between 40 and 100.

One of the main families, if not the main, to have been split off from the Portulacaceae is the Montiaceae (Rafinesque 1820). Its best known genus, the once very numerous *Calandrinia*, has been subdivided into a few separate genera, and its accepted remainder in Chile has now been reduced to eight attractive narrow leaved Andino-Patagonian perennials and five very different-looking small annuals.

Considering the name of this journal and their enormous familiarity and popularity in cultivation, it would be unthinkable not to mention *Lewisia* as also belonging in the Montiaceae, despite none of its taxa being present in South America.

The taxonomy of this group is still far from effectively resolved. Several evident species of the genus *Cistanthe* at least are still listed under the Portulacaceae, as they have yet to be recombined. In fact the taxonomy is so varied from source to source that it is impossible to know whether or not one has made the most accurate sense of it under the circumstances. This presentation will do its best, even though the authors admit to not being dedicated specialists despite their strong interest!

In fact one of the leading authorities, if not the leading authority, of the Portulacaceous alliance has admitted that significant areas of the group as a whole are difficult, if not sometimes impossible to make sense of as things stand, even for him. He has described the taxonomy of certain sectors of the group as chaotic (Herschkovitz 2018).

The species presented here and its new genus

The genus to which we have assigned the taxon here, *Montiopsis*, was described and presented by the German botanist Carl Ernst Otto Kuntze (1898), but has only assumed significant importance

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since it was adopted as one of the main genera of the taxonomic division of the genus *Calandrinia* sensu lato. But the initiating modern specialist and leading authority of this was the American botanist Donna Ford. She and other co-authors reviewed and recombined all the former distinct *Calandrinia* species that fell within its circumscription (e.g. Ford 1992).

Regarding its two systematically close genera, it differs obviously from *Cistanthe* by the absence of succulent foliage, which characterises all bearing that name. The remaining taxa in Chile still included in the other, *Calandrinia*, consist of eight perennials, which all possess tufted rosettes with grassy, very narrow, semi-succulent laminas, while the five annuals are very disparate in appearance.

The 18 species of *Montiopsis* differ from those genera in several respects, but the main characteristic is the evident pilosity (hairiness) of all but one or two. However, Hershkovitz (1993) has published important further vital distinguishing features between the [inflorescence development](#) and forms of the three: *Montiopsis* (bostryx or botryoid), *Calandrinia* (solitary/axillary and so-derived) and *Cistanthe* (cincinnus).

Donna Ford also happened to be a personal friend. While in Santiago investigating and defining *Montiopsis* in the field and the Natural History Museum's herbarium, she stayed in Anita's flat there. Later, after we two had just formed our life and work partnership, she paid another short visit and got to know John. It was then that he discovered she had not seen in the wild either *Montiopsis andicola* or *M. tricolor* - which she had synonymized in her monograph. He, who was very familiar with both species in situ already, explained and described the very considerable morphological difference between them, as well as the significant vertical distribution gap, and she agreed immediately that they should be treated as distinct (D. Ford, pers. comm.). It was her agreement with our judgement which formed the basis of our presentation herein.



fig.1: *Montiopsis andicola* (photo - courtesy of the Internet)

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Taxonomy

Montiopsis tricolor (Phil.) J.M. Watson & A.R. Flores, comb. nov. [figs. 1,2,3]
Syn. *Calandrinia tricolor* Phil. Linnaea 28(6): 642. (1858)

	MONTIOPSIS ANDICOLA	MONTIOPSIS TRICOLOR	
High Andean (3000 m) Portillo	X		
Low Andean (2200 m) Lagunillas		X	
Plant compact, more or less prostrate	X		
Flowering stems patent to suberect		X	
Leaves small, short	X		
Leaves larger, longer		X	
Corolla bright pink with white centre	X		
Corolla tricoloured: base yellow surrounded by short zone of bright pink to red: extensive outer zone white, pale pink or pale yellow		X	
Corolla small	X		
Corolla larger		X	

Note: No intermediate forms or hybrids between these two distinct species have been recorded. This is hardly surprising, for the ca. 1000 m vertical distance separating them contains neither, so far as is known.



fig.2: *Montiopsis tricolor*, photo - Marijn van den Brink

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Rafinesque, C.S. (1820) Montiaceae. *Annales Générales des Sciences Physiques* 5: 349.

Useful [Glossary of Plant Terms](#) - Missouri Botanical Garden -

Stevens, P. F. (2001 onwards). Angiosperm Phylogeny Website. Version 14, July 2017 [and more or less continuously updated since].

fig.3: Maule Region, South Chile: *Montiopsis tricolor* in the Maule Valley. It grows high up on the lateral range enclosing the valley to the south. (12 Jan 2014. ARF).



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--- New Dionysia Cultivar ---

Painted Flowers: text Zdeněk Zvolánek, photos: Martijn Jansen

Martijn Jansen is a young Dutchman who grows, breeds and sells fine alpine plants. In the autumn issue of the Czech Rock Garden journal we admired on the covers his *Dionysia khuzistanica* and dark purple form of *Physoplexis comosa*.



Physoplexis comosa - Martijn Jansen's very dark form of this iconic alpine plant.

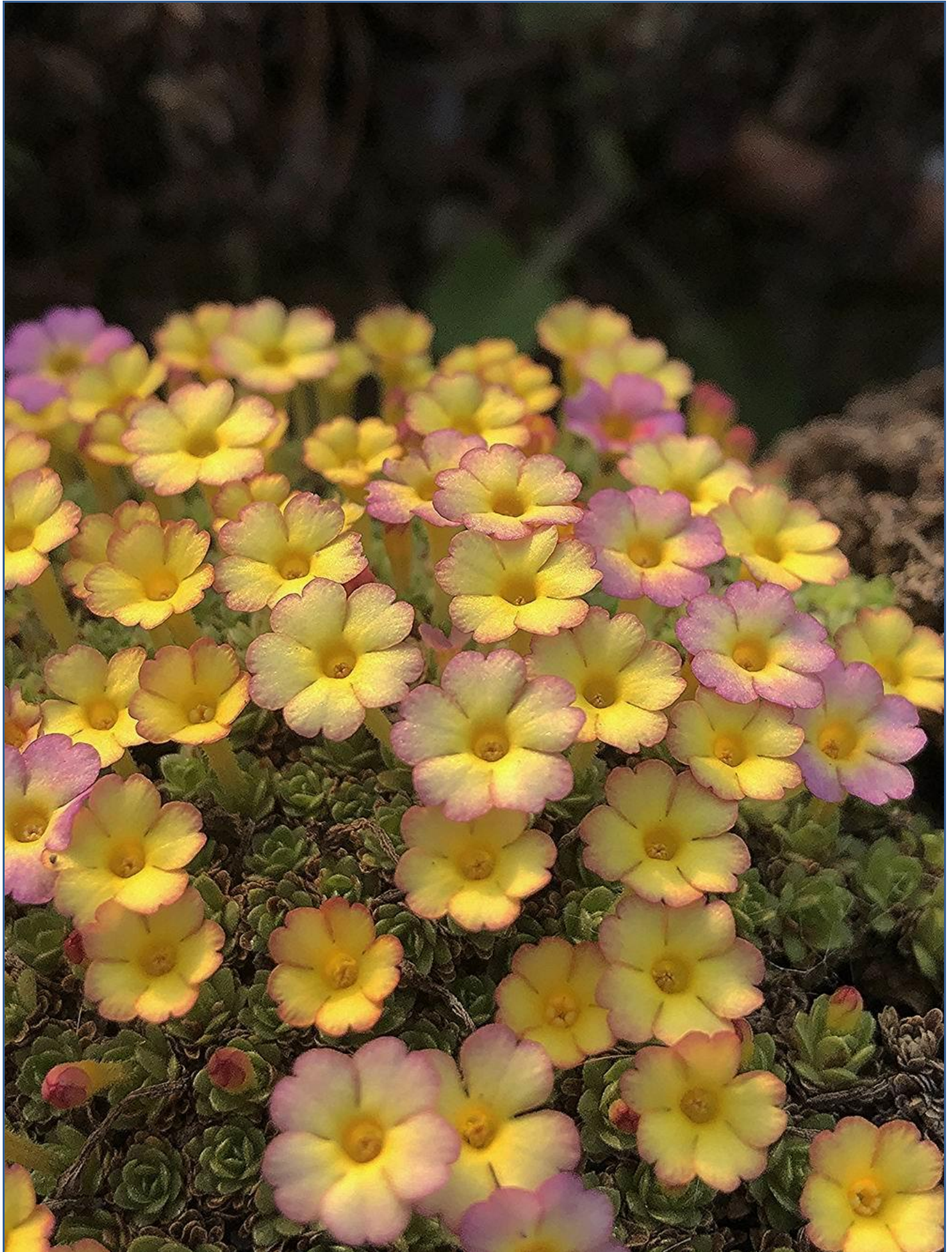
The genus *Dionysia* is one which engenders great enthusiasm from growers of alpine plants though the plants are not easy, with a few exceptions, either to obtain or to grow. There have been some notable growers, such as the late Eric Watson (a former president of the Scottish Rock Garden Club) and the wizard that is Michael Kammerlander, who has bred so many fine plants.

The relatively newly named *Dionysia khuzistanica* was described by Jamzad in the *Iranian J. Bot.* 7: 25 1996. It occurs in a valley of the Zagros Mountains in Iran, growing there as if nailed on vertical limestone walls at altitudes of 2000-2100 metres. Cushions made of light green hairy leaves are as solid as fists. Seed was collected there by a small German expedition marked JLMS in 2002. One of the members of the expedition was the robust Bavarian stonemason Josef Mayr, a specialist in the difficult and most beautiful alpine plants, especially from the genus *Dionysia* (grown on the flood benches of new wooden greenhouses). Josef Mayr also collected *Dionysia khuzistanica* seed there in 2015.



Dionysia khuzistanica

A portion of these seeds was germinated in the Netherlands by Martijn Jansen; a total of 21 seedlings resulted, most resembled the mother with yellow flowers, but, after the intervention of an unknown pollen donor, there were some pink flowers. One plant was noticeably different – it was like a slightly mixed vanilla ice cream with a beautiful pink border and flash or blush.



Dionysia x 'Thom'

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That one plant is so distinctive and different that it bears the name of the grower's son - *Dionysia* x 'Thom'. The cultivar is compact; the small rosettes are made of obovate entire leaves covered with miniature indumentum of minute capitate glands. The flowers are single, sessile to the cushion, thin flower tubes are 10-15 mm long. The crown is honest yellow with pink painted margins. The short style is hidden under long anthers, indicating that it is a "thrum" plant. (In "pin" plants, the style is much longer than the anthers. [Primulaceae is one of the plant families which displays this heterostylous nature.](#) Self-pollination can occur more readily in pin flowers, but for successful seed set it is often necessary to cross both types.)

We know well from the practice of the *Dionysia* hybridizer Michael Kammerlander that insect pollination in an alpine greenhouse is very productive, as is the case in Josef Mayr's house near Dachau, where many fathers of beautiful hybrids remain unknown. Hybrid plants are almost always more sustainable than parents, and that is the most important thing for growers.

Ed.: See photos of the exquisite *Dionysia* grown by Michael Kammerlander [here on the website of Josef Lemmens.](#)

Polish plantswoman, Ewelina Wajgert has visited the garden of Josef Mayr and she kindly shares some pictures of his *Dionysia* collection in the following pages. You can see more, [here on Ewelina's website.](#)



Dionysia in tufa

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Pot grown dionysias in the alpine house of Josef Mayr



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Tufa wall



Dionsyia thriving in tufa.

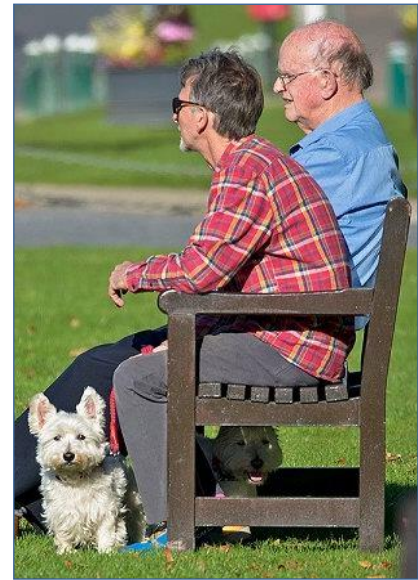
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--- Remembering a Good Friend --

The late Glassford Sprunt was a real hero to the SRGC in many ways – this is a small tribute to him. He was a regular at shows - first exhibiting, then judging and always photographing and taking copious notes on all the exhibits that caught his very discerning eye!



Three distinguished judges at Aberdeen SRGC Show 2010- all three have also served as SRGC Presidents- Carole Bainbridge, Ian Christie and Glassford Sprunt.



Glassford and another former SRGC president, Ian Young, chat in the sun at a Discussion Weekend in Grantown on Spey.



Glassford chatting with Don Peace at a Show in Dunblane in 2019.

Shortia illicifolia - shown by Glassford in 2009



Shortia uniflora grandiflora shown by Glassford at an SRGC Autumn show. Regrettably I do not have photos to hand of his various Forrest Medal winning plants – he won four of these Best in Show awards – illustrating another “string to his bow”!
M.Y.

---International Rock Gardener---

My Way with Seeds: Glassford Sprunt (first published in *The Rock Garden*, journal of the SRGC, in June 1993- Vol. XXIII No. 92)

Over the years during which I have been growing alpines and dwarf bulbs from seed I have probably had more than my fair share of disappointment resulting from total failure of the seeds to germinate, damping off once they have germinated or total swamping of the seed bed by liverwort, pearlwort and/or moss. Success in germination has sometimes been followed by disaster when some passing slug has indulged in a slap-up feed on the fare that I have provided.

My present approach to seed sowing and seedling growing has only been reached by traversing a long and tortuous path with many blind alleys; a maze in fact. Each new idea appearing in print has been seized on, in the hope that at last I may have found the solution to my problem.

One of the early suggestions that I seized on was that the seed pan should have fierce drainage and it suggested that I should put a 25mm layer of drainage material in the bottom of the seed pan. This may be fair enough if there is time to check the pans daily. Two or three busy days with thoughts elsewhere left one, in effect, trying to grow seeds in a desert. That was the most disastrous season ever, for practically nothing grew and a whole growing season was lost.

(Ed.: Read about "perched water tables" from Ian Young in [the Bulb Log](#) and from Paul Cumbleton in [the SRGC Forum](#) to learn more about this problem.)

Gardening literature is liberally sprinkled with a great deal of mythology, which is faithfully copied from one author to another without any attempt at any sort of analysis, let alone critical analysis. One of the myths still current, and I heard it only recently on a gardening programme, was that all pots should be crocked to improve the drainage. I have not crocked a pot for ten years or more and have had far fewer problems since I stopped. Now I screw my pots well down into a sandbed placed on 'mother earth'. This makes certain that there is good contact between the compost and the ground. With good contact there is an infinite reservoir for the excess moisture to drain into, or if the pan is drying out, for it to draw moisture from.

My advice is, certainly, to think critically about what you are doing. To continue using a method because you have always done it that way, is not necessarily smart unless the results are extremely good. Experiment with new methods, but do not abandon the old completely until the new have been proved to be better, and beware of slavish adherence to a "guaranteed" successful system until it has stood up to the test of experimental use in your own hands.

In my busy life as an orthopaedic surgeon, neglect of my gardening activities was inevitably the order of the day. It was, therefore, necessary to devise a system which would bridge the gaps in attention which resulted, and bring the seed sowing to a successful conclusion.

In general I try wherever possible to sow the seeds at the time that they are being shed by the plants. This has two advantages: a) it gets the job done, instead of having the seed stuffed into an (almost inevitably) unlabelled packet only to be sown later as "unknown" or "*Crocus* sp." or something similar, and b) it improves the chances of a good germination in seeds of short viability.

Bearing in mind that the time required for your seed to germinate may vary from a few days to a few years, precautions have to be taken to make sure that the conditions in the seed pan will remain compatible with nudging the seed into active life over this period. It is also necessary to have a compost which will allow the seedlings to continue to make at least some development until such time as the gardener can get round to pricking out the seedlings.

The properties required of the sowing medium are:

- 1) the ability to retain sufficient moisture to prevent the seed drying out until germination is secure.
- 2) the ability to drain excess water off quickly.

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- 3) adequate reserves of nutrients in the main body of the compost to promote active and healthy growth following germination.
- 4) protection of the surface of the seedpan compost against,
 - a) panning of the surface from heavy rain and/or watering;
 - b) invasion of the surface of the compost by liverwort, pearlwort and/or moss, all of which can result in a layer being formed over the pan which is rendered impenetrable to germinating seedlings.
- 5) the compost mix should be varied to take into account the local climatic conditions, especially in respect of rainfall and humidity.

The methods laid out below have been developed over the years, perhaps making more allowances for my own idiosyncrasies rather than those of the seeds I am dealing with. It must also be borne in mind that these methods have been developed to cope with the particular climatic peculiarities of the centre of the central belt of Scotland.

I do not use any peat composts, not necessarily on ecological grounds, but because I can almost guarantee to kill anything that I attempt to grow in them. I like to think that I have a bit more latitude when using soil-based composts because of the in-built buffering of the various constituents of this type of compost.

All my seed sowing composts are based on John Innes No.3. This is a very variable commodity due to the great variation in its basic constituent – soil - but as I have already said you have a bit of latitude. The one great problem in this country is to find a Garden Centre which treats John Innes compost with respect and stores it under cover. Mostly it is stored in the rain and in a relatively short time this results in a product that is worse than useless.

For those who garden outside the UK, John Innes composts are based on fibrous loam derived from rotted down turves. By volume the basic formula is:

- 7 parts medium loam
- 3 parts coarse sieved peat or leafmould
- 2 parts coarse sand.

Modern long lasting fertilisers are now added to this mix, and give the compost a very much longer shelf life. The original John Innes base fertiliser consisted of:

- 2 parts ground hoof & horn
- 2 parts superphosphate of lime
- 1 part sulphate of potash 113-4g of the above mixture per bushel (36.4l) was used for JI No.1 Compost, 226-8g for JI No.2 and 12oz for JI No.3. Ground limestone or chalk is also added at the rate of 21-3g per bushel for JI No.1 and this amount doubled and trebled for JI Nos. 2 & 3.

The original JI composts were designed for use in clay pots on an open greenhouse staging, and in their original form are not really suitable for use with plastic pots or plunged clay pots.

I modify the JI No. 3 to overcome some of the problems and the mix that has resulted is as follows:

- 2 part JI No.3
- 2 parts modified concreting sand
- 2 parts coarse grit -9mm down
- 1 part coarsely sieved leafmould

I always have trays of concreting sand drying off for sieving. I put it through a series of four sieves and these produce five grades of grit and sand for which I have a use.

- 1) Sieve 6mm -The grit held back by this goes onto the rock garden.
- 2) Sieve 3mm - The grit retained by this is used for topping the seed pans and the pots into which the seedlings are pricked off.
- 3) Sieve 15 mesh per 25mm.
- 4) Sieve 40 mesh per 25mm.

The grit retained by sieves 3 & 4 is mixed and used as the modified concreting sand of my modified JI No. 3 compost and for the seed sowing layer in my seed pans.

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5) The finest grit and silt which pass through sieve 4 is retained and used for making cement mortar. Only if there is no brick-laying in prospect is this thrown away. The sieving provides time for thought, so that even this time spent can be used creatively.

Seed pans

Most of my seeds are now sown in square pots. This makes the best use of the available space. It reduces the potential for weeds growing in the seed frame and makes certain that most of the applied water is used effectively. I have reduced to two sizes the pots that I use for seed sowing; 8 x 8 x 9cm and 11 x 11 x 12cm. This reduces the problems of odd sizes resulting in unnecessary waste of frame space.

The seed pans are loosely filled to the top with my modified John Innes No.3 compost and are then gently tamped down with a piece of wood which is a loose fit inside the top of the pot. This brings the final level of the compost down to 12-15mm below the rim of the pot. A layer of 3-4mm depth of the following mix is then added:

4 parts fine grit as from sieves 3 & 4 above
1 part fine leaf mould - put through 3mm sieve

I have found this ratio the best one for my area, giving the best water holding capacity with the least potential for a good crop of liverwort or moss. The proportion of grit could be increased or decreased for wet or dry areas respectively.

The seed is sown in this layer. Hard coated seeds are pre-soaked in warm water with a little detergent added - for about 24 hours before sowing - and disc seeds like *Tulipa* and *Fritillaria* are sown edgewise to prevent them "hovering" when the covering layer is added. The exception to covering is very fine seed and those allegedly requiring light for germination. In these the pan is gently tapped after sowing to settle the seed. The pan is then topped off with the grit from (2) above. Finally the pan is labelled. I put the name of the plant on the top end of the label and a shortened version of the name on the bottom end of the label. On the reverse I write the source of the seed, the date of sowing and with the bigger seeds - the number sown. The label is then inserted point up. Once germination has been achieved the label is inserted the right way up. It is thus easy to see how the germination stakes are going even when the seedlings have gone below ground. Some species seeds show considerably erratic germination, and I am often anxious to get on with potting up those which have germinated.

Having three distinct layers in the pan makes it easy to deal with this and then put the rest back to get on with their tardy germination. The top grit comes off easily; the layer containing the seed is readily separated from the underlying compost. The seedlings are then extracted. I usually replace this compost with fresh, put back the seed layer and top off again with the coarse grit and reverse the label once more and await further germination.

The topping layer in the seed pans is usually about 10-15mm deep. This does not appear to cause the seedlings any problems nor does it seem to prevent the germination of those allegedly requiring light, but it does seem to be sufficient to reduce the problems of the growth of liverwort, pearlwort, moss and sundry other weeds to the minimum.

Where it is possible I like to take seed straight from parent plant to seed pan. It is the way that nature does it and in some cases it is the only way to obtain a worthwhile germination or, indeed, any germination at all. Many of the primula family, Ranunculaceae, *Corydalis*, *Hepatica* and *Hacquetia* respond well to this treatment and will often produce an embarrassingly high rate of germination. Seed from the various Seed Exchanges is much more problematical. The viability of seed can be profoundly influenced by the way that it is treated between collection by the donor and sowing by the recipient. Perhaps a controlled study of the various conditions to which seeds are subjected following collection would be of considerable interest and might elicit whether or not seed has lost its viability or just become profoundly dormant and requiring the right key to stir it to life. G.S.