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Pascal Kissling. A morphotaxonomic sketch of the Central European Ribesia or 52 questions for molecular biology. 2016. hal-01408211

HAL Id: hal-01408211

<https://hal.science/hal-01408211>

Preprint submitted on 3 Dec 2016

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A morphotaxonomic sketch of the Central European *Ribesia* *or 52 questions for molecular biology*

*This work is dedicated to Martin Frei
Taxonomy's engine starts up with 3 individuals
with 6, an aeroplane is on the runway
with 36, it takes off
We owe this flight to Martin*

to say nothing of the contribution that his rich experience made to the exchange of views



Pascal Kissling¹

With the collaboration of Jitka Kissling and Petr Mízek

Translated from the French by Rachel Fell

Alenor Drafts 3 (2016)

¹ Alenor Conservation garden, CZ-384 33 Záblatí

1- Please note

This is merely a sketch. It should not reveal, should the artist die before his canvas is finished, all that he had in mind; he will correct it; it asks more than it has answered. And then, *“I wanted to treat philosophy in a way that was not philosophical; I have tried to bring it to a point where it was neither too dry for the general reading public nor for the more academic reader; [...] It may well be that in seeking a level where the philosophy is right for everyone, I have found one that is not right for anyone”*¹. Why then such a sketch?

*“With red currants, in three years you do nothing; in five years you have the first results; you need ten years to start to see the wood for the trees.”*² We have had seven years. Some 450 areas of Sudeten rubble were visited in the Bohemian Forest for a simple phytosociological overview of about 120 species cultivated before the war. Most of these species have been recultivated in the small Alenor conservation garden, and the most useful or attractive come back into public distribution through the aid of voluntary growers of the associative Czech gene bank Gengel.³ Part of this fund goes towards the national gene bank. The finest part of this is the *Ribesia* section of the *Ribes* Genus: red currants, known in France as "groseillers à grappe", in Quebec as "gadeliers" and in the French part of Switzerland as "raisinets".⁴ Around 130 Sudeten clones brought into cultivation again. Several dozen have been located and are awaiting collection, 60 reference clones received from gene banks⁵ and 80 clones collected⁶ from nature. A grid of 400 illustrated and evaluated biometric characters⁷, a database of 250 columns and 500 rows which resembles an (almost) empty large cupboard. An overview, a start to becoming familiar with the cultivars, almost nothing ready for publication. Just two introductions, as if like the first two swallows.⁸

This independent research was following its natural course, of quick work and slow results, a whole heap of sand for a handful of pearls. Along comes programmed scientific research and sets to work on our heap of sand: a tempting if risky invitation, accepted. Some 200 clones of *Ribes* from the Alenor garden are sent off to the molecular laboratory. As probably already demonstrated by epistemology, the interpretation of a dendrogram showing DNA resemblances makes sense by comparison with the identity categories proposed by the former terms: morpho-, chemo-, and cyto-taxonomy, geobotany and pomology. For example, who would have thought that a certain branch of the biomolecular dendrogram would correspond to the very old cultivar *Prince Albert*? The new biology must first climb onto the shoulders of the old, whether to enrich, amend, contradict, or even to dismiss it.

The shoulders provided by this work are still somewhat fragile, but as time is pressing for the other discipline, we are attempting to work while hoping that everyone will find their role. However, it goes against nature to anticipate the results. As an example to all, clones of *Ribes spicatum* found growing along the North Sea coast have been recultivated for three years but have not yet flowered; their flowers will be a key point in the morphotaxonomy of red currants and we do only know about them from the literature and from photos published on the internet. If we take the risk of disappointing the *“expecting reader”*⁹, it is because of the sense of fair play and intelligence of the other party, Madame Leona Svobodová.

¹ B. de Fontenelle (1724,2-3)

² MARTIN FREI (2014, private communication)

³ www.gengel.cz

⁴ MORET & JAUQUES (2008,104 & 192)

⁵ Half of these were given by Pro Specie Rara, represented by Martin Frei (www.prospecierara.ch)

⁶ Collection of cuttings, layers or divisions, hardly ever a whole shrub

⁷ Currently in draft

⁸ P.&J. KISSLING (2012 & 2015)

⁹ PIERRE MICHON 1984- *Vies minuscules : Vie du père Foucault*. Thanks to Claude Candolfi for his patient sharing of the riches of French literature

Acknowledgements

Although this work is independent and funded exclusively by our horticulturist parents, research is never done alone. One continues the work of those who are no longer living and work alongside or from afar with those who are.

Indirectly, acknowledgements are due to the immeasurable knowledge sharing enabled by the internet and by collaborative or institutional sites such as Wikipedia, the Biodiversity Heritage Library (biodiversitylibrary.org), the National Library of France's Gallica digital library (gallica.bnf.fr), persee.fr and hal.archives-ouvertes.fr, to name a few. Without them, how could any botanist wandering in the Bohemian Forest, far from the Conservatory and Botanical Garden of Geneva and the National Library of France, read Lamarck's Flora, rediscover the myriometer or access the tiny horticultural journal of an American community of the 19th century? An independent researcher is above all else indebted to this huge digital resource hub with a human soul.

As for direct acknowledgements, Jitka risks her little car on the Sudeten roads too remote for bicycles, finds half the red currants in rubble, shares the gardening work, teaches us Czech, tries to change the mood of our texts, oils the cogwheels of the collaborative work and puts up with discussing botany from breakfast time while eating nothing but various types of red currant jelly. Petr Míšek arrived like magic to turn our research duo into a trio: he is an expert in field botany, with already over a hundred stations to his credit and found the first pink currant of the Bohemian Forest.

David Vostrovský lends his rare energy for the hard work in the Alenor garden.

François Kissling is our Excel crisis consultant. Danièle Kissling, Petr Dostálek (www.gengel.cz) and Alena Wagnerová give their encouragement to this work in times of doubt.

Joëlle Magnin-Gonze and Jean-Louis Moret, then directors of the Botanical Museum in Lausanne, had authorised us to photograph the Janczewski "bible", which all ribesologists need to have, just as every decent man his Montaigne beside his hearth, even if he does not open it every day.

Radim Pešek (stareodrudy.cz) started working with us in professional conservation of the best clones rediscovered.

Bohuslav Čejka, director of the Velké Losiny breeding station sent, without any shilly-shallying, in 2010, the first sacred cuttings of the cultivars "*that are in the books*". His parcel was like an open door to a foreign forest botanist who ventured into a domain other than his own. That will never be forgotten.

To start off, taxonomic biometrics immediately needs wide diversity in the proposed group. It was Martin Frei, a specialist in small fruit at Pro Specie Rara (Switzerland, abbreviated as PSR), who generously and diligently sent us a huge assortment of ready-rooted reference cuttings. This research took several years thanks to him and the collaborative gene bank he represents.

The other precious reference clones¹ were sent to us from the American Corvallis & Alaska gene bank (Bruce Bartlett & Robert Carter), the Slovak institute for research into fruit species in Bojnice (Irena Cagáňová), the Austrian Research Institute for Viticulture and Fruit Growing, in Klosterneuburg (Elisabeth Mantler & Wolfgang Patzl), the Czech fruit gene bank in Holovousy (František Paprštejn), the James Hutton Institute in Dundee (Rex Brennan) – a thousand regrets for not having been able to grow those cuttings! - and the German Federal Plant Variety Office in Wurzen (Erik Schulte & A. Schliwa).

In principle we do not collect red currants from existing gardens and source plants exclusively from Sudeten rubble to be sure of ancient origin. But we have received some remarkable shrubs of documented origin from families: Mme. Prof. Kroupová of Arnoštov and here planting of 'Prince Albert' known far and wide, the Korytars and the Škopeks of Záblatí, the Menšíks of Křišťanov, Mme. Lebedová from the former nursery at Prachatice, Christiane and François Kissling in Switzerland, Radim Pešek of Bojkovice and Petr Dostálek of Vsetín.

My warm thanks to all these institutions and individuals!

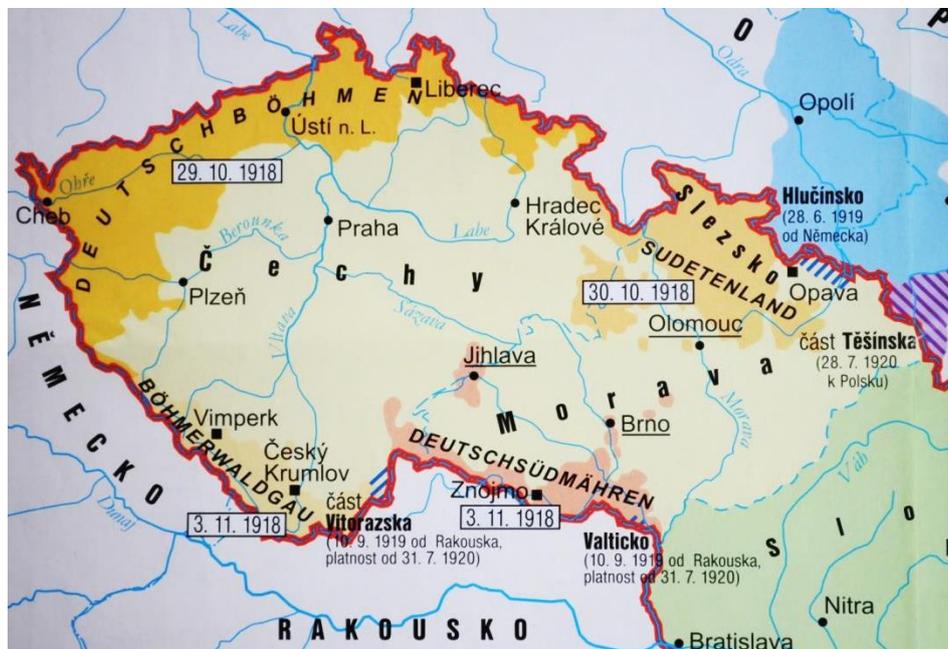
¹ See the current catalogue of the collection in annex

2- Historical context

1946-2016: almost 70 years ago, one of the largest collections of old cultivated perennial plants in Europe, if not the world, was begun, in perfect obscurity, and it still mostly exists to this day: the clandestine arboretum of the Iron Curtain, countless stations now hidden underneath the willows and spruces on a strip of land several kilometres wide and some hundreds of kilometres long. A birth amid pain and tears: in the political calculation of the great (not only Czechs by any means) so skilled in cultivating ignorance, and thus hatred, among the ordinary people, nearly three million German speakers were expelled from the Czechoslovak territory to East and West Germany and their land made available to Slavic settlers. Ten years later, for strategic reasons, a national programme started to demolish the unclaimed houses, tens of thousands across the western border region.¹ This is the area we are exploring², with two certainties:

- Under certain conditions, clones and possible generative lines from the old garden where I currently am have been here since before the Second World War
- The people who tended this garden spoke German.

For those who want a brief glimpse into the whys and wherefores of this painful history, the [Sudetenland](#) page in Wikipedia seems a reasonable place to visit. For a deeper insight without getting lost as a professional, we might recommend the serious and sober fresco of the rise of nationalism in Central Europe since 1848, created by a young Polish historian³: one emerges less categorical about the distribution of merits and faults, and above all sadder. To offset the inevitable History of the Great Leaders and of the Nations, there is an excellent book on the people's history that is both sound and poignant, a collection of testimonies from German-speaking anti-fascists expelled despite their loyalty and *passed into history, already forgotten*⁴



Czechoslovakia in 1924. The régions that could be called "Sudeten" were the self-proclaimed provinces in 1918 (80% German-speaking), shown in orange/yellow ochre.

The area concerned in this study is shown as a green ellipse in the south-west

¹ See the remarkable joint collection at www.zanikleobce.cz

² Work that is fascinating, sad and of shared awareness: leave these family places to die in peace or "keep" their memory alive?

³ MAJEWSKI (2014)

⁴ ALENA WAGNEROVÁ (ed., 2010), published in German and in Czech

The word **Sudeten** was prohibited for a time by the totalitarian Czech regime and becomes explosive again at election time. Because of its geographical and political ambiguity, it is better to avoid dwelling on the term, as it is difficult to explain it in just three pages.¹ Nevertheless, one cannot ignore a certain historical and phytogeographic element: the mountainous tiara of Bohemia², a German-speaking mountain community tolerated and sometimes welcomed from the Middle Ages, and resulting in a large preponderance of the German language, a hard-working and industrious culture above the average that can no longer be identified among the current vast underpopulated areas, the fragments of Alpine architecture, the gradual naturalisation of *Myrrhis odorata* and *Imperatoria ostruthium* introduced from the Alps by German-speaking farmers, for us the dominance of the cold-resistant morphohybrids of *Ribes petraeum* and *spicatum*, the unfortunate passion of a German nationalism that did not know to where to turn until the Nazis offered the lark lure of **Sudetenland**; the frustration of being merged in 1919 into the new Czechoslovak republic, the general evacuation in 1946 followed by a Slavic recolonisation as part of the Cold War, the removal of houses and all German place names, the Iron Curtain and its sorrowful arboretum . The cherry trees and currant plants could talk + This area seems to be well expressed by the name **Sudeten**, which we will resolutely preserve as an adjective. If even the adjective is troublesome, we can draw another word from the pot of the Nazis that was entitled to redemption and now embodies the Czech-German reconciliation: Volkswagen.

¹ Thanks to ALENA WAGNEROVÁ and KRISTIÁN SUDA for the gentle warning -. MAJEWSKI analyses this difficult word

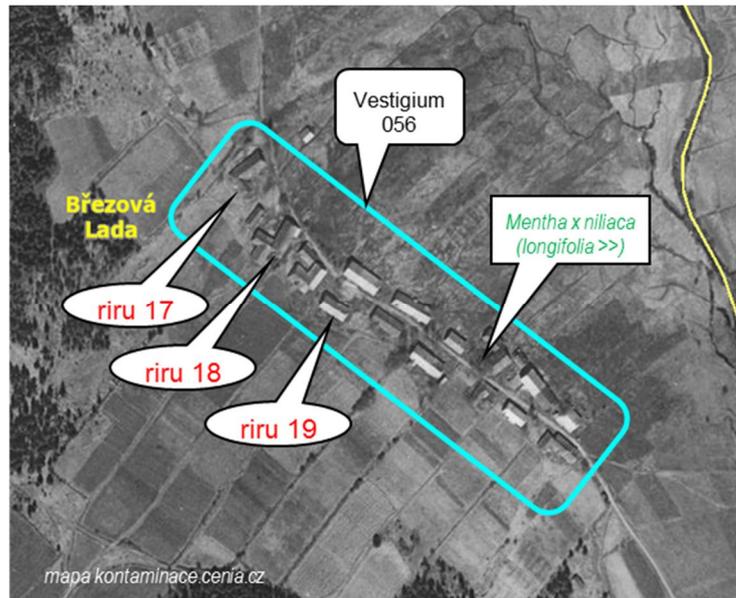
² český prstenec hor+at MĀKŔÍ EK (2005,9)

3- Ethnobotanical questions

Let's start in the field. The way the relicts of cultivation are distributed in the rubble and their individual identities tell us about the life of the former inhabitants. Morphological botany cannot establish the digital imprint of a clone. With molecular biology, you may say, «It's simple»¹. So here is a fine training ground!

3.1- Did neighbours share the same red currant clone in Březová Lada?

In this totally razed street-hamlet, all that remains are some mounds of fine soil covered in grazed vegetation². Three red currant bushes remain (riru clones 17, 18 and 19 in the Alenor catalogue) the morphology of which is easily linked to Prince Albert one of the oldest cultivars. Three neighbouring families had the same cultivar in a hamlet that now seems to be in the middle of nowhere: did they divide the plant or did they each have one from a different provenance? The morphology prompts a reasonable question by showing the coincidence of the cultivar, but cannot provide an answer. Two blind comparative tastings in 2013 placed riru 18 as sweeter and more aromatic than the



The hamlet in 1949, between the expulsion of the German-speaking inhabitants and demolition



other two.

Question 1– Are these three shrubs a single clone shared between neighbours?

Březová Lada / Birkenhaid in 2009
860m above sea level

¹ L. SVOBODOVÁ (2016, private communication)

² The admirable multi-strata map www.kontaminace.cenia.cz revolutionised our field work after Petr Mízek found it: *Historická ortofotomapa* © CENIA 2010 a GEODIS BRNO, spol. s r.o. 2010
Podkladové letecké snímky poskytl VGHMÚ DOBRUŠKA, © MO R 2009



3.2- Same question at Radvanovice / Schillerberg

Here three neighbouring houses within 200m had the same cultivar €Gabreta€ (§542): clones 54, 55, 56.

2- Is this the same clone?

Radvanovice 845m, in 2010

One of the houses was between the historic lime tree on the left and the two larches. There is still a colony of 6 red currant bushes that is growing out of the rubble (riru 56)

3.3- Same question at Kamenná Hlava

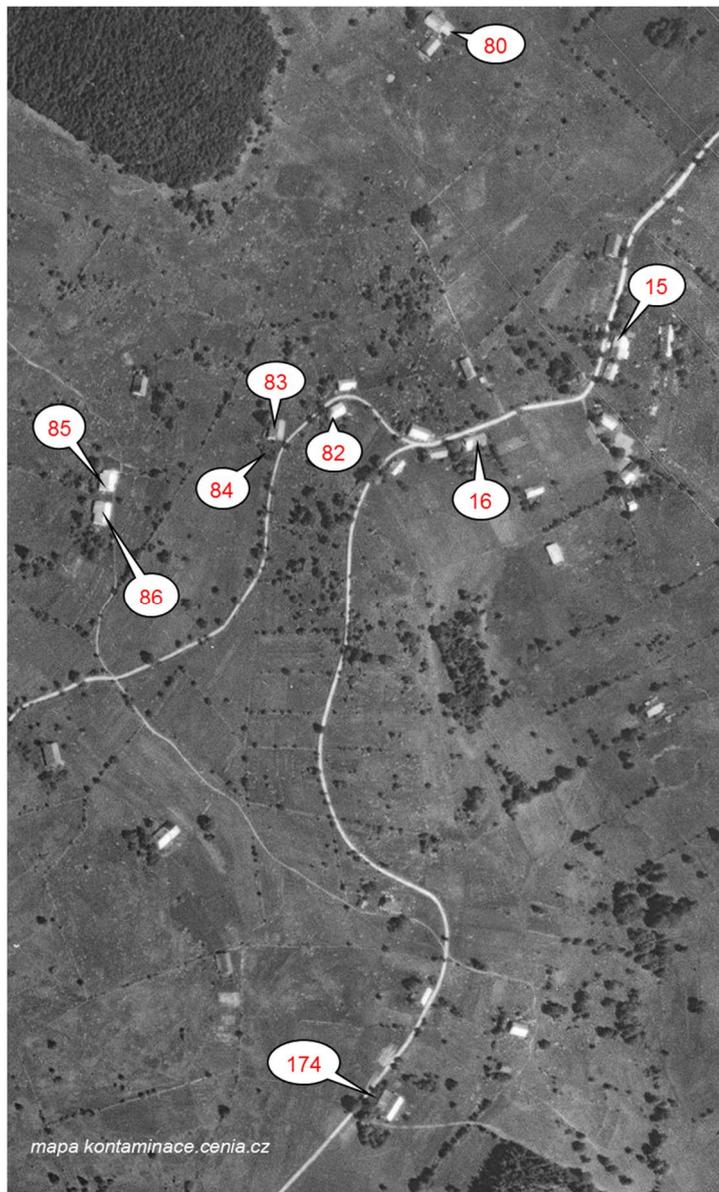
The vast swathe of scattered farms between the former Iron Curtain and the German border has been totally destroyed; but most of the debris contains different varieties of red currants. There are also gooseberries and black currants there, at a remarkable altitude for the latter species. It is one of the very beautiful stretches of land in this area, located in a gentle pass on the mediaeval salt route between Passau and Prachatice, and an inexhaustible reservoir of findings about old *Ribes* varieties. The small extract of the map shows 9 stations of 'Gabreta' among people who all knew one other.

3 - Again, is there a clone among these 9 bushes that would have been divided between these families by cuttings or root division?

Kamenná Hlava / Steinköpf
(950-1000m) in 1949

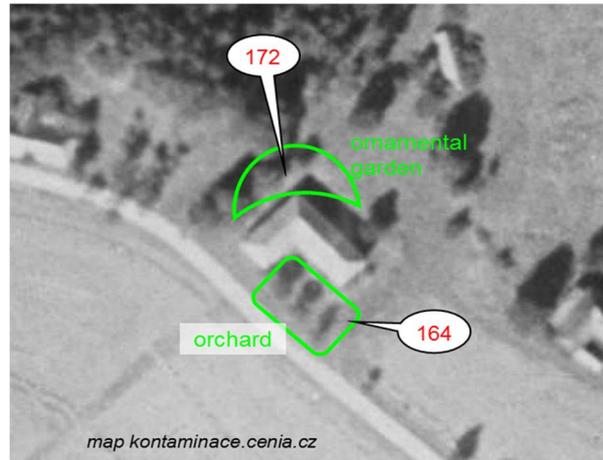
The 9 clones of 'Gabreta' to be compared

Vast swathes of €Gabreta€ are also found in other hamlets, but it is better to address this question again from another perspective later (§542).



3.4- Was the same clone growing at the front and the back of this house?

The landscaping of this property is unusual, probably due to the proximity of the road: 3 cherry trees in front of the house and an ornamental garden to the north, still containing snowberry (*Symphoricarpos albus*), mock orange (*Philadelphus coronarius*), lilac, periwinkle (*Vinca minor*), monkshood (*Aconitum x cammarum*) and orange lily (*Lilium bulbiferum*). Also, curiously, two separate red currant bushes in the south corner of the rubble heap and in the north garden. Recultivation . without which the morphology is impossible, as a cultivar cannot be identified from three wilted leaves with a field lens! . teaches us three things:



A house in 1952 on the road from Křišťanov/Christianberg to Český Krumlov. It was destroyed, but the garden is still blooming

- They both fall under *Ribes vulgare* and are red; the red cultivars of this delicate species are rare in the mountains of the Bohemian Forest.
- The berries are large enough for it to be considered as a cultivar: the average diameters of the 10

largest berries of the shrub recultivated in the sun (S20 character) is 10.8 mm to 11.6mm for riru 164 and 11.6mm for riru 172. Conversely, the larger berries of the wild *Ribes vulgare* plants taken from a North Sea marsh (riru 141 to 151) score between 7.2 and 9.6mm. In our collection all the *vulgare* cultivars measure more than 10mm. It is also



generally considered that the berry size in the *vulgare* species (but not in the other species) is a useful argument to tell whether a wild or a cultivated plant is involved¹.

- They have a pinkish hypanthium, which is very uncommon in the cultivars of this species.

The fact that these three unlikely points occur in two neighbouring bushes leads us to think that the same cultivated clone is involved, shared on the whim of the original gardener or by the mechanical shovel of the demolishers.



Pinkish hypanthium in a typical rotinate flower of *R. vulgare*

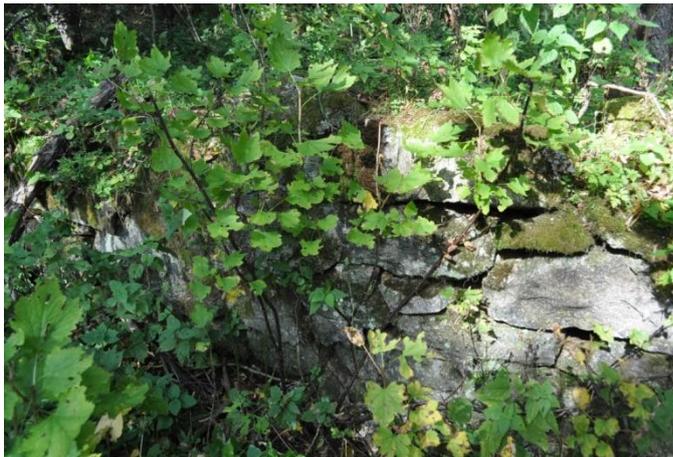
4- Are riru 164 and 172 divisions of the same clone?

¹ KIRSCHNER (1992,364) . HORST (2012)

3.5– Same question for "Klostermann"

In the string of houses destroyed along the beautiful road in Sv tlé Hory / Oberlichtbuchet (the Light Mountains, a wonderful place) there was a tiny house with a tiny garden containing no fewer than three different forms of red currant. After some years of recultivation, the clone found at the base of the former south façade (riru 94) showed its full potential. It was one of the most original and moving things found so far. We have called it "Klostermann" and we will describe it later (§66). It is an **orphan clone**: a bush that after recultivation in sun and in good soil demonstrates qualities worthy of a cultivar, but does not correspond to any classic variety and is the only one of its type in the collection. Its unique morphology penalises the orphan by a fundamental doubt about its biological status: however good it seems, the suspicion remains that it could be a spontaneous seedling. It is only when one discovers its double a few kilometres away that it will be officially recognised: the same recombination of many characters is too unlikely to be produced twice in a seedling. Only then will one know that it is a previously selected type subsequently reproduced vegetatively, otherwise known as a *forgotten cultivar*. That will be a day for celebrations.

A recurrent theme in natural science: take two people, one a strapping fellow with the hands of a farmer, legs of an explorer and a sharp eye who runs through the woods with a GPS receiver among the nettles in the rubble, and a refined scientist adding the final details to his biometrics or sequencing in a laboratory. Which of them advances taxonomy the more?



Klostermann (riru 94) in front of the house on 4.10.2011

...and in the Alenor garden on 16.7.2015 after recultivation



In the case of orphan clones, the answer is clear. In our survey, the first white currant appeared after 14 red, and the first pink currant, found by Petr Mišek, is the 111th Sudeten clone. Since the results of the survey show on average 1 clone per three sites visited, it goes without saying how many field hours are required to get results in taxonomy.

In another corner of this garden, there is a similar red currant (riru 197) under a cherry tree. It is not flowering yet in recultivation, but the leaf similarity is strong.

5– Can molecular biology tell us if 197 is a division of 94?

In this case, we would still have an orphan, but an orphan divided by someone . because the good condition of the foundations of the house indicates that the demolition was not carried out in a violent manner that would cause an offshoot to be sent 15 metres away from the mother bush. So if someone divided this bush, it must have been interesting to him, and that is what interests us!

Now we must mention one of the crucial questions: is the bush or the shoot stand (polycorm) found a **cultivar** or a **spontaneous seedling** with no pomological value? There will probably never be any absolute certainty about this fruit plant that was never traditionally grafted. But there are arguments that we are collecting for each clone:

- The *PRIOR* arguments (at the Sudeten mother-station): Where the colony is located in the architecture of the garden, are the shoots connected by a layer, etc.?
- and the *POST* arguments (after recultivation): Does the clone match a known cultivar, or does it show qualities worthy of a cultivar?

In the case of the orphan "Klostermann," the two stages of the argument were favourable: the mother bush in front of the south façade of an old house - the fine fruit and health qualities following recultivation. But sometimes, especially at a low altitude, a colony may be found near a ruin, but also, for example, on top of a badger sett, then after a few years a clone in an orchard will only bear berries measuring less than 10mm in diameter: it was a seedling.... For now, a dozen clones have proved disappointing after recultivation.

4- Pomological questions

4.1- Elementary pomology

The plan for this research was to identify the old Sudeten red currant cultivars of the older flora. We did not know that the pre-Linnaean state of the systematics for *Ribes* cultivars made any such an ambition laughable¹. We do not shy away from this amusing side of botany, however. It may shed some light on the richness of varieties of a region that is almost unknown in this respect.

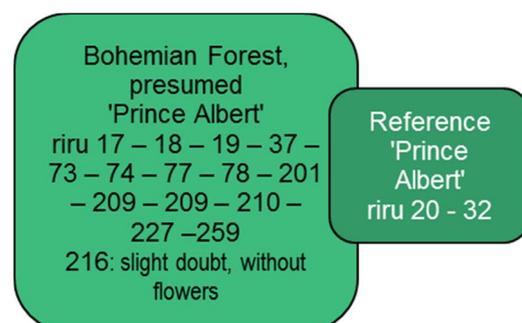
4.1.1- 'Prince Albert'

Honour where honour is due: ~~Prince Albert~~ which is believed to date back to somewhere in northern Europe in the eighteenth century, so one of the oldest known varieties, is the Zátopek of red currants. A marathon runner slow to set off but with old branches that perform well for ages, extremely resistant, the sturdy cuttings branching immediately (white buds in the photo **a**), rooting all along the buried section, inelegant in shape with its wide branching habit and fruit bunches hidden among the leaves, but pleasant and liked by everyone as the least sour of the mountain red currants; it has been overtaken in performance but it still held on the whole in high esteem.

It is known for its lateness, its relatively pubescent leaves with small indentation at the base and sharply elongated lobes (photo **b**), bearing stalked glands beneath the ribs (**c**), its cylindrical herbaceous shoots (without a carina under the nodes: **d**, above), with abundant cilia up to the last bracts of the raceme (**e**), deeply campanulate flowers (**f**, **i**), calyx with flesh-coloured sides (**f**), slightly but regularly ciliated, the ribs of the sepals often anastomosing in closed loops (**h**), its petals often in the form of a crossbow (**g**), long introrse stamens with an anther that is narrow and wider at the base than at the tip (**l**), its hypanthium shaped like a fluted cake ring with 10 discrete ribs (**j**), its semi-inferior ovary like a Gothic vault rising as a cone at the base of the style (**i**, NB left: petal, right: sepal); its berries are often slightly furrowed like a hot-air balloon at the tip (**m**), showing a fairly large proportion of orbicular tufts² (**m**), the ?leucoplasts³ of their epidermis are large (2.4-3 μ m) so visible with a microscope at low magnifications (**n**: the refractive granules around the nucleus are clearer than the vacuole full of anthocyanins), their clear pulp makes old-rose coloured jelly (**o** left, right: ~~Gabreta~~ and their seeds have an outer tegument that is at first hyaline and turns pink at the apex (**k**) as it matures.

The two reference clones . one witness is no witness . for this cultivar (Pro Specie Rara and the Velké Losiny breeding station) are a perfect match for this diagnosis. A series of Bohemian Forest clones correspond to it. It is the second most common cultivar in the Sudeten ruins in the region. Not surprisingly for a cultivar always recommended for its resistance to a harsh climate:

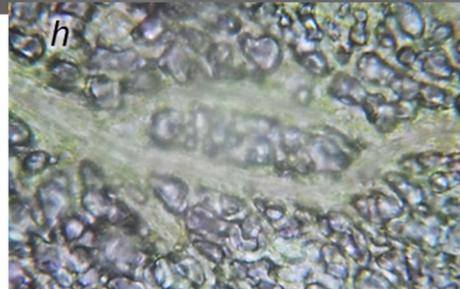
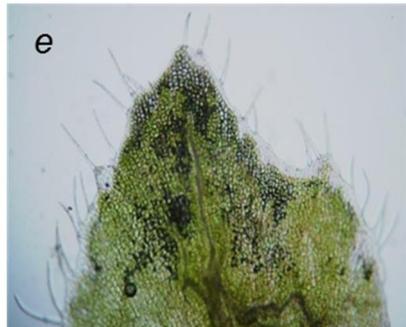
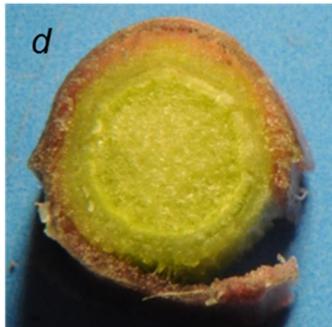
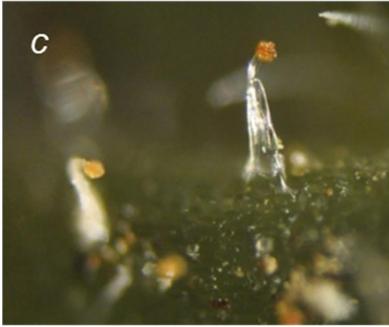
6- Does the DNA confirm the identification?

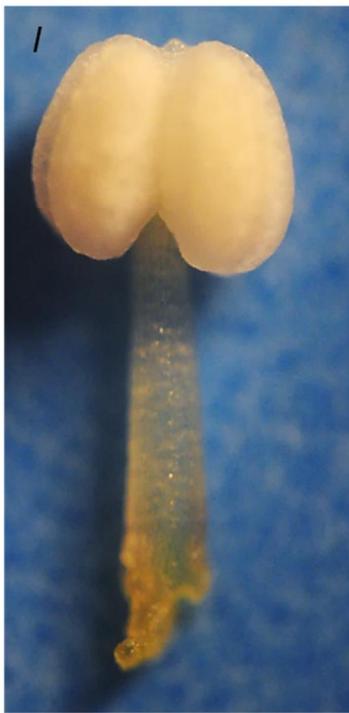
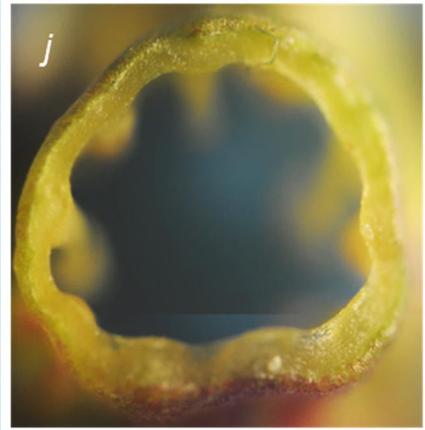


¹ Cf. VOELTZ (1967)

² By ~~tuft~~ we are referring to the complex brown marcescent remains of the flower at the tip of the berry, which principally include the hypanthium and calyx

³ These cell organelles are probably leucoplasts, but this is not our speciality and our attempts to find out about this are as yet unanswered





4.1.2- 'Pink Dutch'

In Eastern Moravia, in front of a family farm there is an elderly red currant bush that was already there at least during the 1960s. Petr Dostálek¹ calls it the "Pink bush in front of the windows" (clone 180).

How many similar nameless treasures are there growing in front of Czech-Slovak windows? One day it will be delightful to call on the gardeners who are the holders of these precious unknown types. But it would be a good idea first to reconstruct the criteria for a systematic pomology about cultivated red currants: there will still be work for morphologists and molecular biologists. A rich band of knowledge at different intellectual levels disappeared after the wonderful "Popular Pomology" of the nurseryman and landscape architect Josef Vaněk² and the monumental masterwork of the Academy of Sciences³, where M. Blatný was able to invite the authors of different approaches, from nurserymen up to one of the fathers of Czech botany, Dostál; it was among the finest red currant pomologies in the world, together with the one in New York⁴. The intrinsic value of this time-old pomology was the knowledge by familiarity, which are still the alpha and omega of knowledge. The aged professor of botany says, «Ah, there you can see *Lathyrus montanus*» for an insignificant plant with no flowers three metres into some undergrowth, his students think he is correct and they are right; but does he remember the dichotomous key of *Lathyrus* that he used to drone on about forty years ago? This kind of knowledge may explain why old pomologies describe cultivars so little: a good watercolour and the confidence in experts were sufficient. But for new pomologists, cut off from their predecessors, there is only Cartesianism, which is the politeness of ignorance. Ignorance is not a sin, although that does not make a virtue. It is possible and good to start from scratch with the tools of reproducible science and to mend the broken links with the past. A myriad of unknown bushes in front of windows can then tell their stories.

At the other end of the country, in the destroyed hamlet of Nový Kízánov in the Bohemian Forest, Petr Mízek found his first Sudeten red currant in 2015 (riru 224). When recultivated, an elderly branch immediately produced some small pink berries.

The morphology of both clones is akin to that of the reference 'Pink Dutch' that we have from Pro Specie Rara (riru 62). In both cases the comparison is uncertain due to the material that is limited and in a precarious condition; in addition, we only have one reference specimen (62). On the other hand, confidence is enhanced by the fact that there are only four old pink red currants in the pomologies and that the 'Pink Dutch' is distinguishable from the others by at least two spectacular characters:

- o The gelatinous epidermis of the outer tegument of the seed⁵ turns deep pink as it matures, the berry looks like a small lantern lit up with a red light
- o The hypodermis of the epicarp of the berry has no anthocyanins, which is unique among all the red and pink red currants that we have seen.

7- Does the DNA confirm the relationship of the clones 62 – 180 – 224?



¹ <http://gengel.cz/>

² VANĚK (1941)

³ BLATNÝ & al. (1971)

⁴ HEDRICK & al. (1925)

⁵ JANCZEWSKI (1907,219)

4.1.3- 'Heinemann's Late'

One of the easiest red currants to recognise, if only by its extravagant flowers with sepals that are folded back all along, stamens that protrude far out and the 5 exuberant nectariferous nipples, all traits inherited from the Mediterranean *Ribes multiflorum*.



A bush found growing poorly among the shrubs in the rubble in Cudrovice / Zuderschlag (riru 87), not far from a current apiary, it is difficult to grow from cuttings. When it finally managed to flower it looked similar to the reference 'Heinemann' received from Velké Losiny (riru 30). In fact, its reluctance to grow from cuttings already revealed its identity, as this cultivar is one of the hardest to propagate.

8- Can you confirm the identity of riru 87 / 30?

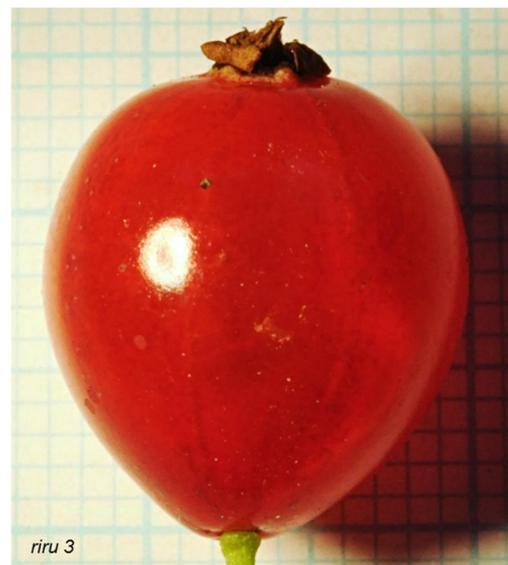


This bush bears witness to another episode of human history in the Bohemian Forest. Following the general demolition between 1956 and 1970 many Sudeten sites acquired squatters: here the framework of a tepee patiently awaits the return of its summer visitors, there an old military truck lies abandoned, rusting away on breeze blocks, and elsewhere a hippie cabin is crumbling. A new generation of life has sadly ended up on the ruins of the previous one. The red currant 87 is part of this movement. It cannot be Sudeten, simply because it did not exist before the war. It is the first major cultivar of a new era of selection that turned to *Ribes multiflorum*, it came out in 1942

and was only introduced on a large scale in Czechoslovakia in the 1960s¹, where it was very popular.

4.1.4- 'Rondom'

The second great veteran, with Heinemann of the new wave of red currants. When we established the Alenor garden, there was a large, vigorous and very productive red currant bush (riru 3). As it had been recovered during the 1970s from what was left by an old tree nurseryman nearby, it was established and no-one could doubt the fact that it was an old red currant. Until the day when the Rondom of Velké Losiny (riru 28) was shown to be exactly alike, and so a PSR specimen (riru 133). Many traits marked the morphological uniqueness of this cultivar. We consider the shape of its berry, which is the only one in the entire collection that is on average longer



¹ BLATTNÝ et al. (1971,311)

than it is wide: the most typical berries are tear-shaped. Only the rare *Goegginger's Pear-shaped Redq* found in Switzerland by Martin Frei, shows this exceptional trait.

9– Can it be confirmed with the DNA that the clones 3 – 28 – 133 are of the same cultivar? (see also question 15)

This cultivar shows another chapter of history. Selected by successive crosses between 1929 and 1934, it was not declared until 1949 – cannot therefore be found in a trace of first generation Sudeten material - and was probably introduced into Czechoslovakia around 1960. The presentation of Blatný et al.¹, written in the 60s, has the respectful tone of a car showroom catalogue announcing the latest hybrid BMW; it is the red currant of the future. 50 years later 'Rondom' was already declining in popularity although it is an admirable cultivar in our opinion. Man creates varieties at the rate of songs. The new ones can only take their place at the expense of some of the old ones. There is nothing like the idea of novelty to create antiques.

4.2– More advanced pomology

4.2.1–'Red Versailles', 'Caucasiche'

The isolated house of *Sister Barka* in Svi ovice / Schweinetschlag, 830 metres above sea level, is still shown on the military map of the 1960s, it was not destroyed until the 70s: that is perhaps why the traces of the garden in front of the rubble is so rich, with lilac, Bowles's mint (*Mentha x villosa*), monkshood (*Aconitum*), daffodils and the red currant 42. A bush scoring on two fronts: it is one of the rare red forms of the *vulgare* species found in the Bohemian Forest and more particularly because its hypanthium is strongly flushed with pink.



This trait is quite spectacular and rare among cultivars for having had the honour of a mention in certain pomologies: Blatný points out that *Caucasicheq* and 'Red Versailles'² have it. A third name is attached to the red hypanthium, 'Fertile de Palluau'. The pomologies of America . where the European red currants had their hour of glory at the end of the nineteenth

century . sometimes give these three names as synonyms. The *Sister Barka* red currant provided an opportunity to try to see things more clearly. The biometric comparison is limited to 4 clones, it is not many, but the available sources of genetic funds are not very common: riru 21 and 120 (from Pro Specie Rara) and riru 126 (Bojnice).

The table includes the only variant characters found in this group. They corroborate the idea of Palluau/Versailles being synonyms.³ We would point out that the pink marks on the dimples between the connective and the pollen sacs (photo opposite) are accurately described by Blatný for *Red Versailles*⁴, which reassures us about the pomology and indicates the quality of this book. *Caucasicheq* differs by a strong presence of glands in the inflorescence, smaller petals, white anther and darker berry. As for the bush from the Bohemian Forest (42), it is not categorically placed in one camp, but is morphologically closer to *Caucasicheq*



¹ BLATNÝ et al. (1971,340)

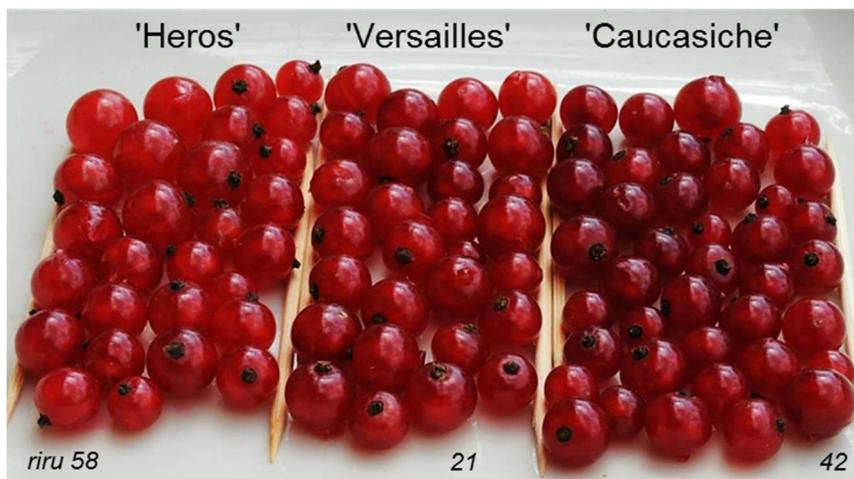
² BLATNÝ et al. (1971,335 & 349)

³ MARTIN FREI (2010, *in lit.*)

⁴ BLATNÝ et al. (1971,349)

			riru 21	riru 120	riru 42	riru 126
			'Fertile de Palluau'	'Versailles'	Sister Barka	'Caucasiche'
E09	scale	petal lamina inflection	incurved	incurved	porrect	porrect-recurved
K01	mom	petal lamina width	8,9 ^{0,7}	8,1 ^{0,5}	6,8 ^{0,7}	5,6 ^{1,8}
K02	mom	petal length	6,6 ^{0,6}	7,4 ^{0,7}	5,7 ^{0,9}	5,5 ^{1,1}
L01	mom	stamen length	11,1 ^{0,3}	10,9 ^{0,5}	8,6 ^{0,2}	9,1 ^{0,3}
L04	mom	anther width	13,7 ^{0,1}	14,7 ^{0,2}	11,9 ^{0,2}	11,7 ^{0,3}
L15	scale	red on juvenile anthers	2 pink spots on the back of anthers	2 pink spots on the back of anthers	slight pink flush in <10% flowers	anther white
N04n	nb	glands on inferior pedicels	1,8 ^{2,4}	0,2 ^{0,3}	15,9 ^{4,7}	45,0 ^{0,0}
N06n	nb	bracts dorsal glands	0,0 ^{0,0}	0,0 ^{0,0}	2,3 ^{3,1}	5,0 ^{0,0}
N12n	nb	bracts marginal setae	0,0 ^{0,0}	0,0 ^{0,0}	2,8 ^{2,6}	36,0 ^{0,0}
N13n	nb	bracts marginal glands	8,2 ^{7,2}	1,8 ^{2,1}	24,6 ^{7,3}	24,0 ^{0,0}
R22	%	apical bracteoles frequency	131% ^{9%}	146% ^{25%}	124% ^{36%}	19% ^{18%}
S06	scale	berry medium red	7,5	7,5	8,5	8,5

mean & mean absolute deviation, 5 petals from a tall flower, 3 stamens from 3 different already swollen buds



10- What does the DNA dendrogram say about it?

First confrontation with a general pomology problem: the bush riru 42, because it is the only one from a Sudeten mountain site, and concerns a species that is rare in the region and has the even rarer characteristic of a red hypanthium, seems to us to be cultivated and not spontaneous. So, if a cultivated plant seems to be

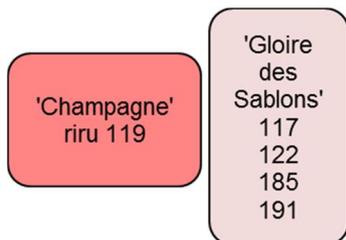
intermediate between two known cultivars, the pomology is facing a multitude of questions that are addressed in the next chapter (§5).

4.2.2- 'Champagne' / 'Gloire des Sablons'

This ancient pair remains enigmatic: "see no difference between them"¹ A start in biometrics and a collection of different strains leaves the same impression, modest differences in disparate flower characters. Yet each year, the Champagne was much more vigorous, with early foliage and strong annual shoots and its berries are more beautiful, pink and sweet, probably the sweetest of all our red currants.



¹ MARTIN FREI (2014, *in lit.*)



It could simply be a matter of the health of the clone¹, and not necessarily genetic. We are looking for a true taxonomic difference between this clone 119 and all the others, but which will be at the limit of the possibilities of biometrics, when we have time to practise properly. Incidentally, we would point out that despite their Western names (France and Belgium) these old cultivars are not foreigners in the Czech Republic since clone 185 is an old family line in Moravia.

11– What does the DNA say about this narrow systematic group?

4.2.3– ‘White Versailles’, ‘White Dutch’ ?

The problem of the reference

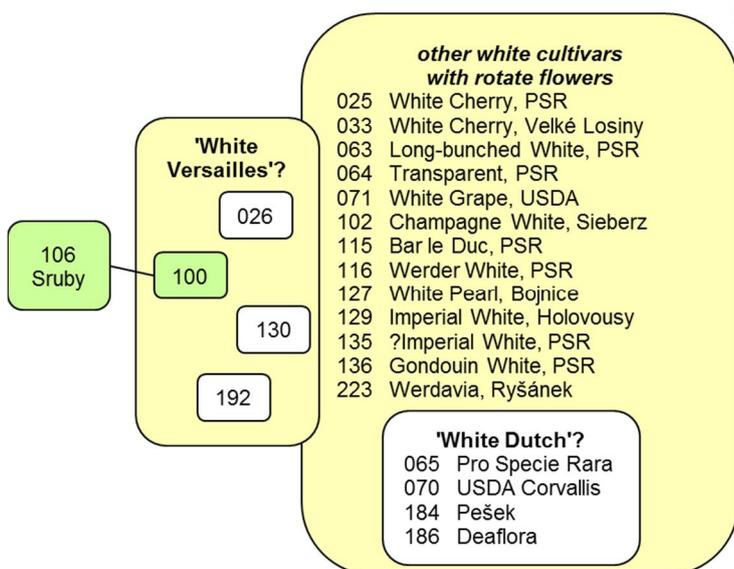
In one area of rubble in the destroyed hamlet of Sruby / Heuhof², in the area of Domažlice, surveyed because of its low altitude of 440m, a white currant was found (riru 106) which after recultivation and initial biometrics appears very similar to the one that the present day nurseryman Starkl sells under the name of ‘White Versailles’ (riru 100). There are numerous white cultivars with rotate flowers (see the diagram), so a similarity like that is unlikely but a delightful find for a pomologist. What is less delightful is that other clones that also bear the name ‘White Versailles’ in other collections are different (riru 026 from PSR – 130 from VŠÚOH Holovousy – 192 from Haerberli CH).



12– Does the DNA confirm the match 106 – 100?

13– What does it say about the dispersion of the various ‘White Versailles’ among the whites with rotate flowers?

14– Same question for the 4 clones of ‘White Dutch’ from different provenances. Morphologically different, is their DNA also different?



This is where pomology encounters the universal **problem of the reference**. Biometrics pushed far enough could establish keys for identifying the forms, molecular biology identify fingerprints³, but the problem lies elsewhere: the most sophisticated technology will not say WHO REPRESENTS the ‘White Versailles’ or the ‘White Dutch’!

¹ RADIM PEŠEK (2015, private communication)

² Procházka & Annuß (20,236)

³ PALMIERI et al. (2013) envisaging the possibility of implementing them to manage a gene pool

Bunyard¹ noted a century ago in his direct way: *Cherry. I find it impossible to describe this variety [ō] Of the varieties I have received as Cherry from modern sources, two only agree, the remaining five all present small differences, and no other variety illustrates better the extraordinary difficulty of deciding what is the original type. The distinctions are small, often only a difference in time of starting growth, a glabrous or downy rachis, the eye green or red, but as they preserve these unchanged over a series of years I cannot disregard them as negligible.*

That sums up life in the orchard of pomologists, ancient and modern, young and old. There will be no technological magic wand to end the disorder of gene pools. There will only be, if the will exists for such a glance towards the past, a patient review such as that of Linnaean botany for centuries; implementing modern taxonomy techniques, but also the research of historical literature and of old regional sources. Research into the identity of clones is not a simple problem to be settled once and for all, it is a discipline, a basic research field.²

¹ BUNYARD (1920,43)

² VOELTZ (1967)

5- Clone / phylum questions

- Were the old cultivars forcibly propagated vegetatively?
- Did the mother population consist of a single seed or of several very similar stock-plants chosen by mass selection?
- What then is the discrimination limit for a cultivar?

These are the questions that arose in the case of the imperfect *Caucasicheq* of Sister Barka in the Bohemian Forest (riru 42, §421). Pomology will be faced with them at least regarding the old red currants. Here are just some of the preliminary items in the file:

- Normally and since long ago cultivated red currants have been propagated vegetatively
 - not only to preserve the hereditary qualities
 - but also for speed.
- *What remains the cause of this neglect [ō of the practice of sowing]? It must be due, as we have said before, to the general practices of agriculture. «We never use seeds», they say «because you get results more quickly with cuttings and layering which are so easy to do». But that way slavishly reproduces the same flowers, the same fruit and removes any hope of obtaining new ones.* That is how one currant pomologist put it two centuries ago¹. It was already clear to him that the appearance of white and pink currants was a virtue of sowing. But the derogatory tone of this old author with regard to vegetative propagation is reminiscent, two centuries later, of the young farmers who are so keen to sow seeds, who advocate the importance of seed sowing in producing a population of plants suited to a specific region. It is an alternative ideal, worthy and ecologically beneficial, which stands in contrast to the purism of the conservation of the genome of old cultivars. If we can detect this spirit in a serious work back in 1829, we cannot be sure that the propagation of old *Ribes* bushes always respected the purism of strictly vegetative reproduction.
- In recent selection, the practice is sowing followed by mass selection in stages², until a parental lot which is then propagated vegetatively. But how many seedlings (inevitably slightly different genetically) constitute the set of stock plants? We have never managed to find this out, no doubt because of lack of practice and sources.
- For a cultivar of the eighteenth century, we will never have historical information on the biological system of its selection. The pomology of New York³ documents the mysteries surrounding the origin of varieties sometimes sprinkled with colourful anecdotes.
- Finally, even supposing that a nineteenth century cultivar had received the exemplary treatment of a pure clone . a single stock plant and exclusively vegetative propagation . the biology and pomology have adequately shown that somatic mutations cause it to evolve, if they happen in an apical meristem⁴. The apple *Golden Delicious*⁵ is enough to illustrate the evolutionary power of clones and its significance in agronomy.

So, regarding the taxonomy, how long does it take for a **clone** (a homogeneous entity in terms of taxonomy) to become a **phylum** (a heterogeneous entity in terms of taxonomy but with a recognised common ancestry)? Molecular biology will doubtless be able to measure the genetic drift in clones of different ages, and so understand and assess the heterogeneity of old cultivars.

¹ THORY (1829,75)

² Dr. I. CAGÁ OVÁ (2014, private communication)

³ HEDRICK & al. (1925)

⁴ VAN MELLE (1936) . VAN HARTEN (1998) . JIANG & al. (2011) . for *Ribes* KEEP (1975,220)

⁵ Griffiths & Sanlaville (2001 fig.7-31)

5.1- Recent cultivars

5.1.1- Is 'Rondom' a clone?

For example, we have (§414) 3 quite distant provenances for Rondomq Záblatí (riru 3), Velké Losiny (28) and Switzerland (133). They show small morphological differences (in the form of the tuft of the berry, in frequency of the valvate sepal aestivation) but nothing decisive. Moreover, its origin in the 1930s has not had much time for genetic drift.

15- Does the DNA show them to be very close, what does it say about their status as a single clone?

5.1.2- Same question for 'Jonkheer van Tets'

This is an example of a cultivar that is no longer recent (1941) but is still very popular and available at any the nursery. It deserves its success. Our two provenances (riru 28 from Velké Losiny and 101 from Starkl) are as alike as two peas in a pod. It is also probably too recent to have diversified yet ð

16- Does the DNA confirm it? Where and how to place a taxonomic limit in molecular genetics?

5.1.3- Same question for 'Red Lake'

Our two provenances of this unmistakable cultivar are very alike and it would be good to have the opinion of molecular biology on this American cultivar of 1920, which became so widespread in Europe:

17- Are riru 34 from Velké Losiny and 59 from Pro Specie Rara already genetically divergent?

5.2- Old cultivars

5.2.1- Is 'White Cherry' still homogeneous?



'White Cherry', one of the sweetest varieties

Its exposed sides turn bronze in the summer sun: not all whites do this.
This is a speckling of anthocyanins on the skin, particularly around the stomata which mark the meridians of the ribs

This cultivar is old, however (nineteenth century at least), so it has had time to diversify:

18- Are the Czech clone (riru 33, from Velké Losiny) and the Swiss clone (25, from Pro Specie Rara) close in their DNA as well as in their morphology?

Here we have practical pomology: we have a pre-war %family+ clone from Pardubice (riru 001) that goes well biometrically with the two previous clones. We do not go into detail here; the morphosystematics of the white *Ribes vulgare* cultivars looks very complex.

19- Does the DNA confirm the determination of this riru 001?

5.2.2- Same question for 'Earliest of Fourlands'

A cultivar that appeared probably around 1900 (§732). Two remote provenances perfectly alike morphologically:

20- Are the Czech clone (riru 31) and the Swiss clone (60) close in their DNA as well as in their morphology?

5.2.3- Same question for 'Houghton Castle'

The New York pomology recounts the amusing early days of this cultivar around 1800. It has consistently changed its name, been considered a synonym or otherwise of another one¹. So the situation was already uncertain a century ago: what may it be now? We asked for one with this name from Pro Specie Rara (riru 76) . it is extremely unusual morphologically. Then another one from Bojnice for comparison (riru 125): unfortunately, this one was too young for us to do a full biometric assessment. At first sight, while the flower is similar in both cases (§741), the foliage and the indumentum look fairly different.

21- What does the molecular biology say about the problematic pair 76 / 125? Two questions run together here: What is 'Houghton Castle'? And if one does know: has it already diverged genetically?

This is not a gratuitous question. When plant breeding continues as currently by hybridising old cultivars, these are cited in pedigree, and if there is any uncertainty about their identity, this is perpetuated and multiplied in the modern assortment. For example, the cultivar 'Emir' of 2010 is a hybrid involving 'Houghton Castle': but which 'Houghton Castle'?

5.3- A phylum for Heros'

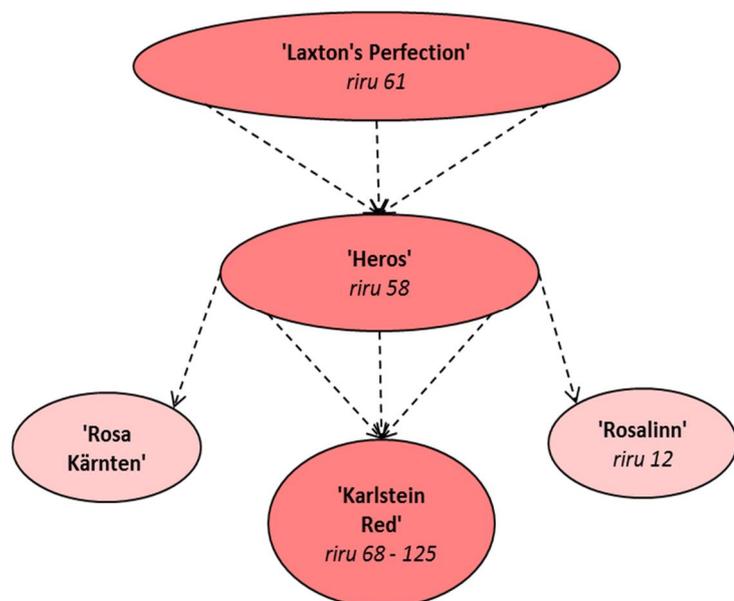
The first cultivar registered in the history of the Czech selection, 'Karlstein Red' has a laborious history of two episodes of mass selection, according to Blatný³:

1. The first, in Germany before 1927, extracted the new 'Heros' from the English 'Laxton's Perfection' of 1910.
2. The second, at the Kozolupy viticultural research station not far from Karlštejn Castle near Prague between 1929 and 1963, again made a positive selection of 'Karlstein Red' from 'Heros' still judged to be too heterogeneous (hence the synonym 'Karlstein Heros').

There are two clones of it in the collection, which took different paths. Riru 68 arrived in 1974 at the world collection at Brogdale Farm in Britain⁴, from where cuttings were given in 1989 to the USA gene bank⁵, specifically in Alaska, from where the clone returned home in 2011 . and riru 125 went to the great plant breeding station at Bojnice (Slovakia), from where we received a gift of cuttings in 2012. Morphologically, from our short experience, they are similar.

22- What will the molecular biology say about this 'Karlstein Red' pair?

Has there really been sowing followed by positive selection of the best plants? It is not spoken of, one would have to consult research documents in both institutes, in Germany and then in Kozolupy. According to the text, a positive selection from a large batch of purchased bushes whose biological status has not been specified is also conceivable. In any case, it will not be easy to establish the biological status



¹ HEDRICK (1925, 297-8)

² Výskumný ústav ovocných a okrasných drevín Bojnice (2016, cerv.rib_.Emir_.pdf)

³ BLATNÝ et al. (1971,328)

⁴ National Fruit Collection (2015)

⁵ GRIN-global (2016)



Slight pink flushing on the hypanthium in the flower bud. It practically disappears when the flower opens

(S17c <1.3 m), which is not common among the red *R. vulgare* varieties. 'Heros', 'Karlstein' and 'Rosalinn' (but not 'Laxton's') have a faint flush of anthocyanins on the young hypanthium (G11,14), which is not common either. The generosity of fruiting in 'Laxton's Perfection', 'Heros' and 'Rosalinn' is out of proportion in relation to the weakness of their branches: these sag under the weight of the racemes, a trait mentioned in some pomologies; in contrast, in 'Karlstein' this defect appears to have been eliminated. The antepetalous calli of the nectariferous ring (J19) are all tall (5-6mm); all the racemes have at least 1 apical bracteole per 2 pedicels (R22); but these last two characters, like many others are common in *R. vulgare*. Apart from the first traits mentioned, it is difficult to find an original morphological trait shared by all the cultivars in the phylum.

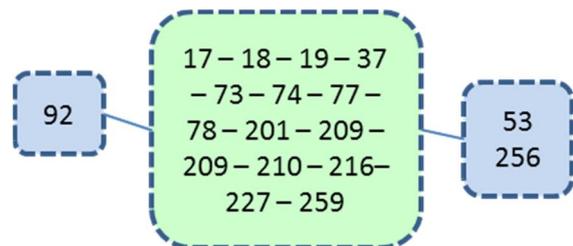
23– In order to detect such a phylogenetic relationship attested by pedigree, molecular biology could be more powerful than the morphology. Here at least is a nice training ground.

5.4– Heterogeneity of the old cultivars?

5.4.1–The 'Prince Albert' constellation

We have already described the morphological swarm of this very old cultivar that seems to be homogeneous (§411). But in two other Bohemian Forest clones, very similar in their characters on the whole, the outer tegument of the seeds is redder, the berries have a smooth spherical tip, less numerous bracteoles and one of them at least has deep pink flowers (riru 53 and 256). We can add clone 92, which, with its pinker flowers and exceptional microscopic diverticula of the epidermal walls of the berry (char. S17), deviates somewhat from type, yet does not merit exclusion. Morphologically it looks like three satellites around a typical constellation.

24– What about the DNA? We are stuck with the problem of demarcating the old cultivars with a long history of development (more than 2 centuries) and unknown history.



¹ BUNYARD (1920,52)

² KAJTNA (2006,5-6)

5.4.2- The 'Gabreta' constellation

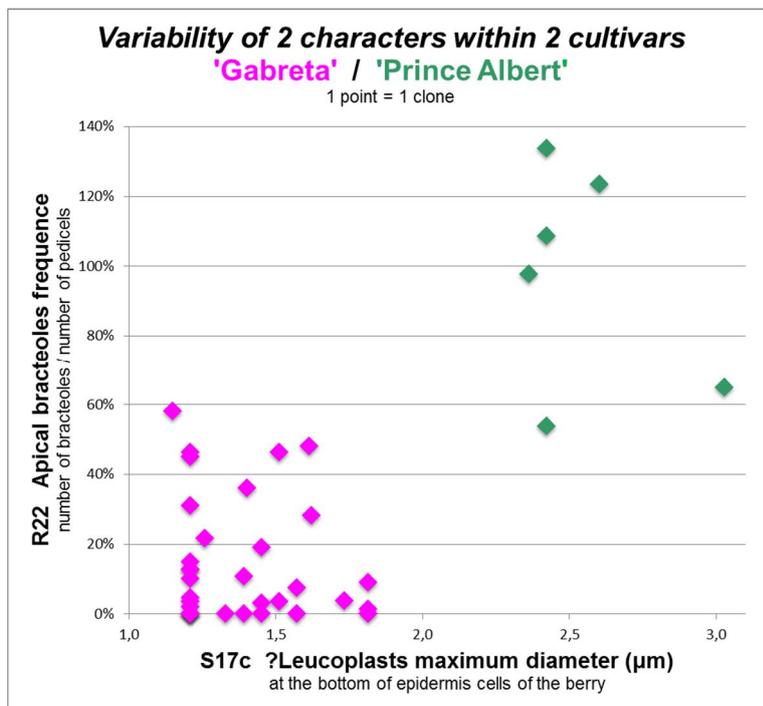
For an old cultivar forgotten before it has been described, the existence of satellite forms around a purported typical swarm is more problematic: would it not simply be a vast morphological continuum of random seeding between classic cultivars in which a botanist craving a discovery picks out an arbitrary plot? Such is the challenge we face in claiming to describe a ~~G~~Gabreta¹



The dispersion diagram below recalls two points:

A. A character is *always* variable in a cultivar, provided that it is measured on a sufficiently fine scale. Homogeneity is only a question of the scale of perception. Unfortunately it is invoked by the authorities in the management of cultivars.

B. A character may not be clearly discriminating (R22) but may confirm the discrimination established by another (S17c). A cultivar is not distinguished by a single good character but by several



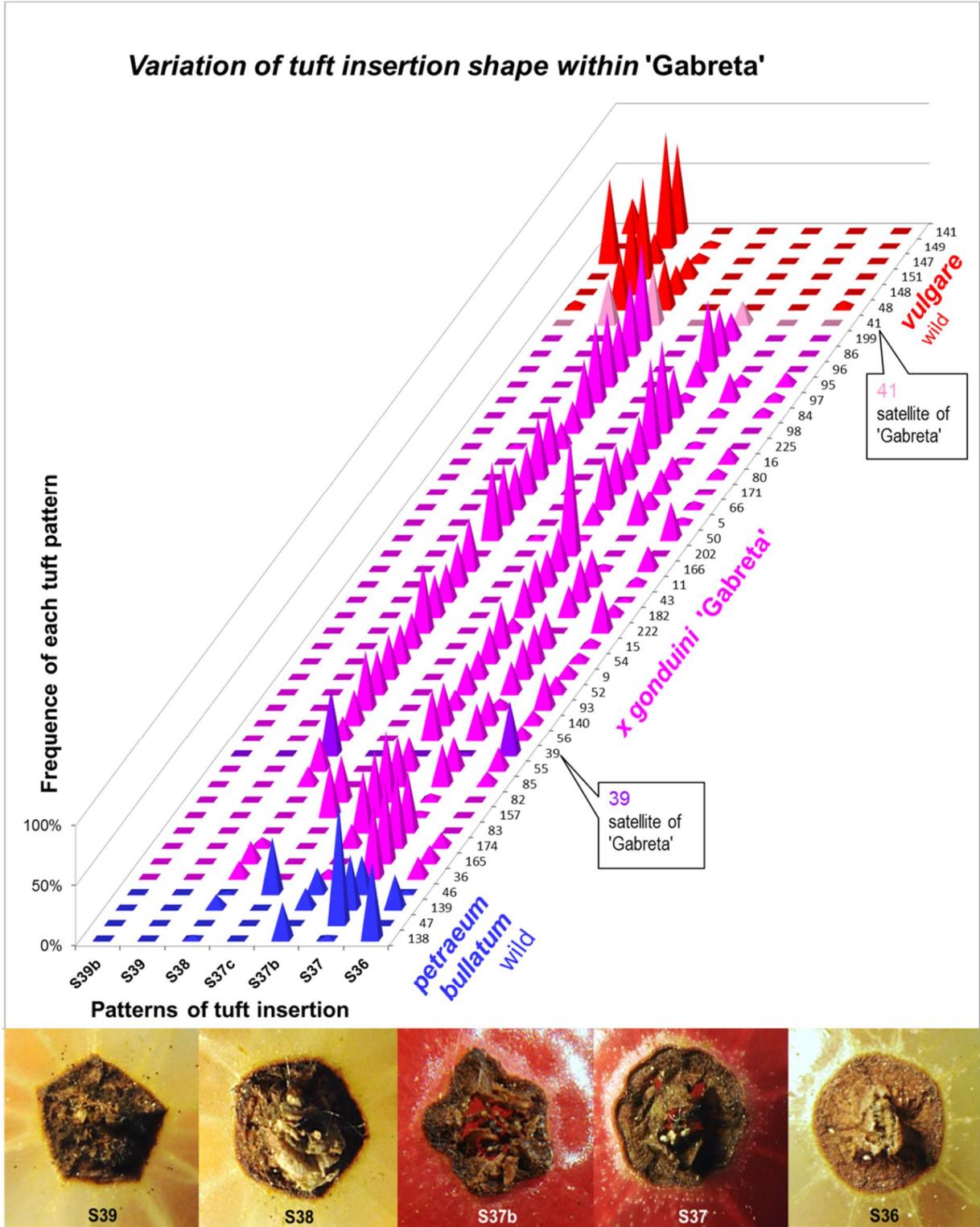
characters with a higher or lower power of discrimination. The median dispersal range of the most mediocre serves as confirmation of the determination, without any further bother: it is known that their extreme values may vary. Provided that the groups of clones can be distinguished by a set of characters, their existence will not be denied because of some of these are variable.

All this is clearly incorporated in the methods of factor analysis, which we do not use.²

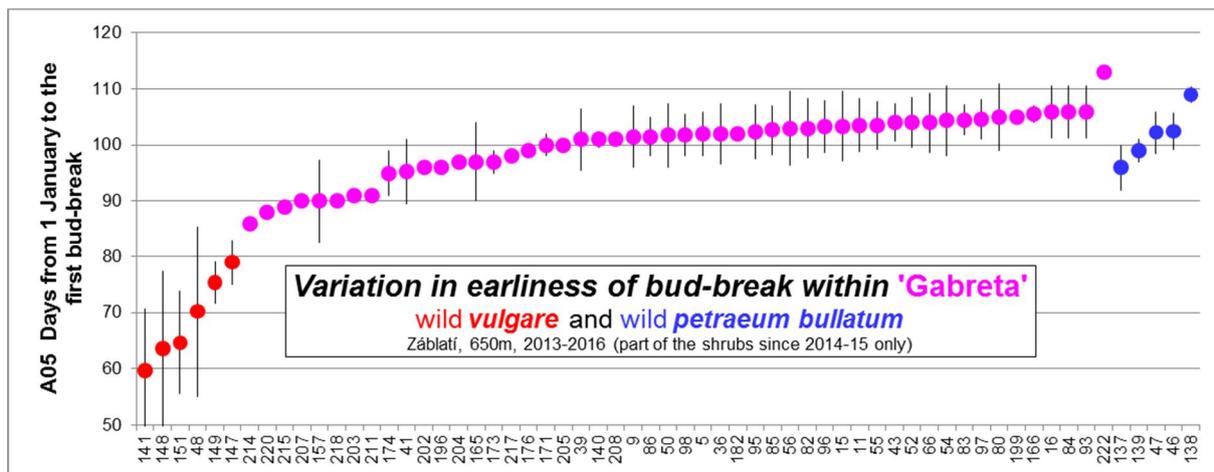
¹ Its description is in progress, an introduction to its main features has been published (KISSLING P.&J. 2015)

² A- The data matrix is not full enough to do it without endless preliminary cosmetics. B- we want to observe how each character behaves in the population

The more one looks in detail, the more one can see the internal variations in a swarm of forms. For example, in a collection of a few dozen plants of *Gabreta* the tuft of the berry takes different forms. This form is one of the major trait variants in the systematics of *Ribesia*. but in an area of variation (S37-38) ranging between the extreme orbicularis forms (*petraeum* and *spicatum*) and the angulate pentagonal (*vulgare*), so we find a limited heterogeneity which makes sense for a presumed hybrid (S752).



A physiological trait such as precocity behaves similarly:



Here is the pattern of the $\text{\textcircled{G}}$ Gabreta population from the morphotaxonomy:

- 1- When approaching an orchard containing a few dozen plants of 'Gabreta', at first they all seem like the picture given in the introduction: relatively large leaves notched at the base and broad, short lobes, pelviform-campanulate flowers . deeper or lighter red with sepals slightly revolute and not contiguous, nectaries in typical carousel form, dark berries that are very acid with tufts that are never angulate pentagonal, and rarely orbicular, with epidermal walls densely studded with microscopic diverticula (S17) and minuscule ?leucoplasts that are hard to see (S17bc). Regarding biometrics, each clone is distinguished by a character, like the "little rebels" who create a national society: a boy imitates the King on Saturday nights but works all week in a workshop, a girl dyes a strand of her hair green... Similarly, clone 15 has the least widely spaced sepals (character 107) . 50 has an average of 130 cilia per sepal (every year, seemingly), which is significantly higher than the normal range for 'Gabreta' (60-80) and it is also high in that of the wild *Ribes petraeum bullatum* . 84 has an exceptional number of sessile glands on the leaf blade (C11) . 86 has the reddest petioles on the upper surface (Q2a) . the flowers of 95 and 97 are less red (G4) . 165 has a particularly long raceme stalk (M11) and a lower number of cilia on the lower bracts (N14n) . 174 has the highest rims to the tuft on the berries (S10-11) ... but apart from all that they are lovely $\text{\textcircled{G}}$ Gabretas'. We have shown them in the central cluster in the diagram (deep green).
- 2- On doing a small intuitive pomology test one finds: many shrubs are still recovering and without flowers in the Alenor garden. Those with leaves that say to us «Gabreta» (without measurements: it would be an extravagant and useless exercise when one has time to wait for the flowers!) are grouped together in the pale green cluster on the left.
- 3- There are two real "dissidents" / **satellites**. So we will name some bushes that look like the photo at the start and have dark acid berries like $\text{\textcircled{G}}$ Gabreta but which, if observed closely, deviate from the main cluster by more than one character:
 - **riru 39**, which looks and tastes like $\text{\textcircled{G}}$ Gabreta has several small biometric deviations: the bell-shaped calyx tube is a little deeper (E19) and more urceolate (E21), the floral envelopes somewhat more campanulate (F06), one sepal has 9 cilia rather than the average 60-80 and the cilia are twice as short and less verrucose (I18-20), the lower bracts of the raceme also have far fewer cilia (N14n), the anther locules are even more convergent towards the apex (L12) and the orbicular tufts of the berries are exceptionally frequent (S36). But all these traits are not just any traits, but specific characters (this will be discussed §72): overall, their deviation consists of a slight drift towards the *spicatum* type as shown by the systematics.

- **riru 41** also looks like a small bush of *Gabreta* but every year the leaf blade is concave like a spoon (not from any disease but by shape), the red of the buds is flushed with bronze while those of *Gabreta* are almost all of a clearer purple (B2), the bowl of the hypanthium is the shallowest (in absolute and relative terms, E16-17), the number of cilia on the sepals is reduced to a third of the average and their length by half (I18-19), the petals are the shortest (K2-3), the vault of the semi-inferior ovary is the lowest (J7,14,15), it is the only one with some acute pentagonal berry tufts (S39) and its buds are the shortest (Z29). Here again, it is not a matter of any old characters, but ones that all converge in a slight drift towards *Ribes vulgare*.

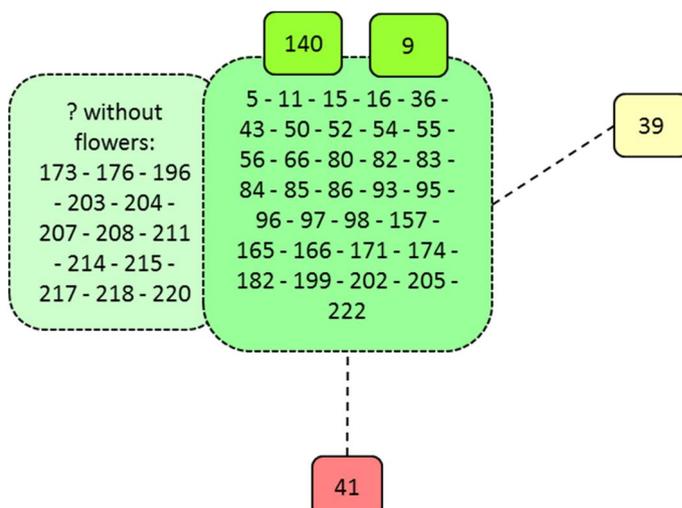
4- Two other bushes stand out not by any morphological differences but by their exceptional quality:

- **riru 140** ("Korytar v") showed the biggest berries ever seen in this cultivar at our neighbour's establishment in 2013, nearly as tall as *Jonkheer van Tetsqor* *Rovada* although the bush itself was delivered without any manure, pruning or watering: an average diameter of 12.8mm for the 10 largest berries found on the bush. Furthermore, the coronal leaves have larger divisions (width:length ratio) at all levels, lobe . primary indentation . secondary indentation (char. W22-23,28, X16-17,21,23), but this appearance of obtuse curves may be seen not as a deviation but as an excess of the characteristic roundness in the *Gabreta* leaf type.



- **riru 9** ("Blanice"): If the 140 is an above average expression of the character of *Gabreta* like Ji í Suchý for the Czech people, riru 9 would be their Karel Kryl, an unparalleled vital force and

eternal questioner. It must be ten years since we found him, in the Sudeten mother-station, in the form of a large decumbent, dome-shaped bush, both more robust and supple than *Gabreta* all through the years of recultivation it has held its head above the others like a torch, but in looking through its biometric scores in fine detail no measured deviation can be found. It is like another one with some hidden difference, we have noted elsewhere a %false outsider+ or %*Gabreta*++. For these two exemplary clones, a biomolecular diagnosis could be enlightening.



25- What will the DNA say about this morphological classification?

26- And the group still without any flowers, identified only by the leaves, does it in fact belong to '*Gabreta*'? Here we suggest the possibility of dismissing the morphology for a biomolecular identification of samples taken directly from the field without recultivation, under the name of "taxonomic impediment"

6- Phylogenetic questions

6.1- Do classic morphospecies hold?

The flowers are of very unequal value in identifying varieties in *Ribes* groups. While in the identification of black currant varieties they are of almost no significance, in red and white currants they are quite characteristic in the determination: in some varieties they are so characteristic that they can be enough to identify them, as the pomology of Blattný rightly noted¹. The explanation is simply the systematics: whereas black currants are derived from a single species, red currant cultivars are descended from three species for the old ones and four since the twentieth century. And these species have different flowers, which form the largest reservoir of discriminating morphological traits. Rigorous analysis of the flower is always essential, even more than any other document, as the *Ribes* monograph note.²

Edward F. Janczewski (1846-1918)³ reviews the profusion of old taxa in a monograph on the Genus *Ribes* which, reinforced by the review by Poyarkova⁴ of the flora of the USSR, is still, broadly speaking, the current reference work for the European species.⁵ Janczewski made an attempt to collect cultivars from nurserymen to compare them in terms of botany: "The best way to classify the cultivated forms of currants is to arrange them according to the botanical species from which they derive"⁶ But cultivars are not really his cup of tea. If Janczewski was the Rembrandt of the wild *Ribes* and Antonina Ivanovna Poyarkova (or Pojarkova) (1897-1980) their Alexandra David-Neel, cultivated red currants have had a Sisley who stopped painting too soon: Edward A. Bunyard (1878-1939). Heir to a large English nursery in Maidstone (Kent), a humanist pomologist⁷, and although not a botanist it was he who was the greatest supporter of the idea of Janczewski to look for a natural classification of the cultivated *Ribes*. In the 18 pages of his sketch⁸, one can sense his experience, the direct practice of morphology (citation §423) and a human presence that brings it all alive; it is as if you are leafing through his notebook with him, sitting with a glass of nice wine under a pergola in his nursery. He makes an attempt to regroup the cultivars according to the traits of the parent wild species. This attempt, if it appears quite natural to a botanist, was innovative and it remains almost unique – apart from Janczewski's somewhat sulky prototype – in the pomology of red currants⁹. It is cited as a classic¹⁰ but is not paid much attention. The best pomologies devote an introductory article to the parent species, even a key¹¹, then they go on to a review of the cultivars in alphabetical order. Czech pomology¹² made a great step forward by trying to link each cultivar to a botanical taxon and drawing a section of its flower, but it is not yet a systematic review, where the descendants of a species would be compared against one another and their common traits highlighted, including the physiological and arboreal ones. These parental physiological traits are nevertheless essential in improving plants and the selectors know them: see, for example, the recommendations of those at the head of the queue for the improvement of *Ribes* by taking the wild species and making the most of their favourable physiological characteristics¹³, or the nice popularisation of the principles of selection of *Ribesia* of Mme. Straková.¹⁴ But this knowledge of species does not yet permeate the pomologies. That is why Bunyard's first sketch, however imperfect, still shines a hundred years later as a huge inspiration in the field of ribesiology.

In trying to understand by interpolation and identify old cultivars, we are going to start with the wild species. There are three for the old European cultivated red currants:

¹ BLATTNÝ & al. (1971,222-3)

² JANCZEWSKI (1909,316)

³ JANCZEWSKI (1907), a Polish aristocrat, wrote in impeccable French

⁴ POYARKOVA (1939), translated into English in 1971

⁵ WEIGEND (2007,174)

⁶ JANCZEWSKI (1909,316)

⁷ WILSON (2007) . BUNYARD (1917)

⁸ BUNYARD (1920)

⁹ VOELTZ (1967)

¹⁰ KEEP (1975,202) . BRENNAN (1996,197)

¹¹ For example HEDRICK et al. (1925,257)

¹² BLATTNÝ & al. (1971,304ff.)

¹³ KEEP (1975,219) . BRENNAN (1996,218-227)

¹⁴ STRAKOVÁ (2010,14)

1. ***Ribes vulgare*** Lam.¹ Flowers rotate with wide green non-ciliate calyx (sometimes flushed with bronze anthocyanins), with large pentagonal nectariferous ring on the hypanthium, which is lobed with five protuberances on the lower face, minuscule petals, short stamens with butterfly-shaped² anthers with lateral dehiscence, inferior ovary with Romanesque vault-shaped locule culminating below the base of the hypanthium, short style emerging directly from the hypanthium with no conical base, berries (the known wild ones are always red) with pentagonal insertion of the tuft³, spindly branches with few ramifications, marcescent epidermis grey on annual shoots in autumn, leaves on average small with short, wide (hence obtuse) lobes, cordately indented at the base, covered only in unicellular hairs and sessile glands. Marshy and alluvial forests of Atlantic Europe. Physiologically: the berry is sweet, this is the principal quality required. The different stages of annual development are early, from bud-break to maturity of the fruit. Its early flowering puts it at risk of late frosts, which burn the flowers and ruin the crop. Poor resistance to all sorts of fungal diseases results in early leaf loss in summer, especially in mountain regions or in a rainy summer; leaf loss that affects the quality of the ripening of the berries. Historically, this was the main species bred; its improvement was already well advanced at the end of the eighteenth century, as Lamarck wrote *It varies, with red, white and variegated fruits*.⁴ And from gardens the species naturalised by returning to a more or less wild morphology in marshes and alluvial plains at low altitude all over Europe. Our clones: wild, from a forest by the Baltic Sea (141-151), and a naturalised one from a Swiss river (48).

2. ***Ribes petraeum*** Wulfen: Flowers campanulate-urceolate flushed with red over all of the organs (for the western European type, *bullatum*, which is thought to be the only one involved in the selection of cultivated red currants), calyx heavily ciliated, hypanthium not lobed⁵, shaped in the bowl with ten discrete ribs like a fluted cake ring, large petals flush with the edge of the bowl of the calyx, long stamens with narrow introrse anthers, semi-inferior ovary like a Gothic vault rising above the bowl of the hypanthium so that the style appears conical, long style flushed with red, berries with orbicular tuft or with a high, creased, whitish rim, thick branches closely ramified⁶, annual shoots with marcescent reddish-brown epidermis, leaves broad on average with elongated (so, acute) lobes, not very indented at the base, even the coronal⁷ ones with multicellular glandular setae visible to the naked eye in spring (see photo with bunch). Humic soils in rock-strewn mountain-subalpine maple woods or mountain-subalpine areas of spruce woods in the Pyrenees, in the Alps, and up to a limit to be determined in the mountains of central Europe. The berries are acid, larger than those of the wild *R. vulgare*; the phenology is late (graph §542), the flowers open after the late frosts so the fruiting is more reliable than for *R. vulgare* in mountain climates; the foliage remains almost intact until autumn. Not much cultivated in the past, only two or three cultivars are mentioned, although it is an important parent in the breeding by hybridisation. Our clones: Swiss pre-Alpine (46-47) and Beskids (137-9).

¹ LAMARCK (1789,47). Unfortunately, it is called *rubrum* L. in many flora and large internet directories. It is systematic confusion that dates back to the nineteenth century, as has been shown by JANCZEWSKI (1907,277 & 289). The "*rubrum*" of Linnaeus is Scandinavian, Baltic and British, and is very different morphologically. It gradually became the habit to avoid using the ambiguous term *rubrum*, to adopt Lamarck's *vulgare* term for this Atlantic red currant and *spicatum* for the one that Linnaeus described. Unfortunately, excess zeal may lead *spicatum* to be used uniformly for everything that was previously called *rubrum*, as a review of the Grin-Global nomenclature in 2012 seems to have done (2016): we are then at risk of another layer of confusion. But in this sketch let us leave this irritating subject of nomenclature that would take up two further pages. It will be addressed again in a later publication.

² Term used by JANCZEWSKI

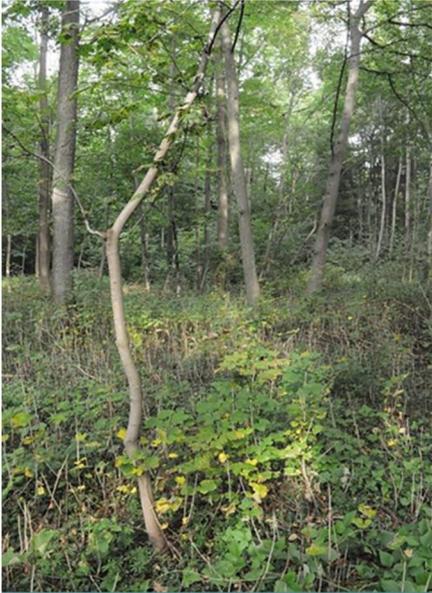
³ Definition §411, footnote

⁴ LAMARCK (1793,137). For white and pink (variegated) currants see §65

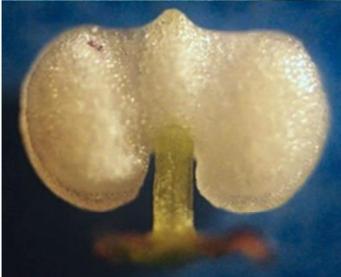
⁵ So, in the shape of a glass for red wine

⁶ Provided that the bushes are grown in sun for comparison of the species under optimal conditions

⁷ The meaning of the neologism *coronal* will be defined in the critique of the biometric traits; it concerns all vegetative organs (shoots, buds, leaves) of adult shoots (susceptible to flower), so located at the periphery of the crown of the bush

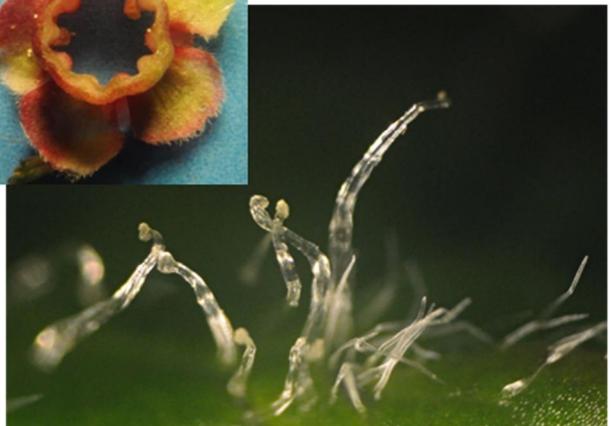


wild
Ribesia

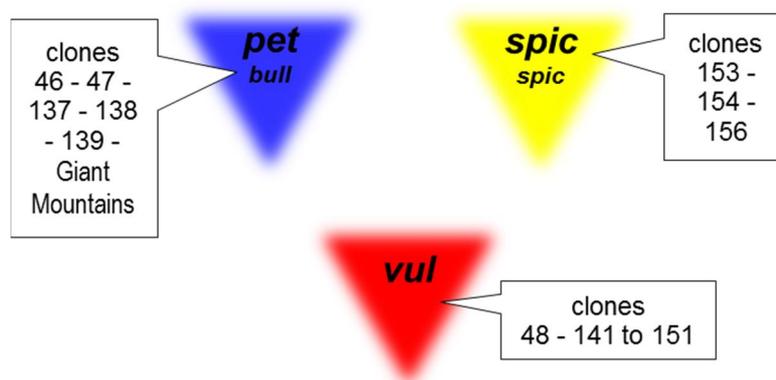
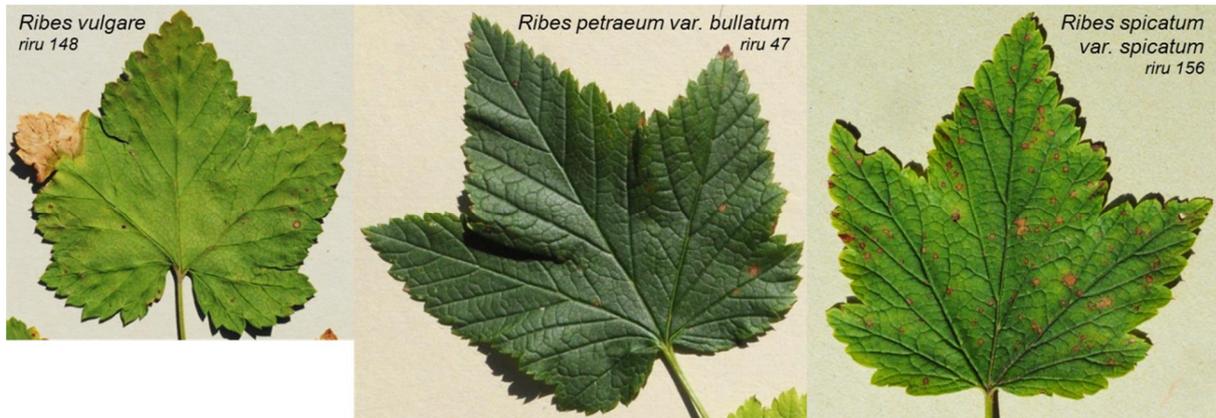


R. vulgare LAM.

R. petraeum WULF.
bullatum O. & D.



3. ***Ribes spicatum*** Robson¹ : flower pelviform with calyx flushed or speckled with bronze, with no or few cilia, hypanthium not lobed (as in *petraeum*), but smooth with no protuberances on the upper nectariferous surface, long stamens with narrow introrse anthers, semi-inferior ovary like a Gothic vault rising above the base of the bowl of the hypanthium so that the style appears conical at the base, berries with an orbicular tuft, thick branches and a strong bush like *petraeum*², marcescent epidermis of the annual shoots brownish-red in the autumn, leaves fairly large with elongated lobes (hence acute) like *petraeum*, but not at all indented at the base, simply with hairs and subsessile glands. Marshy and alluvial Baltic, Scandinavian and British forests. Rather late, also retains its leaves for a long time.



27– Does the molecular biology confirm the phylogenetic coherence of these parental species? The proposed sample brings together the only wild clones

¹ Here is where we stumble against two problems in this sketch: A. we have not seen any flowers yet! The traits mentioned are from Janczewski and sometimes we risk extrapolation from old cultivars that Bunyard and Hedrick say are *spicatum*: London Market and Earliest of Fourlands. B. we only have *R. spicatum spicatum* (= *scandicum*) and not the variety *pubescens* yet, of which BUNYARD (1917a,261) emphasises the pomological importance. If the glabrescent Earliest of Fourlands reminds us of *R. spicatum spicatum*, on the other hand for a London Market with its exuberant hairs and glandular trichomes (§67), it is time to look for another more pubescent ancestor.

² We judge them by the only plants of *spicatum* var. *spicatum* found in a forest in the north of Germany, mixed in with bushes of *vulgare*, where they were growing upright and sturdily, like weightlifters lost in a troupe of tap dancers; London Market and Fourlands confirm the robustness of the species.

4. A fourth parent appeared in the twentieth century, *Ribes multiflorum* Kit. from the Italian and Balkan mountains. Its cultivars are too recent to concern the Sudeten ruins (§413-414). Unfortunately, we have had no success in getting the precious cuttings of this species that we received to take root and we will resume this subject later. Nevertheless, it is clear that the certified hybrid cultivars of this species share some morphological traits: the stamens protrude above the profile of the calyx (character E2, see §413, the extreme case of 'Heinemann'; and 5 spectacular antepetalous nectariferous nipples between which the antestaminal protuberances go unnoticed (J17-22). These are classic traits of *R. multiflorum*.¹ Moreover, the young foliage at bud-break (transient character D00) emits a *Lamium*-elder type odour in 'Rondom' and 'Heinemann' (but not in 'Rovada' which is in contrast to the odourless foliage of other red currants.

28– Is the DNA of these hybrids of *multiflorum* (riru 3 – 28 – 30 – 87 – 99 – 133) also close because of common elements that would enable the genetic involvement of a species foreign to the classic trio to be guessed?



Nectariferous nipples of 'Rondom' inherited from *R. multiflorum*

6.2- Above the level of species

Seen as a whole, the Genus *Ribes* really seems to be a phylum, but one that has large units (sub-genus, sections) long proposed by the morphology and that molecular biology in fact confirms, as summarised by Weigend². For the cultivated species, gooseberries (*Grossularia*) are according to different authors either clearly from a neighbouring genus, (this is the view of Blatný et al.³), or they are included in *Ribes* as a sub-genus. The Alpine currant (*R. alpinum*), physiologically dioecious, formerly grown as an ornamental plant, belongs to the sub-genus *Berisia*, black currants (*R. nigrum*) to the section *Botrycarpum* of the sub-genus *Ribes* and, finally, red, pink and white currants to the *Ribesia* Berl. section of the same sub-genus. The terms "rybíz / Johannesbeere / currant / groseillier" may then be misleading for the non-botanist: black currants and red currants are only fairly distantly related. To specify the location of the systematic topography of this work, we are in a tiny corner of the Genus *Ribes*, a small group of three or four species of the section *Ribesia*. It so happens that this tiny group of European origin has flooded the temperate regions with cultivars, but many other Eurasian species from the same section have been grown for their berries or are likely to be.⁴ This means that we map in detail one small district, not a continent.

The majority of biomolecular studies available (unless I am mistaken) are, rather, on the continental scale+of *Ribes*, and analyse the phylogeny of the sub-genera and sections.⁵ Only one study is of the pomological kind, in that it starts from the bottom, the cultivars of a collection, to test the possibility of making molecular fingerprints of it⁶ that are useful for identification; but in the end it confirms the

¹ JANCZEWSKI (1907,273-4)

² WEIGEND (2007,174)

³ BLATNÝ & al. (1971,10)

⁴ BLATNÝ & al. (1971,13-14 & 18-24)

⁵ MESSINGER & al. (1999, Chloroplast DNA) . WEIGEND & al. (2002, ribosome DNA) . SENTERS & SOLTIS (2003, ITS sequences nuclear DNA) . SCHULTHEIS & DONOGHUE (2004, ribosome and chloroplast)

⁶ PALMIERI & al. (2013, microsatellites)

separateness of the sections *Botrycarpum* (black currants and the jostaberry hybrids) and *Ribesia* (red currants). By its *Ribesia* content, this Italian work is on the same scale as this sketch, but without the perspective of natural systematics according to parental species, which is our approach. An inventory of the natural heritage of Moravia suggests another possible direction for molecular biology, in geotaxonomy or the genetics of the populations¹.

We do not touch the macrotaxonomy of the *Ribes* Genus, but in everyday practice, in order to locate an unknown clone, we first look to see if it has an elongated or short floral profile (rotate), a nectariferous ring and then sepal cilia. This means that the first practical discriminatory axis, without thinking and for convenience, is between *vulgare* and the *petraeum-spicatum* pair. To compare the three summary portraits above, *petraeum* and *spicatum* have many more morphological features in common than *spicatum* and *vulgare*. Yet some florae², probably in line with the dichotomous key of Hedlund³, place *spicatum* and *vulgare* together into a group %*rubrum*+, of which the principal traits are the absence of sepal cilia of *petraeum* and a less campanulate flower: our practice clearly does not adhere to this model. The phylogenesis of *Ribesia* is largely beyond our ambitions and competence, but if we were to associate two of these three species morphologically, it would be *petraeum* and *spicatum*:

29– How is the DNA resemblance between these three species graduated?

6.3–Below the level of species? The geographical variation

Ribes vulgare Lam. is the only species free of problems. It is a long time now since there was any doubt about it or that it was divided into sub-taxa, and its only misadventure was the unfortunate confusion over its nomenclature with *the R. rubrum* of Linnaeus.

Ribes spicatum Robson (the ancient *rubrum* of Linnaeus) is the biggest problem. The meticulous Hedlund analyses it into small species, which the bold Janczewski goes down to the level of varieties of the wide *rubrum* of Linnaeus, then Poyarkova sets them again at the species level. Currently, according to various global catalogues on the internet, they are treated as sub-species of a %*spicatum*+. This provisional table is an attempt to make the point, but the subject is beyond us, we do not know any of these forms personally (and we are waiting for flowers on the *scandicum* = *spicatum*):

Series	sp.	subsp. / var. (according to the authors)	Janczewski (1907)	area
Rubrae A. Poyark. (1939/1971, 182)	<i>R. spicatum</i> Robs. (Transactions of the Linnaean Soc. of London vol.3, Issue 1, 1797, 240. 241)	<i>spicatum</i> (no author, understood to be Robson type)	var. <i>scandicum</i> (Hedlund)?	Temperate and subarctic northern Europe
		<i>pubescens</i> (Hartm.) R. Cinovskis (Fl. Balti skikh Respublik 2: 33 1996)	var. <i>pubescens</i> Swartz.	Scandinavia, Baltic, subarctic
		<i>lapponicum</i> Hyl. (Nomenkl. Stud. Nord. Gefässpfl.: 196, 1945)	<i>glabellum</i> Trautvetter & Meyer	Arctic, Norway- Russia
		<i>hispidulum</i> (Jancz.) Hämet-Ahti (Ann. Bot. Fenn. 21: 209, 1984)	<i>rubrum</i> var. <i>hispidulum</i>	Arctic, Finland- Russia

¹ BAJER & VAŠUT (2010)

² OBERDORFER (1983,493) . KIRSCHNER (1992,359 & 363)

³ HEDLUND (1901,88-92)

A natural pomology of red currants cannot ignore the diversity of this group, since as Bunyard noted¹, the different degrees of pilosity indicate that at least two forms of this group are probably involved as parents of the cultivars. But we must leave this aside for the moment.

6.3.1- *R. carpathicum*: a sub-species of *R. petraeum*?

In the additions to the Hungarian flora of Kitaibel (1757-1817), published by Kanitz in 1863², all the *Ribes* of continental Europe are there. It was he who described *Ribes multiflorum* Kit. from the Balkan Mountains. It was also he who describes in the Carpathian Mountains a curious red currant with pale flowers. He knows *Ribes petraeum*, which he found in the Low Tatras³. This taxon was described at the time as having red flowers. Its red currant with pale flowers, while it may nowadays remind us strongly of *petraeum*, apart from the colour of the flowers, he identifies as a separate species, *R. carpathicum*. The ciliate bracts and calyx that he mentions leave no doubt as to the quality of his observation: while he separates *petraeum* and *carpathicum*, it is certainly not through ignorance! We must just remember that there was no skimming in the creation of new species at the time.



Ribes petraeum carpathicum in the Tatra Mountains

¹ BUNYARD (1917,261)
² KITAIBEL (1863,480-484)
³ KITAIBEL (1863,481)

Janczewski¹ recognises the existence of this taxon, but from his perspective of synthetic systematics he puts it at the level of a variety in an extended species *petraeum*, where the old *petraeum* with red flowers becomes *R. petraeum* var. *bullatum* Otto & Dietrich.

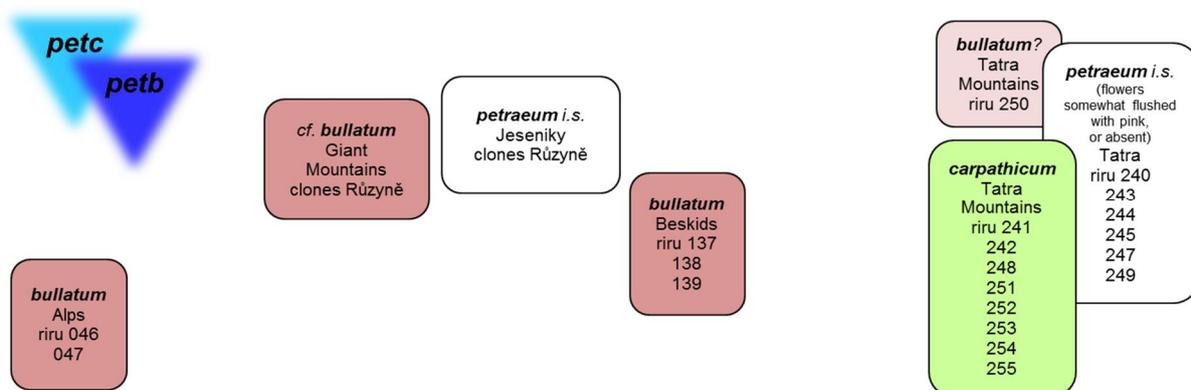
The rank given to taxa has no absolute value, it is a language to express the resemblances and the presumed genetic relationships. The vast *petraeum* of Janczewski, which ranges from the Pyrenees and North Africa to Siberia by including 6 taxa which are treated as species by others², may irritate chauvinistic or nomenclatural purist sensitivities, but at least there is an interest in research and in seeing the resemblances between geographically remote forms: the geotaxonomic aspect is one of the great contributions of Janczewski, by way of heuristic hypotheses. Since then, this taxon no longer makes any waves, the phytosociology is reminiscent of the vicariance of *bullatum* / *carpathicum* between the Alps and the Carpathian Mountains: ¥ibík, by comparing the subalpine pine forests (*Pinion mughii*) of the two mountain ranges, writes %n the Carpathians several species are absent, such as *Alnus viridis*, others are replaced by vicariants (e.g. *Salix silesiaca* and *Ribes petraeum* subsp. *carpathicum* are replaced in the Alps by *S. grandiflora* and *R. petraeum* s. str.):³ From our very limited experience, the two varieties would not necessarily occupy the same biotope: *bullatum* should be in a mountain-subalpine *Lunario-Acerion* or a *Vaccinio-Piceion* humic soil on blocks, *carpathicum* in a humid-eutrophic wing of upper subalpine *Pinion mugo*. This note is little documented but is worth checking because it would indicate a physiological difference between the two taxa, and so more than merely vicariousness.



R. petraeum bullatum ?
in the Tatra mountains

The red of the style can be surmised from the base of the style, so particular to *bullatum* in Europe

In this roughly drawn table, it appears that from the Pyrenees to the north of Bucharest, populations of *Ribes petraeum* are scattered widely, which certainly have red flowers in the west and pale flowers in the east: an ideal subject for European multidisciplinary research, morphological and molecular geotaxonomy and phytosociology.



¹ JANCZEWSKI (1907,293)

² Among others, POYARKOVA (1939/1971) and her Series *Petraeae*

³ ¥IBÍK (2010,89): his *petraeum sensu stricto* is of course *R. petraeum* ssp. *bullatum*

Our little sample (the Swiss Alps, Beskids and Polish Tatra ranges) and yours (Northern Czech Mountains, which we do not know morphologically) allows us to tackle the subject now. The biometry of *R. carpathicum* has been outlined. Apart from the flushing with anthocyanins, the flower looks similar: urceolate, sepals slightly revolute, densely ciliate, large petals flush with the edge of the bowl of the calyx, tall introrse stamens, nectariferous hypanthium in the shape of a fluted cake ring, semi-inferior ovary rising above the bowl of the hypanthium like a wide conical base of the style, bracts heavily ciliate, coronal leaves with long, acute lobes and with a few glandular setae on the upper surface (see the photomicrograph, an exceptional feature of *Ribes petraeum* in the European context.

30– It is expected that the intermediate colours will take biometrics to its limits in the Carpathians. And there, without doubt, molecular taxonomy will have a decisive role to play. What picture of this complex does it give?

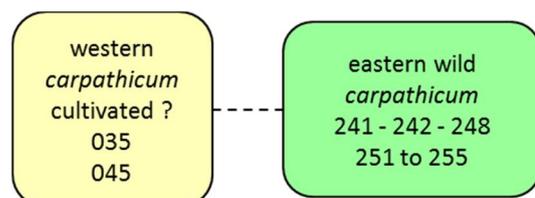
6.3.2– A cultivar of *R. carpathicum*?

What interests us about *Ribes carpathicum*? It is that the Czech Flora has a secondary station of *R. petraeum* at Orlik Castle near Humpolec.¹ We found it again (riru 35). This clone, unlike the *petraeum* plants in the northern mountains, does not have red flowers, but flowers that are almost green, faintly flushed with pink. The serration of the leaves is also more acute than in those of the *bullatum* plants that we know. The secondary station is in fact the southern slope of the castle mound, just below an abandoned grassy terrace that suggests it may once have been a garden. So an atypical *petraeum* in an anthropogenic station: that is already something to think about. The question arose again when some Sudeten rubble in the Bohemian Forest, 200km to the west, produced the exact double of this red currant (riru 45).



Biometrically this pair fits very well with *petraeum*. It differs from *bullatum* by having much less flushing with anthocyanins on the flowers, and paler and less acid berries. All this makes one think of *carpathicum*, but far from the Carpathians and in stations which rather suggest cultivated status. They also have fewer sepal cilia than the one we measured from the Tatra Mountains. So we see it as a cultivar just at the edge of the domain of *Ribes petraeum carpathicum*.

31– Question for molecular biology: are these two clones 35 and 45 related to the most reliable of the *R. carpathicum* from the Tatras?



¹ KIRSCHNER (1992,362)

6.4- Cultivars of *R. vulgare*?

We return to the search for a natural pomological classification. According to the biometrics, we would say that all the cultivated clones listed below on the left derive from the pure species of *R. vulgare*. On the right, some wild clones and one subspontaneous clone are shown that best embody the morphological concept of the species as described in the literature.

<p>red</p> <p>042 <i>Sister Barka</i> 164 <i>Křišťanov S</i> 172 <i>Křišťanov N</i></p>	<p>red</p> <p>021 Fertile de Pallau, PSR 023 Laxton's N.1, PSR 061 Laxton's Perfection, PSR 069 Pomona, USDA 075 Chenonceaux, PSR 118 La Turinoise, PSR 120 Versailles, PSR 123 Göpertova, Bojnice 126 Caucasiche, Bojnice 131 London Grand Ruby, Holovousy 159 North Star, Bojnice 188 NON 'Prinz Albert', Deaflora 189 NON 'Heros', Deaflora</p>	<p>pink</p> <p>012 Rosalinn, Haeberli 117 Gloire des Sablons, PSR 119 Champagne, PSR 191 Gloire des Sablons, Deaflora</p>	<p>red naturalised Venoge CH: 048</p> <p>wild Steinberg D: 141 147 148 149 151</p> <p>wild vulgare</p>
<p>pink</p> <p>122 <i>Corcelles CH</i> 185 <i>Komenský CS</i></p>		<p>white</p> <p>001 <i>Pardubice</i> 040 <i>Vysoký Les</i></p> <p>Bohemian Forest & other unknown ancient</p>	
<p>cultivated <i>vulgare</i></p>			

32- Do the 32 cultivated clones in the table that we consider to be true *R. vulgare*, all belong in the DNA dendrogram with the 6 most representative wild ones?

The forms [ō] that descend from *R. vulgare* [ō] make up about 90 per cent of all those that we have found commercially, wrote Janczewski¹. This species was the principal provider of cultivars up until the nineteenth century. Quite simply, where the climate is more favourable, it is probably the most widely distributed species in old gardens. But in the Bohemian Forest, which is submontane and montane, only 4 pure *vulgare* clones were discovered in about 120!

6.5- Polyphyly of the pink and white?

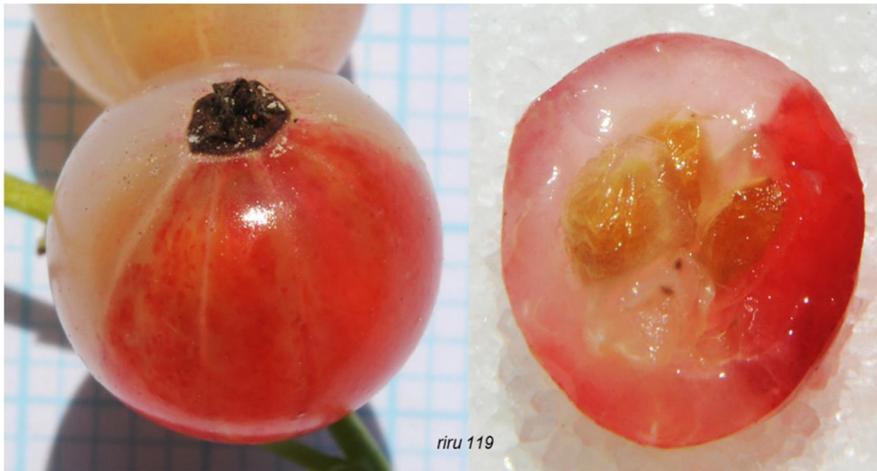
The table above provides an opportunity for another old question: are pink and white currants separate taxa? The morphological pomologies have already said no, between the lines:

- We have seen pink sports occurring in the red 'Heros' (§53) while 'Champagne' (§422) has been in existence for a long time. This example alone indicates that the pink+feature can recur in different phyla.
- The observation of pink and white berries teaches us that it is about partial albinism, extinction of anthocyanins from some tissues:
 - All the pink ones have unpigmented pulp (mesocarp) but the skin (epicarp) is pigmented
 - Pink Dutch switches the pink pigment in the hypodermis off (§412) but switches it on brightly in the testa of the seed and the flowers are flushed with anthocyanins.
 - The Sudeten riru 40 has hyaline berries but the flowers and leaves are flushed with anthocyanins.



¹ JANCZEWSKI (1909,314)

- The berries of ~~the~~ White Cheryqare without anthocyanins at first, but when exposed to the sun their sides turn pink in the summer (§521), while other whites (such as probably 'Long-Bunched White' riru 63) do not show this bronzing.
- The chimaera berries also remind us that there is not much difference between red and pink currants.



Chimaera berry
'Champagne'

The anthocyanin synthesis is activated again in part of the mesocarp which corresponds to 2 segments of the pentamerous receptacle

These observations suggest that the change from red to pink or to white is simple, modulated and reversible, so is probably polyphyletic.

33– Does the DNA dendrogram confirm that the *vulgare* bushes of every colour are phylogenetically mixed?

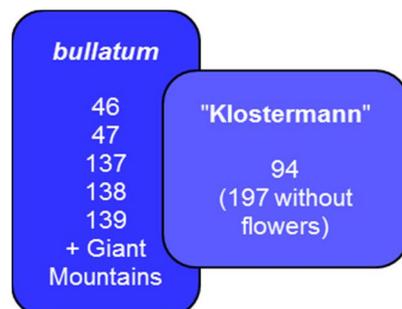
6.6– Cultivars of *R. petraeum bullatum*?

Janczewski only mention ~~the~~ Seedless Redd, as a cultivar of *Ribes petraeum*, which we do not know.

In contrast, the clone 94 from a Sudeten ruin came to us in during the first years of recultivation, a sort of failed *petraeum bullatum*. *Ribes petraeum* is not known in the wild state in the Bohemian Forest, so this clone posed a difficult question, until it finally burst out and showed its qualities as a cultivar. This is the orphan that we have already seen, "Klostermann" (§35). It is not perfect as a representative of *R. petraeum*, it has very few glandular setae on the leaves, ovaries that are almost green, white filamentō but it is the cultivated form that is closest to *Ribes petraeum bullatum* that we know.



The pink style of 'Klostermann', a rare trait, is reminiscent of *R. petraeum bullatum*



And discovered cultivated in the Swiss Alps, in the Pro Specie Rara collection there are some bushes with very red flowers which also merit comparison with *Ribes petraeum bullatum*.²

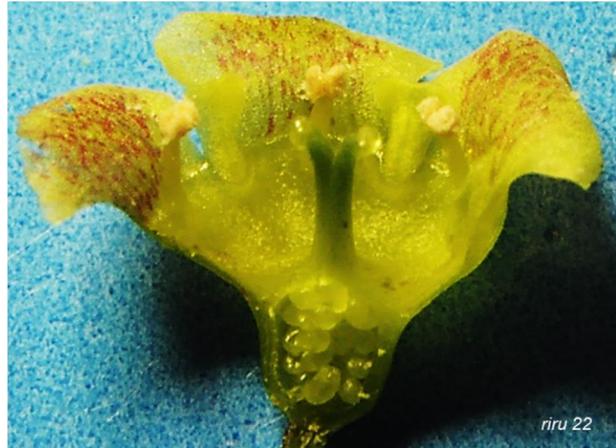
34– Does molecular biology confirm this closeness?

¹ JANCZEWSKI (1907,294) and (1909,318)

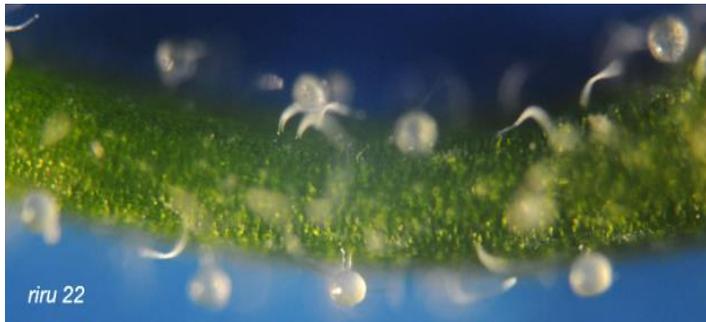
² FREI (2015, footnote in KISSLING 2015)

6.7- Pure *spicatum* cultivars?

Mentioned as cultivars directly derived from *R. spicatum* are 'Raby Castle', 'Scotch' (= 'London Market')² and two other old cultivars from Bunyard's 'Scotch Group'. Only 'London Market' is in the collection (riru 22). But it probably derives from the subsp. *pubescens* which we do not have. On the other hand, half of the tufts on the berries were rounded pentagonal in shape (S38 type), which seems further from the pure *spicatum*, whose tufts were reputed to be orbicular (type S36).³



'London Market', flower pelviform, hypanthium with almost no protuberances, semi-inferior ovary, tall introrse stamens: the classic flower of *R. spicatum*



The extraordinary pilosity and glandulosity of the pedicel of 'London Market' / 'Scotch' suggests ancestry of a pubescent form of *R. spicatum*

35- Does it make sense to compare 'London Market' (22) with the wild *R. spicatum spicatum* (= *scandicum*) plants (riru 153 – 154 – 156)?
From the flower, yes, but from the DNA?

¹ BUNYARD (1920,40)

² BUNYARD (1920,49) . HEDRICK et al. (1925,261)

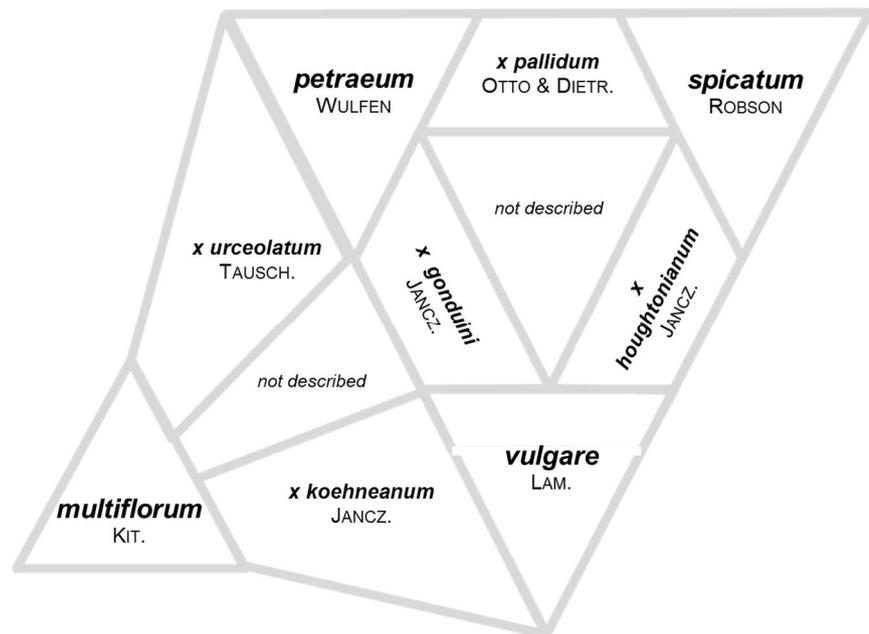
³ We repeat that we have not had any flowers on *spicatum* yet, so let us not judge this sketch too severely

7- Questions on the genetics of the hybrids

7.1- The cultivars of *Ribesia*, a hybrid swarm?

We are getting to the heart of the matter! ~~We~~ We do not know of any hybrid currants that are definitely spontaneous, wrote Janczewski¹. It is not surprising that *Ribes petraeum*, far away from the other two species in the mountains, does not produce any hybrids with them. In contrast, *R. vulgare* and *spicatum* live alongside one another in marshy North Atlantic forests and yet there does not appear to be any hybridisation between them either: that was our impression in a population beside the Baltic Sea, taken as cuttings for examination; and between the lines, this is also the impression of a British field botanist who recommends studying a possible introgressive hybridisation and notes that *spicatum* does not flower much in undergrowth.²

Nevertheless, species of the same section are interfertile, in the sense that they can be hybridised and the resulting hybrid is itself at least partially fertile. So in cultivation almost every imaginable combination between wild taxa has appeared. Janczewski endeavoured to record, describe and locate them between known species.³ This rather daunting set of Latin names can be mapped so for the European taxa. Initially these hybrids were



sometimes described on the basis of a single cultivar, but it is . or it will be useful . to consider them as varied groups of possible hybrids between two species.

7.1.1- How can one tell if a red currant is a hybrid?

Molecular genetics will probably decide this issue. But as we are old hands here, an old timer, it behoves us to remember the old disciplines:

- A- Sometimes the **pedigree** says it all⁴ : the 'Heinemann's Late' is the result of a cross of 'Prince Albert' x *R. multiflorum* cultivar followed by a backcrossing with 'Prince Albert'. As 'Prince Albert' is close to *petraeum*, we may deduce that this new cultivar falls under *R. x urceolatum*. But as Keep noted⁵, "Well-authenticated hybrids of the redcurrant group of species are few".
- B- The status of interspecific hybrid can also be inferred from intermediate morphology. Janczewski was a past master of **morphological induction**. Plus, all classic systematics is induction, a creation of hypothetical models, a wonderful art that continues. But for all that, because 'Houghton Castle' is a textbook example of intermediate morphology between *R. spicatum* and *vulgare*, it has not yet been proved that it is actually a hybrid of it. In order to clarify the state of

¹ JANCZEWSKI (1907,224)

² RICHARDS (2015)

³ JANCZEWSKI (1901), (1904)

⁴ BLATTNY et al. (1971,311) . BSA (2002,20)

⁵ KEEP (1975,215)

knowledge, we use the word **morphohybrid**¹ for a hybrid *presumed by morphological induction*. Most of the named hybrids between red currant species are morphohybrids.

- C– In certain cases, a reduction in the **fertility of the pollen** indicates hybrid status.
- D– **Karyology** has its arguments, which escape us but engender admiration in particular for the magnificent inaugural works of Himmelbaur and Meurman on *Ribes*², where it seems possible to distinguish homologous chromosomes inherited from both parents. Keep commented on this approach which prompted quite a number of studies until the 1960s³. One of the achievements is, for example, that polyploidy is merely an exception in breeding research: so, if the classic hybrids are diploid, should they not be fixed and should be submitted to F2 testing. Why could karyology not be able to continue to clarify the status of hybridisation?
- E– We believe that **Mendelian morphogenetics** can still prove useful. The F2 progeny test with biometric examination of the behaviour of the characters of the presumed parental species remains possible, with the opposite of Mendel's



F2 progeny for testing hybridity of 'Gabreta'

Autumn 2014 sowing, out of 600 plantlets transplanted 350 survived. It takes 4 years for any flowers

intention, like an electric motor that one might use as an alternator: testing the hybridity by recombination of the characters.

- F– We end with a somewhat forgotten argument, **Anderson's morphogenetics**: when two species produce a population of fertile hybrids and these have the opportunity to hybridise between themselves and/or with their parents, the population ends up showing a **correlation of the discriminating characters** of the parents. A correlation due to the linkage of multifactorial traits and reduced by disturbances such as crossing-over. Reciprocally, Anderson held the existence of correlations of traits as a strong argument for the hybridism of the population. This is a generalisation of the Mendelian morphogenetics for graduated traits. A discipline that responded to the model of experimental science:

¹ HEPBURN et al. (1998,340 & 342)

² HIMMELBAUR (1911) cytological embryology . MEURMAN (1928) karyology

³ KEEP (1975,214-215) . see also GOLDSCHMIDT (1964)

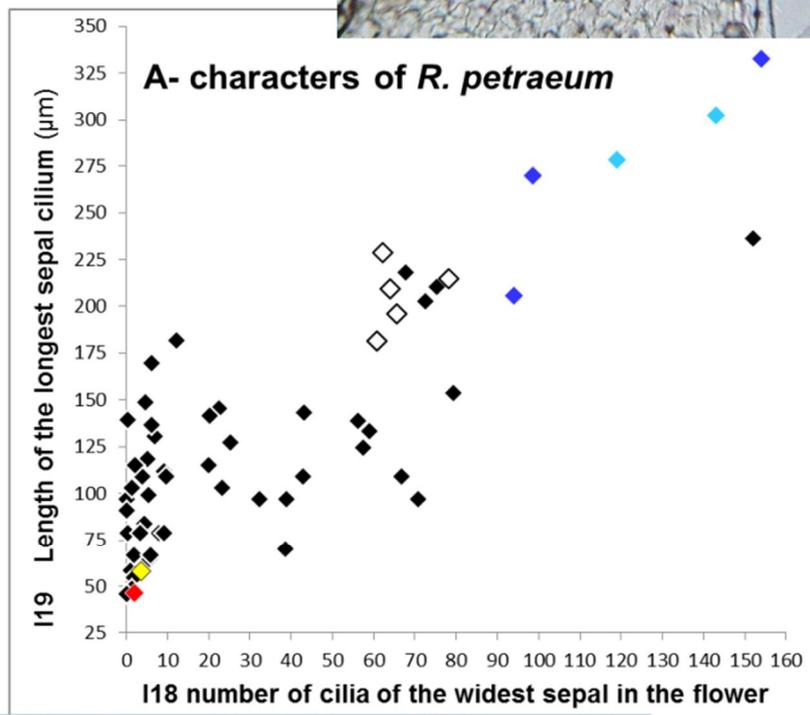
observation of wild populations, constructing hypotheses, calculations of large numbers of theoretical recombinations from the laws of Mendel from before computers existed, testing in the field or in hybrid cultures. This approach gained widespread acceptance in America in the first half of the twentieth century and Anderson's¹ handbook is still for us one of the pearls of morphological biology. His approach lies at the heart of our work.

7.1.2- Anderson's test

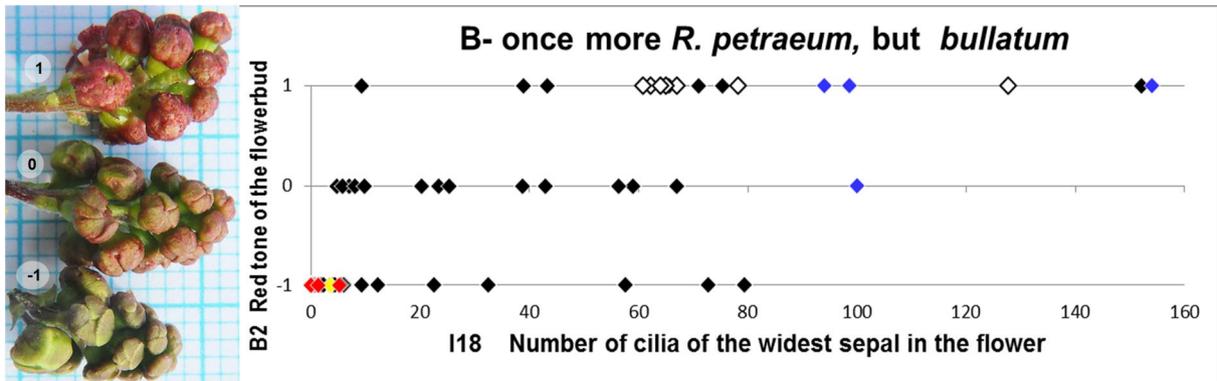
Let us assume that all the *Ribesia* grown for centuries in gardens all over temperate Europe and North America constitute a scattered population of hybrids from different generations, more or less introgressive, between selections from three species (four since the twentieth century). According to the genetics of Anderson one can deduce a morphological test: the differential characters of the species must be (more or less moderately) correlated in this population². Scatter diagrams of the recognised characters for these species compare this model to the global collection.

In the examples A-F, conventional colours are used to represent the wild clones (red = *vulgare*, royal blue = *petraeum bullatum*, light blue = *carpathicum*). For want of wild specimens of *spicatum* in flower we will use 'London Market' for the moment to represent this species, in yellow. Black diamonds represent cultivated clones. Among them as white diamonds is the morphohybrid cultivar 'Gabreta' being described.

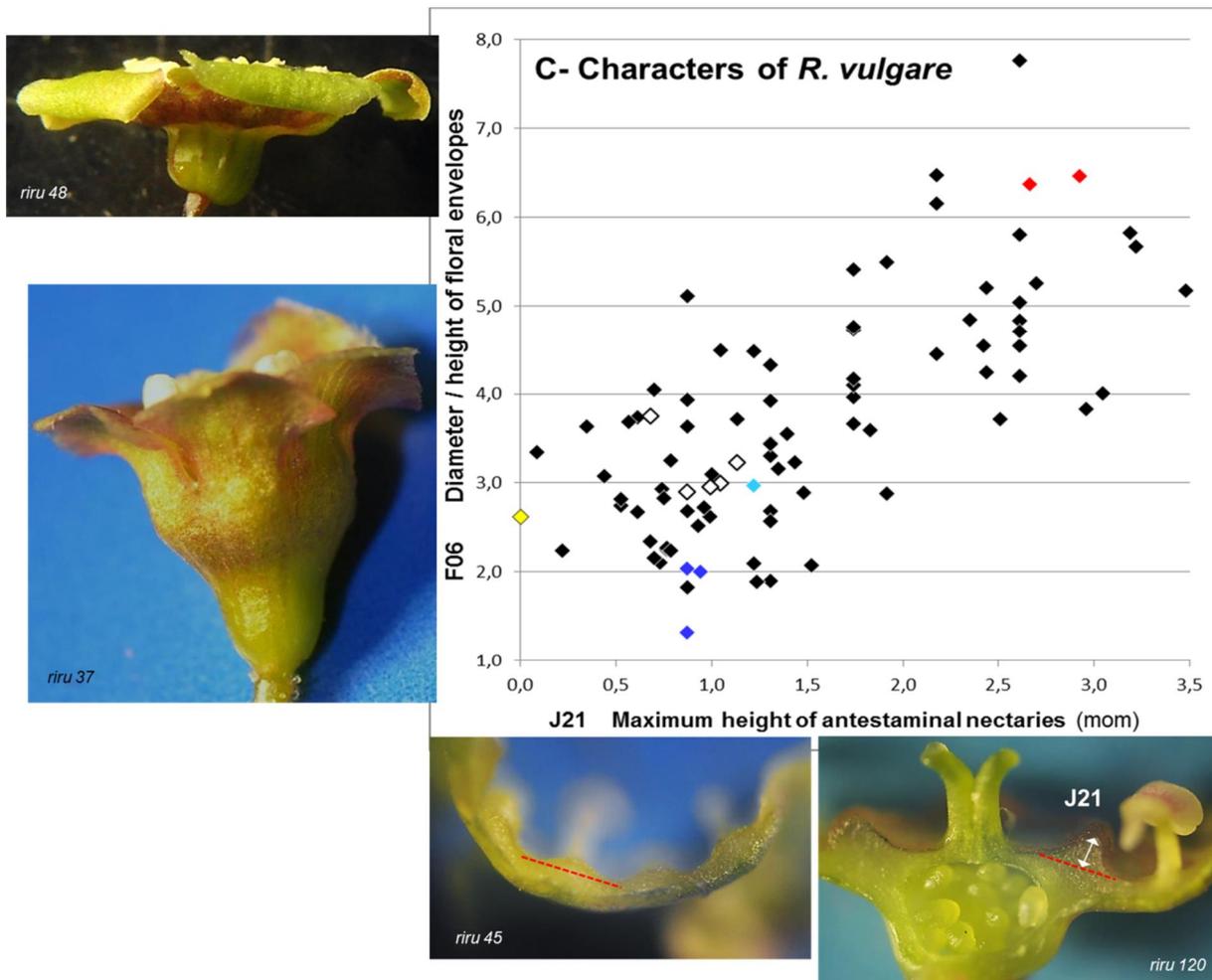
A. The more sepal cilia there are, the longer they are (and verrucose, an I20 character left out here): it is not that surprising as one can imagine that a single group of genes may govern the quantitative and qualitative creation of these cilia. In this case it would not yet be a correlation by linkage but perhaps a simple physiological correlation.



B. On the other hand, between the shade of the anthocyanins of the flower bud and the profusion of sepal cilia, there is clearly no physiological relationship: here there is a presumption of linkage.

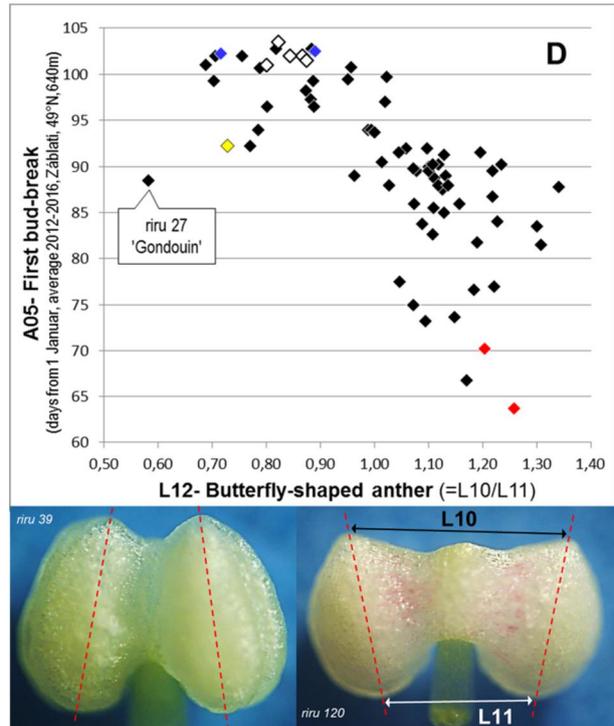


C to F. Similarly, the following eight characters also show correlation in pairs which certainly show nothing in common physiologically: for example, the more butterfly-shaped the anther is, the earlier the bud-break is (D).

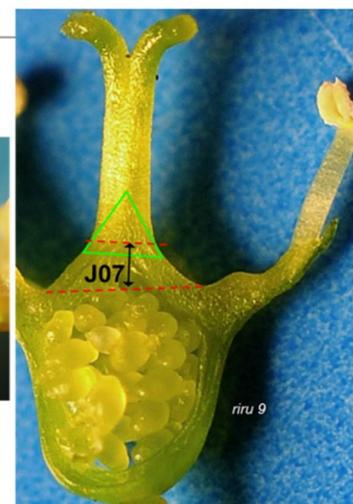
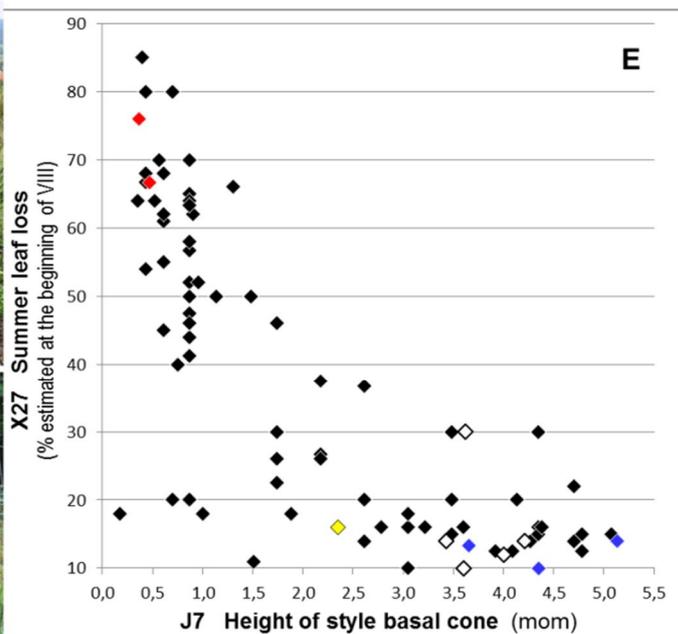


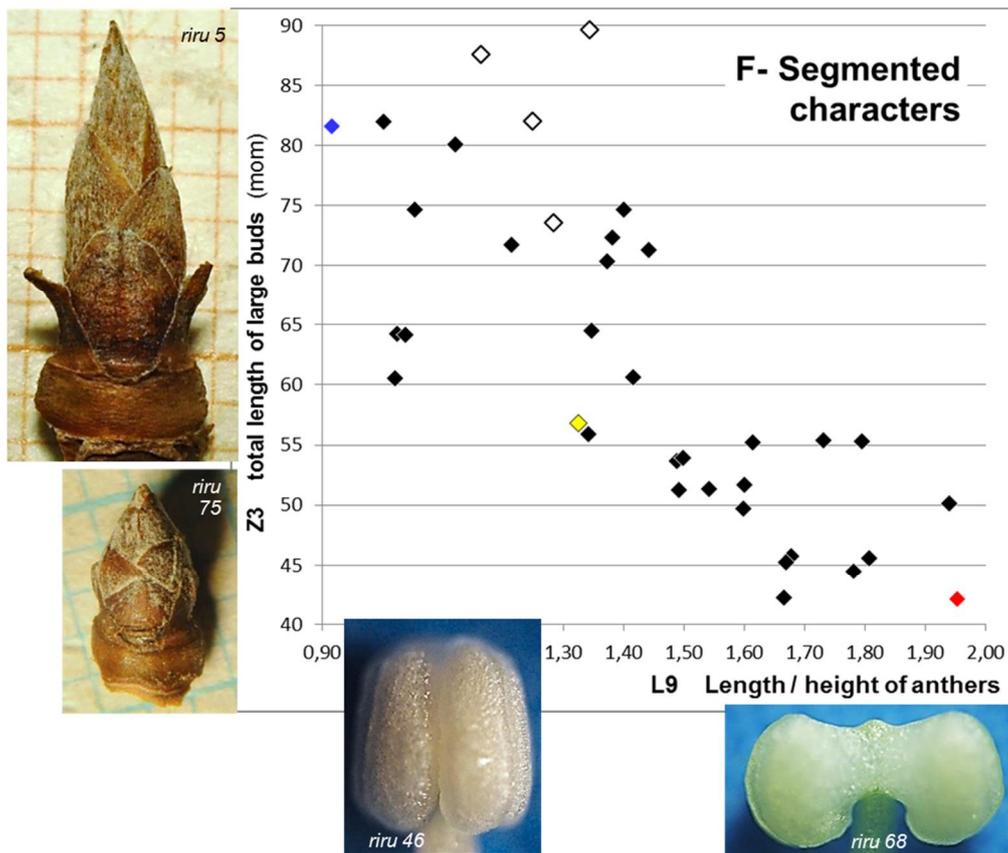
These characters (and others not illustrated) are both graduated between the extremes of the wild species and correlated non-physiologically; moreover, they are classic in the systematics of the group: so the test supports the thesis of a vast hybrid swarm in *Ribesia*.

36-Does molecular biology offer a global test for hybridity of a population?



Leaf loss at 23 September
 - above, total:
 Wild *R. vulgare* bushes
 - below, still low:
 Wild *R. petraeum bullatum*
 and 'Rondom'





Comments:

- The correlation of characters does not prevent some clones from suddenly leaving the herd because of certain characters. 'Gondouin' (diagram D, riru 27) was described as a *petraeum x vulgare* morphohybrid, which would have "inherited more traits from *R. petraeum* than from *vulgare*". The biometrics of the flowers, leaves and berries confirm it. It only deviates curiously in all the forms of *petraeum* by an intermediate earliness that it shares with *vulgare*; the nineteenth century nurserymen were already aware of this, as they called it "Johannisbeere *sehr frühe* hochrote".² We would say that it is **recombinant** by its phenology.
- Moreover, this 'Gondouin' has anther locules that are even more convergent towards the apex than its *petraeum* parent (diagram D). Similarly, a fair number of the 'Gabreta' have very large buds that exceed the average for wild *petraeum* (diagram F); and several cultivars of *vulgare* flower before the wild *vulgare* bushes in our collection. We refer to this eccentric behaviour that is fairly widespread among the cultivars by the expression *more royalist than the king*, without prejudging its biological explanation.

7.2- Specific markers?

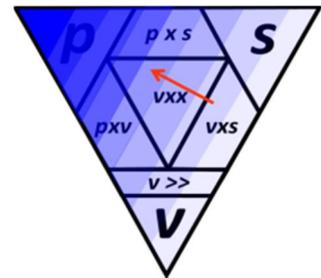
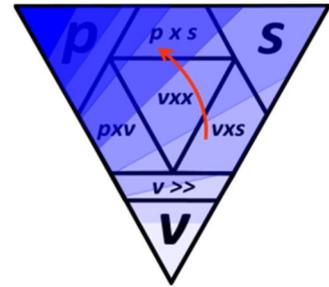
7.2.1- Segmented and bipolar characters

The desire of the pomologist next uses the characters to locate a clone in the swarm and so approach a determination of the cultivar. Of the hundreds of characters considered, only those which are more or less correlated can be of use, since they represent the parental baggage of the hybrid swarm. That leaves only a few dozen. And among these there are two degrees of merit:

¹ JANCZEWSKI (1907,485)

² *ibid.*

- ❖ The most common is the lower one, obviously. These are the **segmented** characters: one species has a minimum value, a second one a maximum value and a third an intermediate value¹. This does not stop the correlation of two of these characters. We have the example of the length of the bud and the proportions of the anther (diagram F): provided that London Market² effectively represents *spicatum*, this species would have intermediate values between *petraeum* and *vulgare* for these two characters. At all events, the phenomenon is common. A character of that kind has little diagnostic value in a hybrid swarm: one does not know how to interpret the intermediate values, they could be inherited from the intermediate species or from the hybridisation of the two extremes. For such characters, the triangular diagram shows a rotating vector field.
- ❖ The ideal would be to find a **bipolar** character, which distinguishes one species from the other two. This is the art of classic systematics for seeking the most exclusive traits, those pearls in the sand. In modern terms, one can speak of *specific markers*. They show as a non-rotational field in the triangular diagram:



- *Ribes vulgare* has the maximum of these extremely useful characteristics, for example the butterfly-shaped anther (D): it is the only one with locules divergent towards the apex, while those of the other two parental species are convergent. The rotate profile of the floral envelopes (=hypanthium + calyx) has the same behaviour (C). The antestaminal nectary in the form of a straight ridge (photo) rather than a callus is also exclusive to *vulgare*.
- *R. petraeum* has them too, but less so. The classic thing is the presence of verrucose cilia at the edge of the sepals (A) and the bracts. The purple red of the flower buds is due to *petraeum bullatum* while *vulgare* and *spicatum* are bronzed (B). But the character does not apply to *carpathicum*.
- *R. spicatum* is the poor relation. The floras describe it negatively: it does not have nectariferous protuberances like the other two, none (or almost none) of the cilia of *petraeum*, its floral profile is termed pelviform, a euphemism for avoiding to say that it is not campanulate like *petraeum*, nor rotate like *vulgare*. It will be the biggest problem in this work and its flowers are eagerly awaited.



"Unicorn horn" of *Ribes vulgare*:
5 straight antestaminal nectariferous ridges

In the *Glass Menagerie*, when the little Murano glass unicorn falls down and its horn breaks off, Laura notes delicately that "Now it is just like all the other horses".³ The psychological metaphor may come down to taxonomy: what looks like a red currant more than another red currant? How can one be sure of a *vulgare* without any straight nectariferous ridges and of *petraeum* without any verrucose cilia? These are their **unicorn horns**. These are the ultimate bipolar characters, which are mostly quantitative: taller/ more elongated/ more spread out. We have here an unmistakable invention for the taxon: of course it may vary, the horn may be longer or shorter, thicker or thinner, ringed or not, but once there is a sketch of a horn we think of a unicorn. In all ignorance, we assume that the chemotaxonomy of secondary metabolites and molecular genetics are a larger area in which to find any such unicorn horns than morphology.

¹ Which obviously did not mean it is a hybrid of the first two! It is simply just how it is.

² taken as a temporary substitute for this sketch!

³ TENNESSEE WILLIAMS (1945) *The Glass Menagerie*, sc.7

7.2.2- Hybrid index

Bipolar characters are the basis of a useful technique. In order to get to know an area, walking is slow but it allows one to see every flower and every pebble, a car is fast but hides the details of the landscape; between the two, there is the bicycle. Between the scatter diagram, which is the walking of the morphotaxonomy of the hybrids, and the factor analysis (and its avatars) which is the car, Anderson had invented a velocipede to which computer adds pedals: the **hybrid index**, interpolation / indexing of measurements of characters between the limits of the presumed parents. These limits are set by the searcher, either as logical limits or as measured averages in a batch of individuals deemed representative of the taxon (here of wild clones): this part of projection of the taxonomist's experience is not in factor analysis, more inferential and objective. Two poles are needed, so segmented characters cannot contribute. Consequently, given the morphological poverty of *spicatum*, one can only use two indexes for the moment:

<i>petraeum / vulgare & spicatum</i>				<i>vulgare / petraeum & spicatum</i>				
B02	scale	red tone of the flowerbud	non- <i>petraeum</i> threshold <i>petraeum</i> pole	-1 1	A05	days	first bud-break non- <i>vulgare</i> threshold <i>vulgare</i> pole	88 69
I18	nb	number of sepal cilia	non- <i>petraeum</i> threshold <i>petraeum</i> pole	0 116	E07	x°	petal claw tilt non- <i>vulgare</i> threshold <i>vulgare</i> pole	23 71
I19	µm	max. length sepal cilium	non- <i>petraeum</i> threshold <i>petraeum</i> pole	51 269	E10	scale	anther dehiscence non- <i>vulgare</i> threshold <i>vulgare</i> pole	0 1
I20	scale	verrucosity of sepal cilia	non- <i>petraeum</i> threshold <i>petraeum</i> pole	0 1	E19	\	calycinal cup relative depth non- <i>vulgare</i> threshold <i>vulgare</i> pole	0,43 0,29
K02	mom	petal length	non- <i>petraeum</i> threshold <i>petraeum</i> pole	7 17	E20	x°	hypanthium aperture non- <i>vulgare</i> threshold <i>vulgare</i> pole	94 190
N15n	nb	number cilia on apical bracts	non- <i>petraeum</i> threshold <i>petraeum</i> pole	1 27	F06	\	floral envelopes relative width non- <i>vulgare</i> threshold <i>vulgare</i> pole	2,6 6,4
U10	%	relative webbing of ribs	non- <i>petraeum</i> threshold <i>petraeum</i> pole	6,3 17,8	J08	\	style conicity non- <i>vulgare</i> threshold <i>vulgare</i> pole	0,25 0,10
Z03	mom	total vegetative bud length	non- <i>petraeum</i> threshold <i>petraeum</i> pole	54 82	J14	x°	ovarian vault angle non- <i>vulgare</i> threshold <i>vulgare</i> pole	113 162
					J21	mom	antestaminal nectary height non- <i>vulgare</i> threshold <i>vulgare</i> pole	0,0 2,8
					L05	\	stamen relative width non- <i>vulgare</i> threshold <i>vulgare</i> pole	0,76 1,51
					L12	\	butterfly-shaped anther non- <i>vulgare</i> threshold <i>vulgare</i> pole	0,78 1,23
					S40b	scale	tuft angulosity non- <i>vulgare</i> threshold <i>vulgare</i> pole	19 76
					U08	%	mean concavity of lobe sides non- <i>vulgare</i> threshold <i>vulgare</i> pole	51% 11%
					W22	\	anterior lobe relative length non- <i>vulgare</i> threshold <i>vulgare</i> pole	0,86 0,65
					X08	nb\cm	serration density non- <i>vulgare</i> threshold <i>vulgare</i> pole	4,0 2,6

**Hybrid index
Central European
*Ribesia***

status IX.2016

But with the so-called % exclusive cilia of *Ribes petraeum*+a fundamental limit emerges: **morphological markers are only valid within a circumscribed geosystematic context**. If we extended the study to Russian red currants, the sepal cilia would not necessarily indicate the genome of *Ribes petraeum*, but they could also be inherited from the *Ribes latifolium* of East Asia.¹ Apart from the bipolar

¹ JANCZEWSKI (1907, 229) . POYARKOVA (1939/1971,186)

characters, the entire biometric interpretation depends on the defined framework! Janczewski, with his usual synthetic intelligence, finds such confusing resemblances between species separated by thousands of miles and calls them *twins*¹: for example, *R. vulgare* is not alone in having such a special pentagonal nectariferous ridge, there is also *R. triste* in North America and in Asia. This is why we have limited this study as far as possible to the cultivars from before *multiflorum* and from a region that has doubtless had few exchanges with Russia. In this context we have specific morphological markers and auxiliary segmented characters to locate a clone in the hybrid swarm; but we have no absolute fingerprints of the species which would be valid for the whole world.

37– A fundamental question: can molecular biology identify absolute markers of species, which would hold by including the entire Eurasian range or is it, like morphological taxonomy, relative to the context of the sample?

7.3– *The Ribes x pallidum gradient*

We interpolate the morphohybrids morphologically between *petraeum bullatum* and *spicatum* (sadly for the moment represented only by 'London Market'). Like the two presumed parent species, they have elongated leaf lobes, introrse stamens that are more or less tall, ovary that is more or less semi-inferior, they never have a straight nectariferous ridge on the hypanthium at the base of the stamens (a key characteristic of *vulgare*) and a majority of the berry tufts are orbicular. The gradient is a question of the degree of extinction of the characters of *petraeum* (nectariferous protuberances in the shape of a fluted cake ring, diagram **f**, cilia on the sepals and bracts, diagram **b**) and of the segmented characters measuring the floral profile: this is less tall in *spicatum* than in *petraeum*.

The colour plot §735 identifies and locates the clones in this morphological gradient (and serves as a key for the scatter diagrams). The list includes the samples taken for DNA, but we do not have measurements for each one, so the scatter diagrams on the following page contain fewer points. Moreover, the DNA is already available for the wild *spicatum* bushes while we still have to be content with the literature and 'London Market' for the characters of the flowers.

7.3.1– 'Prince Albert'

The common approximation of relating it to *R. petraeum* is not bad, but Janczewski understood it as *x pallidum = petraeum bullatum x spicatum*². The biometrics approve it (§411): the sepal cilia are fewer and shorter than in wild *petraeum* and the antepetalous calli on the hypanthium are slightly smaller; these reductions, we have seen (§72), are rightly among the rare diagnostic characters of *R. spicatum*. The bronzing in the colour of the flower buds (B2) confirms it. This cultivar is morphologically the closest to *petraeum* of the morphohybrids with *spicatum*, hence we note **p>**.

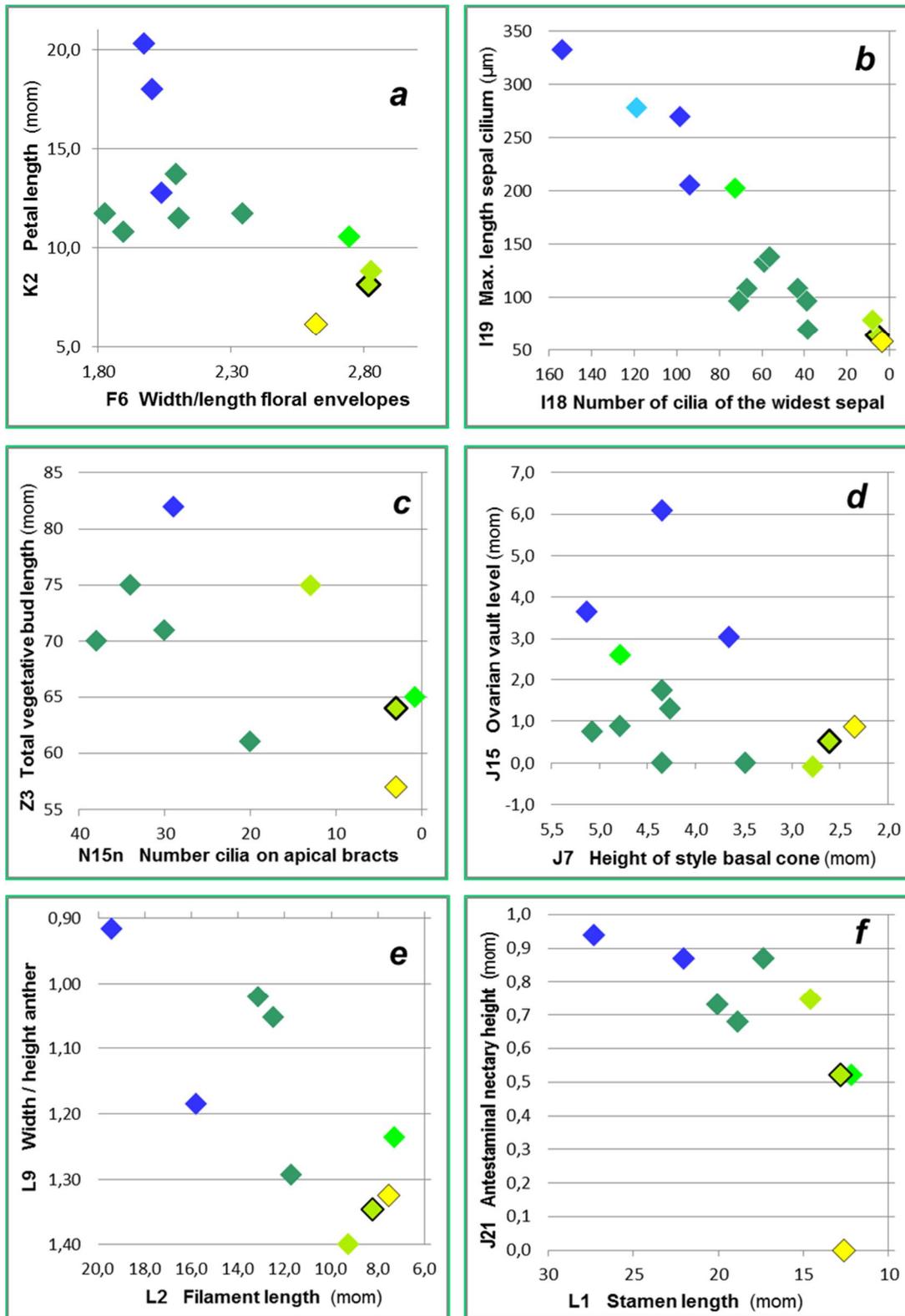
7.3.2– 'Earliest of Fourlands'

Not found in the Bohemian Forest for the moment. It is at the other end of the gradient: the sparseness of its sepal cilia, their briefness (**b**) and their smooth cuticle (l20), as well as the overall profile of the flower (**a d e**) place it in the constellation of *spicatum*. With such specific traits remote from *R. petraeum*, it is remarkable that it should be the result of a spontaneous sowing of 'Prince Albert' as tradition has it³: this very fact would speak for a hybrid status for 'Prince Albert'. From there it is quite some step to relate it directly to *R. spicatum*: the large bud, a significant number of cilia on the superior bracts (**c**) and especially discrete but visible antestaminal calli in cross-section when cutting the hypanthium (**f**) at least represent some introgression of *petraeum* traits. We would therefore say it is ***spicatum >x petraeum bullatum***.

¹ A concept other than *vicariant*, JANCZEWSKI (1907,228)

² Janczewski (1901,298-300) (1904,23-24) (1907,482) . Himmelbauer (1911)

³ BLATTNÝ et al. (1971,352) . BSA (2002,36)



7.3.3- "Pernette" orphan

Almost the same reasoning can be used for this orphan clone from the razed hamlet of Cudrovice / Zuderschlag (diagrams **a-f**). The fact of having specific and important traits in common does not mean there cannot be big differences in other ways: **Pernette** is very different from **Fourlandsq** if only by its



glabrous shiny leaves and the fact that it is extremely easy to grow from cuttings. Its status as a cultivar is uncertain:

- a *PRIOR* argument *against*: the stock plant consisted of two young shoots emerging from a glaciis embankment levelled with a digger, the hamlet having been completely razed, leaving no trace of foundations of the houses, and two *POST*: the small size of the berries and low yield.
- arguments *in favour* of it are the wonderful fruity sweetness of the berries and the delightful vitality of the bush.

Only patience and luck in exploration can relieve us of this uncertainty.

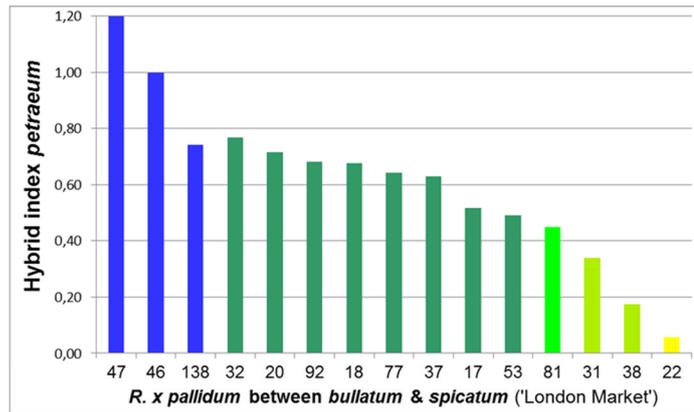
7.3.4- A harsh white orphan

Riru 81 Kamenná Hlava / Steinköpf is very particular. It is exceptional to find near a ruin a flower of *Ribesia* flower so similar to *petraeum* but completely green and giving white berries. One inevitably thinks of a cultivar. But the terribly sour berry, at least two years since the bush has produced fruit, casts its cultivated status into doubt. No confusion is possible with ðuterbog Whiteq also a classic bush close to *petraeum* (§753): it can be distinguished by, among other things, the ten calli on the hypanthium (no ridges) and by very high ovary that rises above the hypanthium (photo). What is striking to a botanist is the heterogeneity of its specific traits: in the diagrams **a-f** it can be seen somewhat all over the place. In assessing this difficult recombination, we classify it arbitrarily in the middle, **pxs**. Probably not of any arboricultural interest, it will nevertheless be fascinating for the taxonomy.



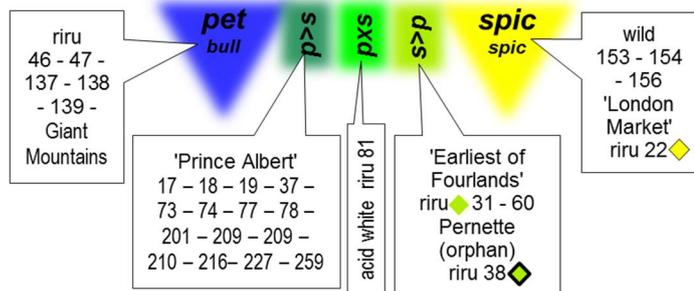
7.3.5- Summary of the gradient *x pallidum*

Having walked up this gradient in detail and intuitively by walking the scatter diagrams, if we straddle the bicycle of the *petraeum* hybrid index, we come to the same conclusions. In particular, riru 81, so difficult to appreciate if one looks in detail at the heterogeneity of its recombinations, effectively drops halfway down the scale!



38- Does the DNA confirm the absence of the genome of *R. vulgare* in this altogether?

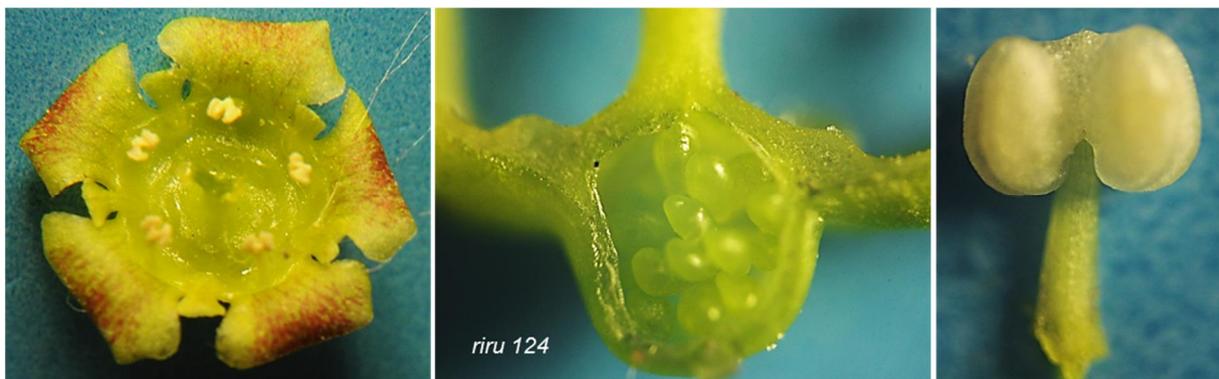
39- And does it confirm this grading of the morphohybrid cultivars between the presumed parents *petraeum bullatum* and *spicatum*?



7.4- The *Ribes x houghtonianum* complex

We started with a simple gradient to define, where the traits of *vulgare* are almost nil. We continue simply, taking all the forms in which the sepal and bract cilia of *petraeum* are absent, the flower bud is bronze and not purple and the buds are quite small. It is the morphohybrid gradient between *spicatum* and *vulgare*, which Janczewski called *R. x houghtonianum* on the basis of his observation of the cultivar \pm Houghton Castleq

7.4.1- 'Houghton Castle'



'Houghton Castle': Slightly hollow rotate flower flushed with reddish-brown, nectariferous ring low and sometimes not going back down into the furrow around the style (so a disc, on the right on the section), semi-long and semi-wide introrse stamens, neither butterfly nor convergent at the top, ovary vault cone-shaped, low and wide: a perfect intermediate

This has been one of the celebrities of the red currant systematics ever since the great Janczewski took it to be a type of a new hybrid taxon *x houghtonianum*¹, a collection piece and a parent still sought for breeding. Not found in the Bohemian Forest yet. Even if our two reference clones are somewhat different, their flower has the same mix of traits of *vulgare* and *spicatum*, which is a textbook case of morphohybridism.

¹ Janczewski (1901,296) & (1904,23) . look at §523 again

7.4.2- 'Jonkheer van Tets'

Between 1860 and 1880 'Fayq was selected as a hybrid, 'Cherry' x 'Victoria' (=Wilson's Long Bunch).¹ These two parents were recognised as *vulgare* by Bunyard², and we trust him. 'Fayq is therefore *vulgare*. Around 1930-1940 'Jonkheer van Tets' was obtained by crossing 'Fayq x London Market'. As the latter is very close to *spicatum* (§67), 'Jonkheer' falls under *R. x houghtonianum*. The pelviform flowers speckled with reddish-brown, a certain degree of resistance to summer leaf loss, remarkable health and huge growth habit unthinkable for an *R. vulgare* confirm it.

7.4.3- 'Witte Parel'?

Here is the problem of reference again (§423): PSR has two identical and very distinctive white currants, so they are easy to recognise, our clones 24 and 121, under two names "Weisse aus Jüterbog" (it is not that, see §753) and 'Witte Parel'. It could be the latter, if one compares the brief description in the German gene bank⁴, so we are keeping this name provisionally. Its nice little white berries are unmistakable and have a high proportion of orbicular tufts. It is always among the last to retain its foliage in autumn. These are traits of the *spicatum-petraeum* pair.



Witte Parel? Leaves flushed with bronze for a long time in spring

7.4.4- One of the many "White Versailles"



Half of the tufts are orbicular:
it cannot be *vulgare*

Clone 26, which Pro Specie Rara received under this name (the problem of reference once again), is exceptionally vigorous and retains its leaves until autumn: this is unheard of for a cultivar traditionally identified as being related to *Ribes vulgare*⁵. The pelviform floral profile and introrse stamen in the almost total absence of cilia links this unidentified bush to *x houghtonianum*.

We can report finding a **red orphan from Sruby / Heuhof** (riru 103) in the plains region of Domašice, whose morphological assessment puts it under *x houghtonianum*: a stronger and healthier bush than the standard of *vulgare*.

¹ BLATTNÝ & al. (1971,307)

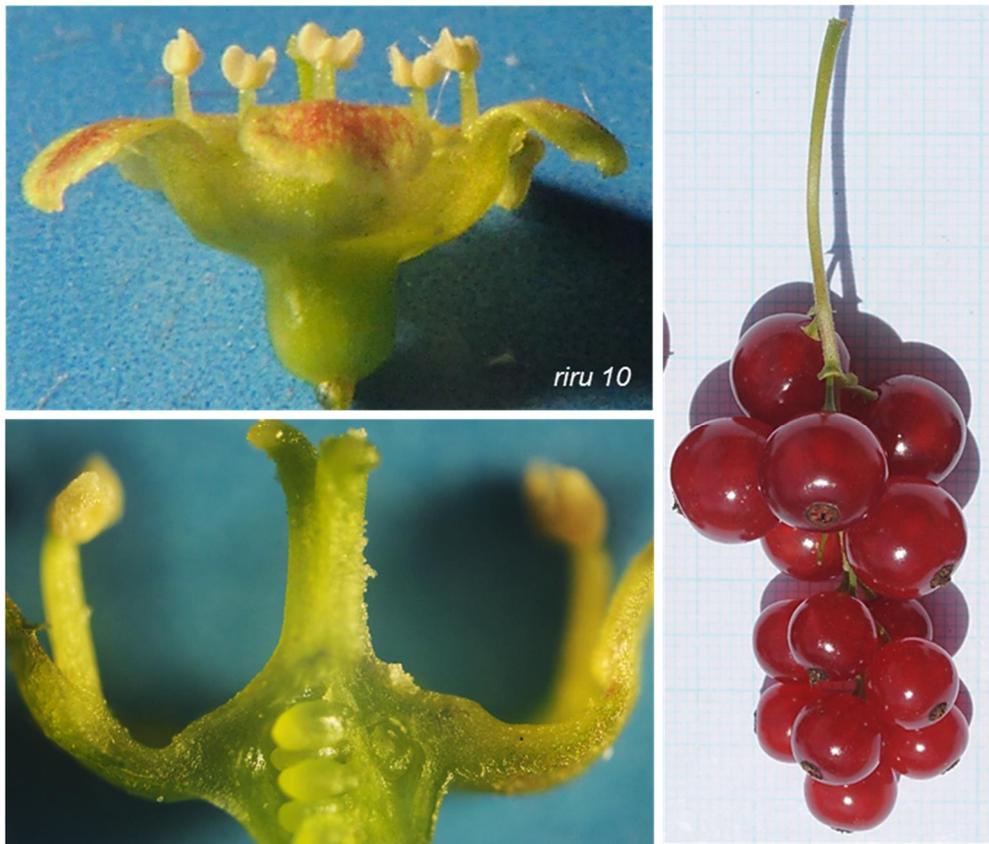
² BUNYARD (1920,43 & 53)

³ If one is to believe Blatný et al. (1971,324). But the German directory mentions only a 'Fayq seedling

⁴ BSA (2002,51)

⁵ Yes, it's fantastic, but it is definitely NOT Blanc de Versailles! (MARTIN FREI 2014, private communication): we agree! Its strength and productivity even suggest that it is a modern selection

7.4.5–The orphan Jitka



From some Sudeten rubble at 750m above sea level near Záblatí / Sablat, this bush is very different from Houghton Castle but its flower is almost identical. Let us say again, the flower is the deciding factor in working out the natural ascendance. The situation of the stock plant at the bottom of a little wall among other garden plants and close to a well indicated a cultivated status. The laborious recultivation resulted in a very vigorous and fairly productive bush, although its berries are not very large, so it does seem that it is a cultivar. The *x houghtonianum* group is rare in the Bohemian Forest: the very rarity of this combination of traits, found in a remote site more than one km from a village, confirms that it is a cultivar.

7.4.6– Two white orphans

The white currants from the Sudeten ruins are favourably considered: they are easily judged to be a cultivar because white seedlings are rare. However, our search in the Bohemian Forest poses a problem: the diversity of white currants continues to increase, and we already have at least eight botanically different types, still orphans, which is unlikely so unsettling. For now, it is about distinguishing them and continuing to search identical ones (see the fortunate case of one §762). It is not just any challenge: for now, most of the known old white cultivars have descended from *vulgare*, apart from the well-known Muterbog White (§753); so any non-*vulgare* white is potentially interesting.

Still calculating from this gradient, an unknown clone from the Bohemian Forest, which has not yet borne any berries, but its flower is definitely *x houghtonianum*, with one exception for this group: the **anthers are marked with pink** (riru 167, see photo).

Finally, we add **ĪPink DutchĪ** (§412) to this group again. This is somewhat bold at this provisional stage in our biometric measurements, perhaps it is incorrect.



riru 88



From Cudrovice / Zuderschlag

Ovarian vault rises high in the hypanthium and tufts are often orbicular: 2 traits that are foreign to *R. vulgare*



From Křišťanov / Christianberg

Anthers folded towards the floral axis during dehiscence (**introrse**), another trait that is foreign to *R. vulgare*

The **opalescent berry** (a rare trait) signals another cultivar than riru 88
Berries still tiny: it is too soon after only two years of recultivation to assess the fruiting qualities



riru 170



riru 167

...and again

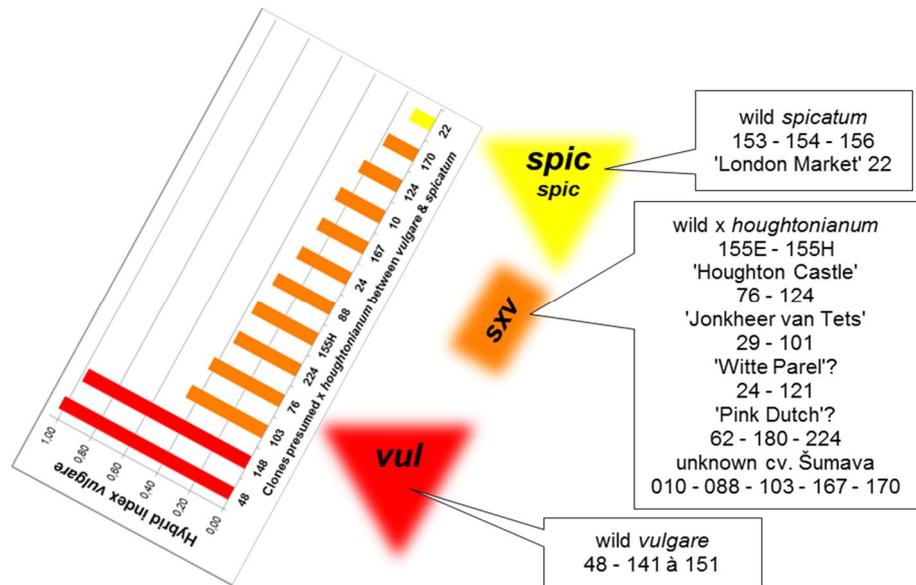
The unknown one with pink anthers

From Křišťanov / Christianberg

7.4.7- Summary of the complex *x houghtonianum*

40- Does the DNA confirm the absence of the genome of *R. petraeum* in all this?

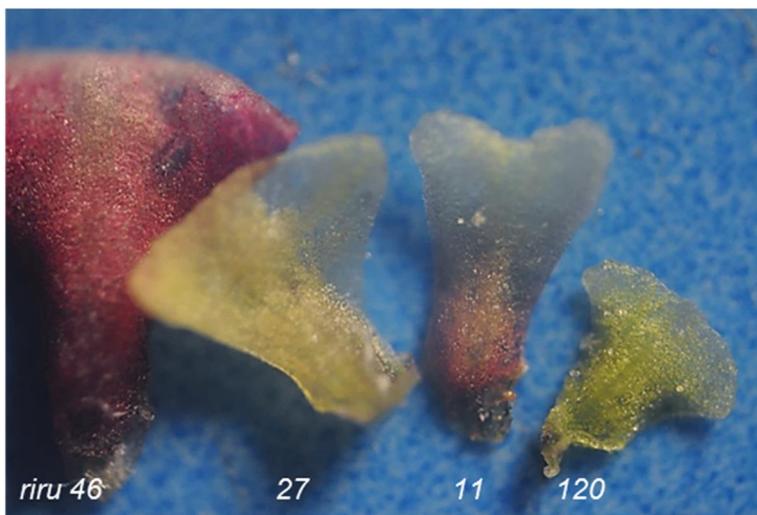
41- Does it confirm a combination of *spicatum* and *vulgare* in these different cultivars, especially in the classic cultivars 'Houghton Castle' and 'Jonkheer'?



7.5- The *Ribes x gondouini* gradient

We define so all the morphohybrids which only involve *R. petraeum bullatum* and *vulgare* by: pelviform flowers more or less flushed with red, abundance of cilia, elongated introrse stamens, semi-inferior ovary and well-developed antestaminal nectariferous ridges alternating with large antepetalous calli to form in the bowl of the hypanthium a sort of children's merry-go-round. It is like a nectariferous ring of *vulgare* but lower and lies up against the wall of the hypanthium (§752, photo Gabreta). Unlike the two preceding gradients, it is not possible to definitively rule out the participation of the third parent *R. spicatum*, since this species does not (yet) have positive original traits to establish a hybrid index. We must suppose that when total number of the traits of *petraeum* and *vulgare* is quite high, there is no room for a third parent.

7.5.1- 'Gondouin Rouge', morphohybrid / true hybrid?



Petals of *petraeum bullatum* - 'Gondouin' - 'Gabreta' - *vulgare* 'Red Versailles'

Selected in about 1830 by Monsieur Gondouin, a nurseryman near Paris, this cultivar is the second celebrity cultivated red currant. It was a parent to later hybrids, but it also served above all as a type for Janczewski in defining the morphohybrid *R. x gondouini* = *petraeum bullatum* x *vulgare*¹. He considered it more similar to *petraeum* than *vulgare*. The biometrics we practise here concur, and we take note of ***petraeum* > *vulgare***. Was it then already a backcross with *petraeum*? We cannot tell, its ancestry is unknown.

¹ JANCZEWSKI (1901,298) (1904,23) (1907,484)

This will be one of the examples of hybrids to be studied. In fact, nurserymen at the end of the nineteenth century prided themselves that it was able to reproduce itself faithfully from seedlings. No doubt they did not consider this cultivar a hybrid, before Janczewski; and the laws of Mendel were still unknown. As polyploidy is not known among the classics, it is probably not a fixed hybrid and it merits a progeny test.

Gondouin Rouge "Drawn by Miss Frances Bunyard" in BUNYARD (1920,46). She probably saw, sharp as she was (or else was she drawing in front of a series of windows? – whichever, it was not mentioned by either her brother or by Janczewski) that the berry is slightly furrowed along the meridian ribs like a hot air balloon; and this trait, which can be found in 'Prince Albert and some of the wild ones, could well be a trait of *R. petraeum*.

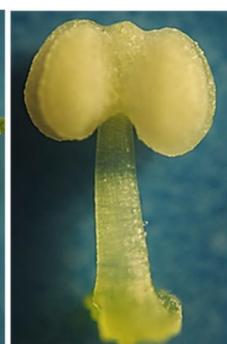


Ah, sisters in the shadow of their brothers!

Upstream from *Gondouin* on the *petraeum* side, there is only "Klostermann" (§66). Downstream on the *vulgare* side, at first there is the extremely strange recombinant riru 14, an enigma that we will leave out here, and then in particular the dominant forgotten cultivar of our region:

7.5.2- 'Gabreta'¹

We already have 50 clones and have addressed the question of homogeneity (§542). The very red and only slightly revolute sepals, the tall introrse stamens, the cone at the base of the style, the deep red and acidity of the berries, the reddish-brown marcescent epidermis of the annual shoots in the autumn, the large vegetative buds and the lateness are strongly reminiscent of *R. petraeum bullatum* and one might be tempted to place it close to this species, like *Gondouin*. But the lower floral profile, the rather spectacular straight antestaminal nectariferous ridges, while they are fewer in *Gondouin* the absence of cilia in the superior bracts and the rounded shape of the leaf recall *vulgare*. The intuitive assessment is certainly closer to *petraeum* than to *vulgare*, but less so than for *Gondouin*.



'Juterbog White' First reaction: "It looks like a green 'Gabreta' flower!"
The main difference is the number of sepal cilia, about twice as few

7.5.3- 'Juterbog White'

The only old non-*vulgare* white currant mentioned in the pomologies: a classic!

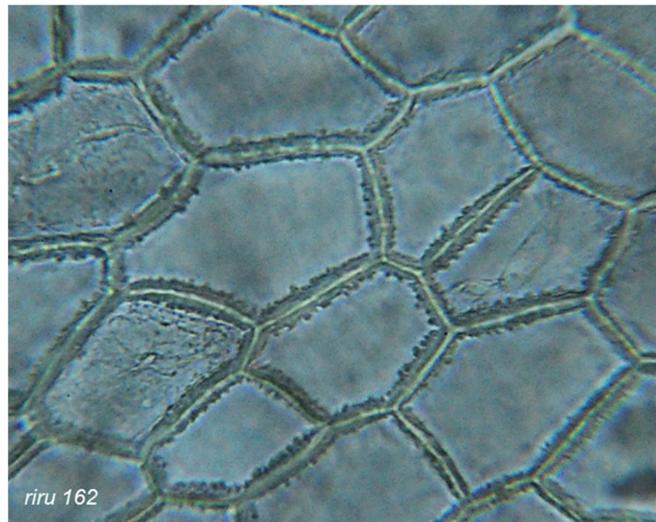
¹ Kissling P.& J. (2015)

7.5.4- Unknown white currants from the Bohemian Forest

Two clones (riru 162, 175) from Kamenná Hlava / Steinköpf fall into this group. Their recultivation and their biometry are in progress and do not guarantee a full diagnosis. Like *muterbog White* they have 20-30 cilia per sepal, but they do not get confused with this cultivar.

Unknown white

Cell walls of the epidermis of the berry are covered in close diverticula as in 'Gabreta'



riru 162

7.5.5- A "White Dutch"



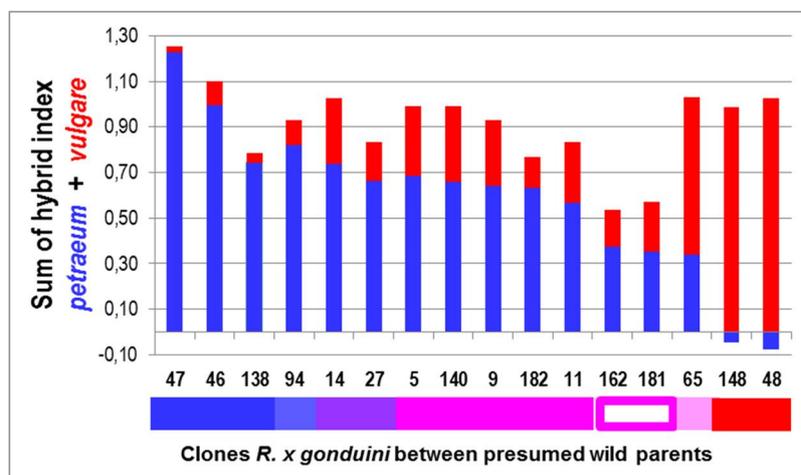
riru 65

The *problem of the reference* has been discussed (§423). One of the various clones labelled *White Dutch* (riru 65) has a fairly typical rotate flower, well-angulated pentagonal berry tufts and a weak habit similar to *R. vulgare*. On the other hand, it has on average 12 quite long cilia per sepal and numerous cilia in the upper bracts. This recombination, at first shocking, is at least of interest in filling in the taxonomic space: the traits of *vulgare* are clearly evident and those of *petraeum* are also very strong, the combination of the two in hybrid indexes is very high. In theory we admit that it is a *vulgare* x *petraeum* morphohybrid.

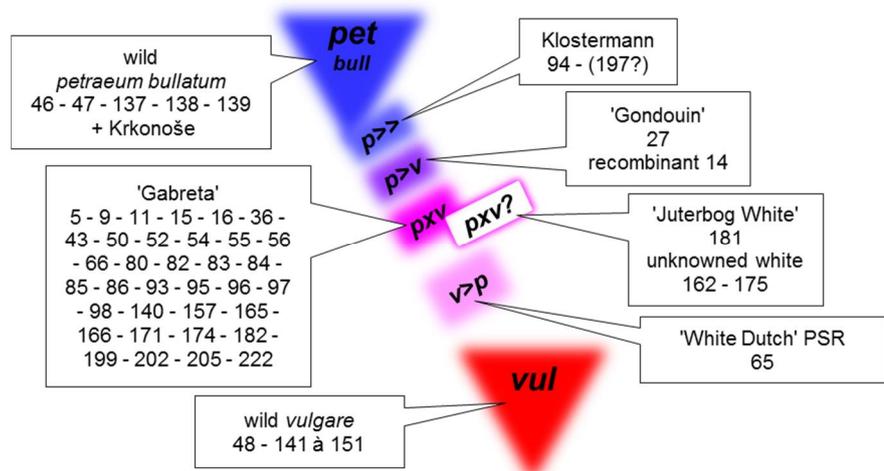
Sepal cilia not very verrucose but measuring nearly 200 µm

7.5.6- Summary of gradient x *gonduini*

If one looks at the two indexes together, the most obvious of the *R. x gonduini* (clones 14 à 181, violet and purple) they appear closer to *petraeum* than *vulgare*. But something else becomes clear: the two whites (162 and 181) have the two weakest indexes, the total scarcely exceeding 50%, while the other ones fill the taxonomic space. Here we would say, in the language of the amateur, that there is enough room for a third taxonomic player, the morphology of which does not yet have a marker; in other words, these could be trispecific hybrids.



We summarise the morphological gradation (*pet* $p \gg p > v$ pxv $v > p$ *vul*) in the diagram opposite.



42- Is the DNA mixed *petraeum-vulgare* in the *x gondouini* group (violet-pink)?

43- Is the genome of *spicatum* in effect absent?

44- Do the three whites ($pxv?$ 162-175-181) have part of the genome of *spicatum*?

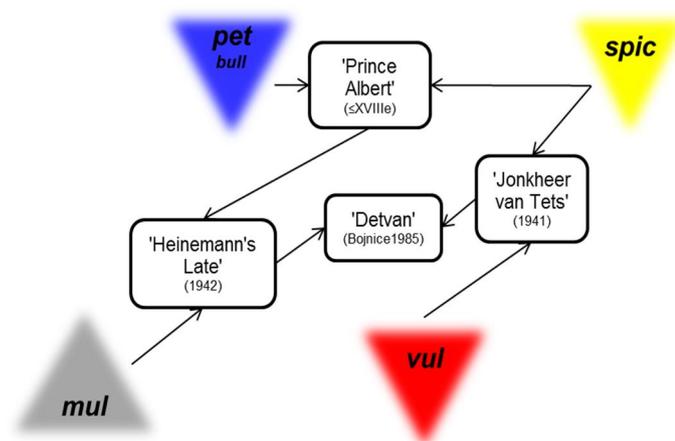
45- Is the fine gradation $pe \rightarrow vul$ among them confirmed genetically?

7.6- Trispecific hybrids?

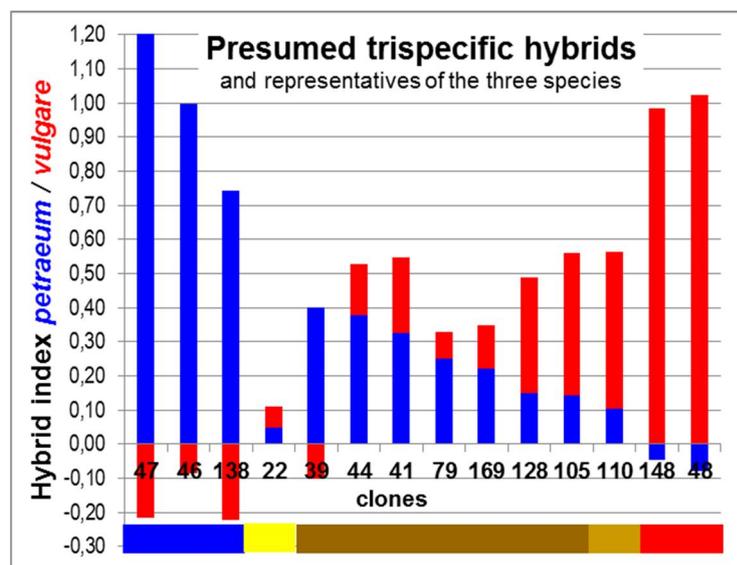
One certainty: they do exist. In this known extract from the genealogical tree, *Heinemannq* is trispecific and *Detvan* quadrispecific!

The most complicated Sudeten red currant hybrids can historically only be trispecific.

How to detect them? Morphological induction remains weak because there are no markers for *R. spicatum*. These markers must be found and in the mean time we will make do with two empirical approaches:



A. The argument of the *empty taxonomic space* (§756): if the traits of *petraeum* and those of *vulgare*



are all somewhat incomplete one may presume that the third culprit *spicatum* with negative traits forms part of the genome. In this cumulative bar diagram, the *petraeum* and *vulgare* clones (blue and red) have strong indexes, *spicatum* (clone 22, yellow) almost none nor any *petraeum* or *vulgare* (to repeat it has no positive *spicatum* index), and those in the middle (39 to 110, brown shades) have low total scores, one may suppose that they have a third non-measurable *spicatum* component.

B. *Encirclement*: just as someone mowing with a big machine first cuts around the meadow then towards the centre, we went all round the easy lot, the species, then the bispecific morphohybrids. From this peripheral band we can look further inwards: "Radost" for example is understood to be from € Gabretaq

We imagine that this will be a heterogeneous group. We will omit here the clones 39 and 41, already discussed as satellites of € Gabretaq(§542) and which present a mass of enigmas in themselves. A taxonomist needs encouraging results, not just problems.

7.6.1- The orphan "Radost"

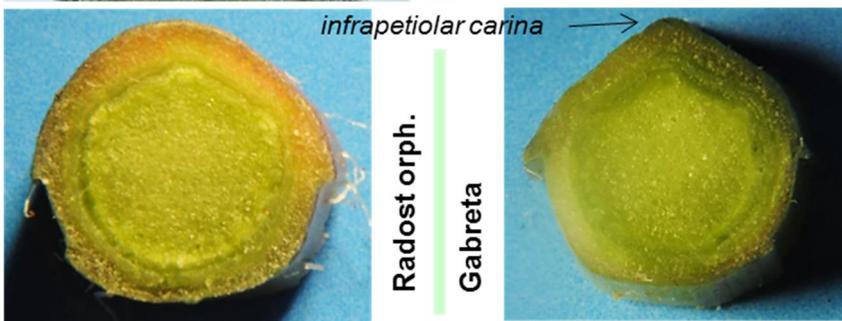
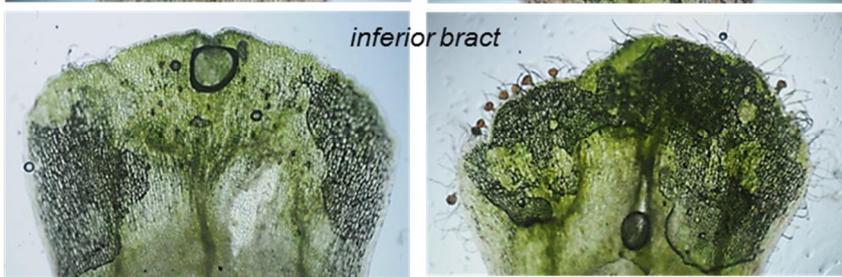
From a distance it looks like an exuberant € Gabretaq covered profusely in brighter berries. A charming bush, hence half of its Czech name, the other half coming from the place known as Na Radosti¹ in Vimperk, the mother-station of this currently orphan clone. Several traits differentiate it from 'Gabreta' (the table contains the main ones) while their floral and foliar architecture (dozens of characters) is almost identical. The quantitative and qualitative reduction of the cilia on the sepals and bracts and the rusty-bronze tone of the calyx (see photos) can be interpreted as a reduction of the characters of *petraeum*. And since the *vulgare* part is weak in the index, one may infer that this reduction does not only come from *vulgare*, but also from the genetic participation of *spicatum*.

			44	5	9	11	140	182
sp.	name	taxon	vxx	pxv	pxv	pxv	pxv	pxv
cv	name	cultivar	Radost orph	Gabreta	Gabreta+	Gabreta	Gabreta	Gabreta
li	name	stock	Na Radosti	Záblatí	Blanice	Milešice S	Korytarův	Lebedův
B02	scale	red tone of the flowerbud	0	1	1	1	1	1
G03	scale	red under hypanthium	4,8	6,0	7,0	5,5	7,2	7,2
G04	scale	red on sepals	5,8	8,0	7,8	7,6	7,6	7,6
I18	nb	number of sepal cilia	20	62	64	61	66	78
I19	µm	max length sepal cilium	142	229	209	182	196	215
I20	scale	sepal cilia verrucosity	0,5	1,0	1,0	1,0	1,0	1,0
N03n	scale	inferior pedicels pilosity	1,0	4,0	5,0	4,8	5,7	5,3
N14n	nb	number of cilia of inferior bract	1	86	94	83	118	25
P09	nb	number of glands first bract	0	21	14	6	35	.
P14	µm	length of cilia first bract	145	292	282	264	307	.
Q08	x°	infrapetiolar carina	150	107	98	109	.	.
R22	%	apical bracteoles frequency	11%	36%	22%	28%	48%	45%
S06	scale	medium berry red	7,5	9,5	9,0	9,5	9,5	9,5
S17c	µm	?leucoplasts diameter	2,0	1,4	1,3	1,6	1,6	1,2

46- Can the DNA indicate trispecific hybridity in the orphan "Radost"?

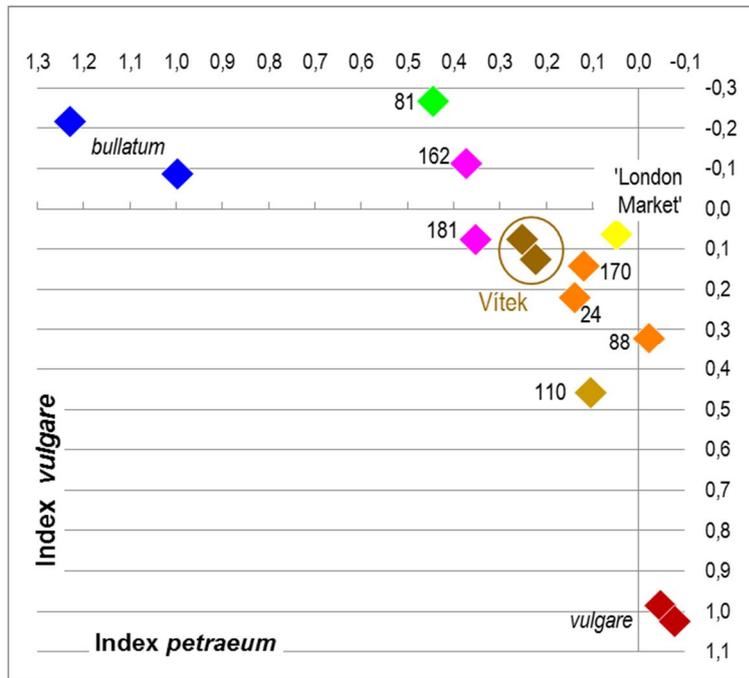
47- Does it also indicate that it is closer to *petraeum* than to *vulgare*?

¹ Radost = joy, in Czech. In 2016 it was less than joyful: the ripening of the berries, as beautiful, colourful and abundant as usual, adopted some sort of perversity and under good conditions remained sour until September; it remains a mystery to us.



7.6.2- 'Vitek'

There are some varieties that can be recognised from a distance at once, like Fernandel and Jack Nicholson: Gondouin, Prince Albert, Gabreta, Others require years of familiarisation and accurate observation for their morphological identity to become imprinted in our minds: such is the case for this

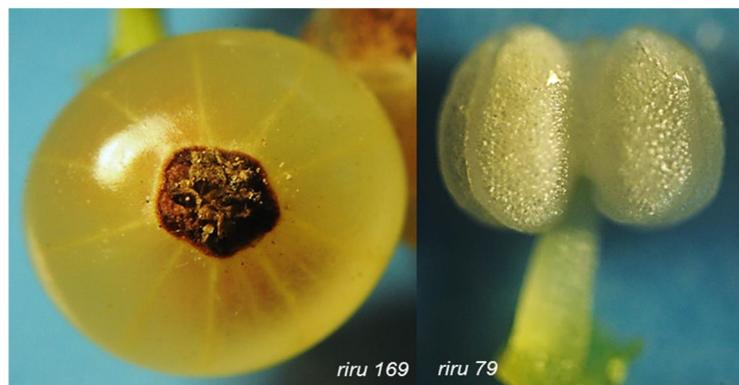


Apart from the representatives of the three pure species (red, yellow and blue), all the dots are **non-vulgare white currants**. Green, pink and orange were discussed as dihybrids. The supposed trispecific hybrids are shown in brown.

white currant from the Bohemian Forest, still unknown in the pomologies. It took years to establish that two of our orphans were not that and were in fact an identical pair: the clones 79 from Kamenná Hlava / Steinköpfel and 169 from Kizanov / Christianberg, thirty kilometres from the other one. This should have been fine, but their resemblance is still really too intellectual for us to dare to believe it!

Clearly a long way from *petraeum* and *vulgare* by all the discriminating traits of these species, one would have to imagine a strong participation of *spicatum* (yellow in the diagram). A few sepal cilia not too short and fairly verrucose still do not rule out the involvement of *petraeum* in this recombination.

The extract from the table of measurements of the varying characters in this group shows that some important characters at least distinguish 'Vitek' from all the others. In brief, to its left, 'Luterbog' 162 and 81 have a more elongated profile (more campanulate envelopes and higher ovary), more numerous and longer cilia on the sepals, more orbicular and fewer pentagonal tufts on the berries, all characters tending further away from *vulgare* and closer to *petraeum* (which the indexes in the diagram summarise). To its right the *x houghtonianum* and the 110 (from Domašice/Taus region) have a more butterfly-shaped anther (L12) and the ovary is not as tall in relation to the hypanthium (J15); two tendencies towards *vulgare*.



The blunt pentagonal tuft and intermediate stamen: these forms which say neither yes nor no, the silent majority of *Ribesia* hybrids

The most spectacular thing about **Vitek**, is its shoots in spring, as red as those of Gondouin, a rare trait

car.	Spig	riru:	162 ¹⁶²	175 ¹⁷⁵	181 ¹⁸¹	168 ¹⁶⁸	81 ⁸¹	79 ⁷⁹	169 ¹⁶⁹	24 ²⁴	88 ⁸⁸	170 ¹⁷⁰	110 ¹¹⁰
sp.	name	taxon	pxv	pxv	pxv	ps	pxs	vxx	vxx	svv	svv	svv	v>
cv	name	cultivar	cv	cv	Juterbog	cv	cv	Vitek	Vitek	Witte Parel?	cv	cv	cv
il	name	stock / provenance	Kamenná Hlava	Kapradnik 3	Wurzen (D)	Křišťanov W	7 mai	Lipová Hlava	Bílý z Křišťanova	PSR	Hus NE	Křišťanov-jh	Mysliv S2
E06	x	sepal recurvation angle	100 0	.	195 0	.	90 0	180 0	185 0	180 0	180 10	90 0	170 0
E18	mom	calyx cup height	14,3 0,0	.	13,8 0,0	.	11,7 0,0	11,3 0,0	10,7 0,0	13,8 0,0	13,2 0,4	12,1 0,0	11,3 0,0
F05		flower relative width	2,05 0,00	.	1,95 0,00	.	1,94 0,00	2,35 0,00	2,30 0,00	1,52 0,00	2,15 0,00	2,17 0,00	2,16 0,00
F06		flower envelope relative width	2,93 0,00	.	3,31 0,00	.	2,74 0,00	4,05 0,00	3,63 0,00	2,24 0,00	3,10 0,00	3,35 0,00	2,88 0,00
H16	nb	sepal rib number	11,0 0,0	.	14,0 0,0	.	12,0 0,0	12,0 0,0	12,0 0,0	16,0 0,0	15,0 0,0	14,0 0,0	17,0 0,0
H18	nb	sepal cilia number	22,5 2,0	30,0 0,0	32,5 11,5	2,5 0,5	72,7 12,2	5,4 2,9	3,5 3,5	2,3 2,4	0,0 0,0	0,5 0,5	6,2 1,4
H19	um	max length sepal cilium	145 0	.	97 0	.	203 3	99 19	79 0	115 0	.	79 0	169 0
I20	scale	sepal cilia verrucosity	1,0	.	1,0	.	1,0	1,0	1,0	0,0	.	0,5	0,0
J07	mom	height of style basal cone	4,4 0,0	.	4,4 0,0	.	4,8 0,0	3,5 0,0	3,5 0,0	3,0 0,0	2,2 0,0	1,7 0,0	0,9 0,0
J10	mom	ovarian vault height	6,1 0,0	.	7,8 0,0	.	6,1 0,0	4,4 0,0	5,2 0,0	5,2 0,0	3,5 0,0	3,5 0,0	2,2 0,0
J15	mom	ovarian vault level	2,6 0,0	.	2,2 0,0	.	2,6 0,9	1,5 0,0	1,3 0,0	0,9 0,0	0,6 0,0	0,4 0,4	-0,9 0,0
J17	scale	nectary pattern	4	6	4	3	3	4	4	.	6	6	6
J20	scale	antestaminal nectary?	2,0 0,0	2,0 0,0	2,0 0,0	1,0 0,0	0,8 0,3	2,0 0,0	2,0 0,0	0,2 0,2	2,0 0,0	0,8 0,3	2,0 0,0
K02	mom	petal length	9,3 0,4	10,4 0,0	13,2 0,6	.	10,6 0,4	9,9 0,6	9,2 0,5	8,3 0,9	6,5 0,7	8,2 0,6	7,6 0,9
K03		petal relative height	0,79	.	1,06	.	0,84	1,25	0,98	0,52	0,48	0,64	0,50
L04	mom	anther width	.	.	11,1 0,5	.	7,0 0,0	10,6 0,2	11,0 0,3	8,8 0,6	11,6 0,3	11,2 0,5	10,6 0,2
L12		butterfly-shaped anther	.	.	0,91 0,06	.	0,88 0,09	0,89 0,05	0,79 0,04	1,00 0,00	1,12 0,10	0,99 0,08	1,07 0,02
N15n	nb	cilium number of apical bracts	.	0,0 0,0	1,5 0,8	15,8 12,3	0,8 1,0	0,0 0,0	0,0 0,0	0,0 0,0	0,0 0,0	0,0 0,0	0,3 0,4
Q00	scale	medium coronal shoots red	2	.	4	4	4	7	6	4	2	4	2
Q01	scale	herbaceous shoots red	6	5	5	5	5	9	8	6	3	5	3
R22	%	apical bracteoles frequency	0% 0%	0% 0%	129% 25%	24% 16%	49% 40%	0% 0%	6% 6%	12% 4%	0% 0%	17% 22%	9% 10%
S10	mom	tuft corner rim	.	.	3,1 0,8	.	1,1 0,1	0,3 0,0	1,2 0,4	1,1 0,1	.	0,6 0,0	0,8 0,0
S17	scale	berry epidermal diverticula	1,5 0,5	2,0 0,0	0,5 0,0	2,0 0,0	2,3 0,4	1,7 0,4	1,8 0,3	1,1 0,3	1,0 0,0	0,5 0,2	0,0 0,0
S17c	um	?euoplasts diameter	1,1 0,0	1,2 0,0	1,8 0,2	2,1 0,0	1,5 0,2	1,2 0,0	1,2 0,0	2,4 0,0	1,2 0,0	1,5 0,3	2,4 0,0
S36	nb	orbicular tufts	0%	0%	27%	81%	55%	0%	0%	41%	29%	24%	10%
S39	nb	angulate pentagonal tuft	0%	0%	12%	0%	0%	39%	9%	0%	4%	24%	57%

All the *non-vulgare* white currant clones

The dots are empty measurement boxes and the mean deviations of 0.0 indicate a unique measurement: so the cabinet is rather empty...

48– Does the DNA confirm that riru 79 and 169 are an identical pair?

49– Can the genome of the three species actually be detected in them?

50– Is the clone 110 confirmed as the closest to *R. vulgare*?

7.7- Finally, the most difficult: an introgression in *Ribes vulgare*?

Anderson called **introgressive** hybrid an individual resulting from a number of backcrossings that has returned to the morphological heart of a parental species and seems to enrich this species with remnants of characters from another species. Following his way of thinking one may become fascinated by these introgressives and try to extrapolate the unknown old hybridisation partner starting from its residual characters or one may consider that it is no more than a sterile intellectual game.

Historically, *Ribes vulgare* was used to provide the majority of European and American cultivars. It therefore constitutes the most numerous and least varied group, since we are remaining within this species. Consequently, pomology will have the trouble of tackling the old red and white *vulgare* cultivars (see the problem of the reference §423). Any *natural* cut (i.e. making biological sense) would probably be welcome. The first that comes to mind is set aside all the *vulgare* cultivars that show any slight deviation in the direction of *petraeum* or *spicatum* as **introgressive morphohybrids v>>**. If they do indeed prove to be of hybrid origin, not only will the category be natural, but it could also shed some light on their historical origin and relationship to other cultivars, which will help pomology. The following ones are classified as hypothetical **v>>**:

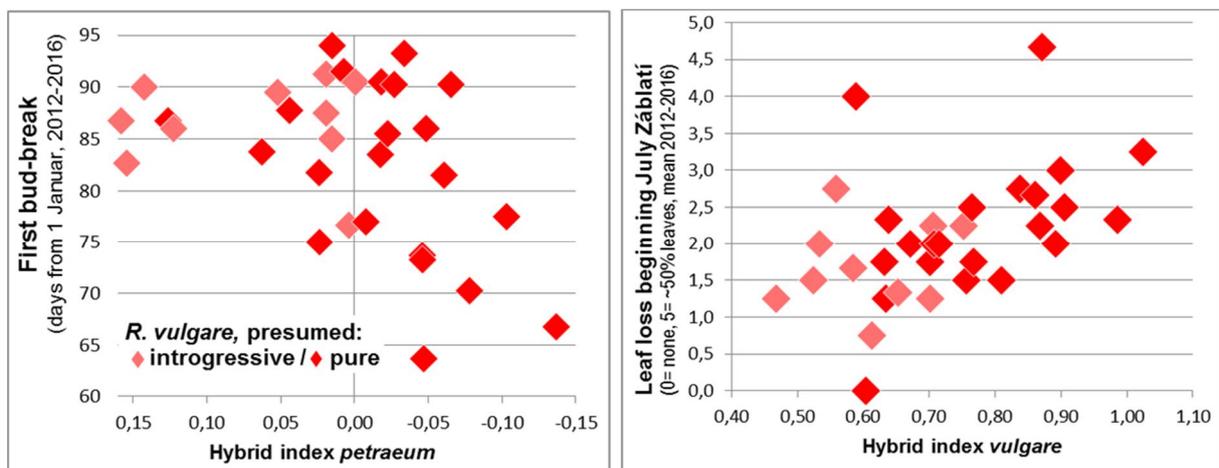
- Red Lakeq (riru 34, 59) for some orbicular berry tufts (S36, *non-vulgare* trait)
- Fayq(57) for almost half of the tufts orbicular (S36)
- Cherryq from the USDA (67) for the more elongated stamen than is standard for *vulgare* (L5) and some round tufts (S36)

- ~~K~~arlstein Redq(68, 125) for a slightly pelviform floral profile with erect petals (E19-20, F6, J8), slightly elongated stamen (L5) and some orbicular tufts (S36) in 68.
- ~~V~~ersailles Whiteqfrom Starkl & from Sruby (100 & 106) for its slightly pelviform flower (E7, E19, F6), sparse sepal cilia (I18) and slightly elongated stamen (L5)
- ~~C~~hampagne Whiteqfrom Sieberz (102) for its sparse cilia on the sepals (I18) and bracts (N15n) and some round tufts (S36)
- All the strong unknown bushes with fairly large red berries found in the rubble in the Doma0lice / Taus region (104, 107, 108, 113) for their slightly pelviform floral profile (E19, F6), slightly elongated (L5) and slightly butterfly-shaped (L12) stamen
- ~~I~~mperial Whiteqfrom Holovousy (129) and the one from PSR (135) for the slightly elongated floral profile (envelopes, stamens and style)
- ~~V~~ersailles Whiteqfrom Holovousy (130) for some bract cilia (N15n)
- The non-Kaukasische from Pro Specie Rara (134) for its slightly pelviform flower and more than 10 cilia per superior bract (trait of *petraeum*, N15n): this one may even go out of *R. vulgare* when the biometrics is more advanced
- ~~G~~ondouin Whiteqfrom Pro Specie Rara (136) for its average of 5 cilia per superior bract (N15n)
- A wild bush from Steinberg (144) for its sparse orbicular tufts (S36)
- Another wild bush (155E) for its slightly pelviform profile, some sepal cilia and slightly elongated stamens
- Finally, a monumental plant from the Bohemian Forest collection, **160 "Franz Weishäupl 1143"**: a *vulgare* white currant found growing at a record height of 1143m above sea level, near Zh í / Haidl. The rich Zanikleobce joint database enables us to find that it belonged to a family named Weishäupl.¹ A *vulgare* currant (moreover, a white one) which survives for 70 years without any care at a record height above sea level is no small thing. This fact even reinforces the hypothesis that the genome of *vulgare* is not the only one in this bush: slightly pelviform floral envelopes (E19, F6), some cilia on the calyx (I18), partly introrse tall stamens (E10, L5) and the ovarian vault that reaches the base of the hypanthium (J15) bring to mind a *petraeum-spicatum* introgression.



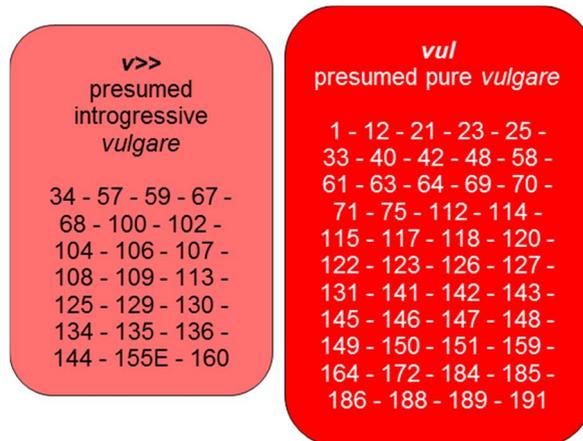
Weishäupl: stamen too tall for a pure *vulgare*

All the others, especially those with a red hypanthium, have virtually none of these weak deviations.



¹ <http://www.zanikleobce.cz/index.php?obec=863>, contribution from Jan Vl ek 2012

This dichotomy is at the limit of morphological induction. The hypothesis is therefore that these weak deviations at the fringes of the species are genetic and not just a methodological issue. Let us test this by comparing this floral microsystematics with physiological qualities that are not measured at the same time (so it is difficult to cheat), the phenology and premature leaf loss (a known fault of *vulgare*): a slight correlation can be seen in the scatter diagrams, which has provisionally been classified as introgressive *vulgare* (**v>>**), has bud-break later on average and loses rather fewer leaves than the *vulgare* that are classified as pure. So it is not futile to push the microtaxonomy to this point.



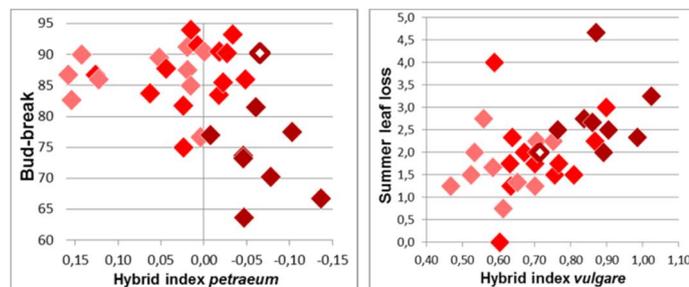
51– Does the chromosomal DNA prove or disprove the idea that presumed introgressives v>> have a small part of the non-*vulgare* (*petraeum-spicatum*) genome?

7.8- A group “with a red eye”?

Unexpectedly, this small piece of research into possible introgression leads to another chapter of microtaxonomy at the heart of *Ribes vulgare*. In his sketch on classification of the cultivars of *Ribes vulgare*, Janczewski uses the trait of the pink flushing of the hypanthium three times in his dichotomous key.¹ Bunyard refers to it as a “red eye” for part of his “Mersailles group”². We have seen that Blatný et al. also mention this simple and uncommon trait (§421).

In the difficult pomology of red-berried *vulgare*, if one could legitimately separate a **group with red hypanthium**, this would be good. We already do this for convenience. However, this trait may not be monophyletic. If it was correlated to others, we would have genetic legitimacy.

If in the two preceding scatter diagrams we put dark red on the clones with persistent strong pink flushing on the hypanthium³, they are set apart. This means that not only are they distinguished by this flushing, but by all or part of the characters that make up the hybrid indexes and to some extent their physiology. Moreover, their position in these hybrid indexes suggests that they would be the most extreme of the pure *vulgare*. It therefore seems legitimate to propose a group *with a purple hypanthium*.



The case of **Chenonceaux** (riru 75) is special: it does not have an “eye” that is entirely red, but because of the purple ring around its nectariferous ring, we have included it in the group with the red hypanthium, a long time before trying the hybrid



¹ JANCZEWSKI (1909, 317-318)

² BUNYARD (1920,41-45)

³ This flushing continues to diminish during the life of the flower, we are thinking here of the clones where it remains until it withers

indexes. This was also in accordance with various pomologies which place it close to *Mersailles Red*. With regard to this new approach, *Chenonceaux* definitely does not belong in this group. *Fay* (riru 57, that we classified *v*>>) has the same rings.

In the other *vulgare* cultivars the hypanthium is always green or else in the flower bud is initially slightly flushed with pink and becomes green when the flower opens: we have seen this in the phylum of *Heros* (§53) and it is also the case for *Gloire des Sablons* (riru 117, 122, 185, 191). It is not limited to *R. vulgare*, since *Donkheer van Tets* (*x houghtonianum*, §742) is also temporarily flushed with pink in the flower bud.

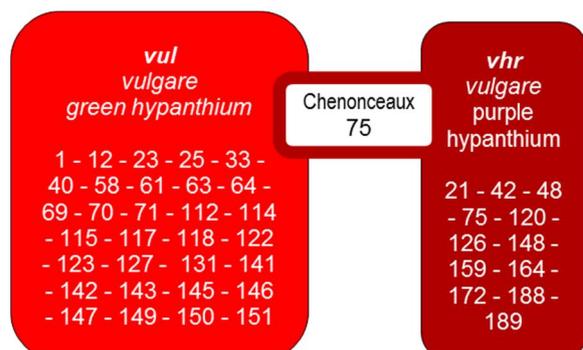


Pink flushing of the hypanthium in wild *R. vulgare*. Spring marsh, Steinberg, Schleswig-Holstein: 1 flower per clone

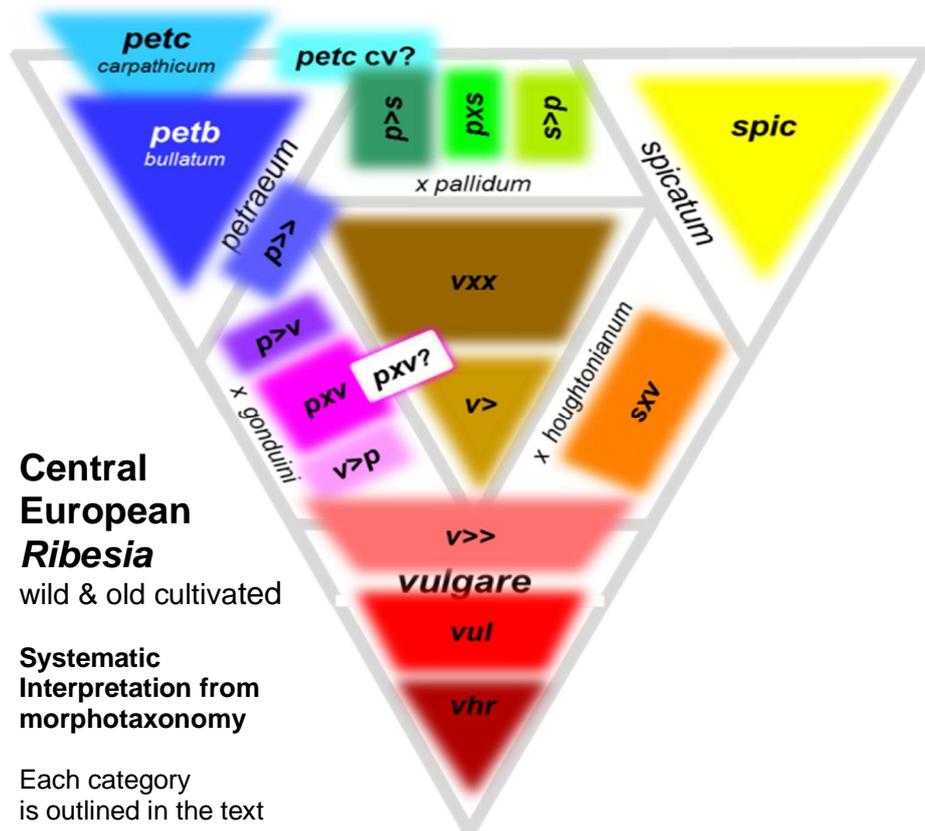
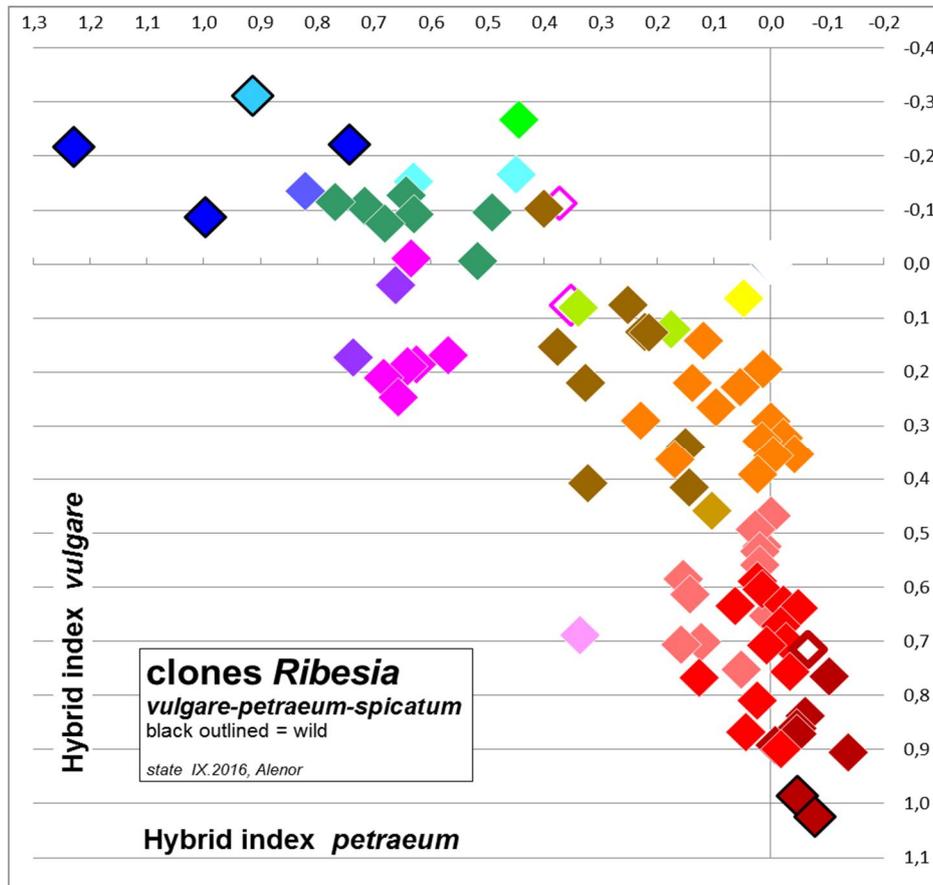
Moreover, this trait is modulated in a population of wild *R. vulgare*: the pink hypanthium does not seem to be exceptional in the wild as it is in cultivars. In a naturalised marshland population in Switzerland (concerning clone 48) these red washings were also common. Which raises the question: do the different "red eye" cultivars come from several samples formerly in different marshes, or from a single one? In other words, is it a poly- or a monophyletic group?

In brief, this trait, backed up by others, suggests the classification opposite for presumed pure *R. vulgare* cultivars.

52– What does the nuclear DNA say about this gradation of *vulgare* with a green hypanthium / "even purer" *vulgare* with a purple hypanthium?



8- Overview



8.3- Epilogue

The story of the three Prince Albert bushes from the lost hamlet of Bezová Lada (§31) was deceptive regarding the geographical isolation in the nineteenth century. The realist novels of Klostermann¹ reveal both the feelings of people at being forgotten by the world and their efforts to break out of the isolation: men and women walked in these mountains, tirelessly, for a whole day in search of a doctor to the local town if necessary, into town to find a young man to marry or to bring a piece of news, even returning home at night. Railway lines were constructed from 1870.² Above all, a large nursery-garden centre was established in Turnov, in the majority German-speaking area, Korselt-Mazek³, which became one of the largest in the Austro-Hungarian Empire. It sent items by train and post and by cash with order across the entire Empire, items could be ordered by telegram. Its successive owners were Czech-speakers and sometimes allowed some Czech patriotism to show in their catalogues⁴. This was nonetheless published in German as it was in Czech⁵. The edition of 1885⁶ contained 108 cultivars of gooseberry, 60 of red, white and pink currants and 18 black currants, plus ornamental American *Ribes*! Fayot New Prolific appeared from 1896⁷, followed by the other first selections of American currants (North Star Pomona) and the first thornless gooseberries in 1903.

So who knows what surprises the Sudeten rubble may be holding?



14. Rybíz — Ribes rubrum.

Vysokokmeny zimního šlechtění v níže uvedených druzích od konce dubna . . . 1 kus —50 kr.
 „ loňského šlechtění jen dle naší volby 1 „ —60 „
Nízké kořenoprávé (druhy s * poznamenané) à kus —15 kr., * poznamenané . . . 1 „ —20 „
 „ velikoplodné, v směsici 100 kusů zl. 8.—, 1 „ —10 „

Červeno- a pestroplodný.

1 Admiral Rouge.	14 Fertile de Bertin.	30 Třeshovitý, veliký, červený.
2 A gross fruit roses.	16 „ de Pallau.	34 Knight's červený.
4 Belle de Saint Gilles.	18 „ de Sablons.	36 Prinz Albert.
6 Boulogneský veliký.	20 Masobarvý obyčejný.	38 Queen Victoria.
7 Cerise de Japan.	22 Gloire de Sablons, pestrý.	39 Sweet's read.
8 Chenonceaux (Dr. Bretonneau).	24 Goliath (Cerise Goliath).	40 Versailles (La Versailles).
10 Champanský růžový.	26 Veliký, starý, červený.	
12 Du Caucase.	28 Holandský červený.	
	29 Impérial rouge.	

Bíle- a žlutoplodný.

41 Blanc d'Esperen.	48 Veliký obyčejný.	56 Transparente blanche.
42 Boulogneský veliký.	50 Holandský bílý.	58 Versailleský bílý.
44 Německý žlutý.	52 Impérial blanc.	60 Victoria blanc.
46 Gondouin blanc.	54 Třeshovitý bílý.	

Korselt & Mašek – 4th cover of 1904, offered currants from 1884

¹ KLOSTERMANN (1891) Ze sv ta lesních samot [A world deep in the woods] . (1893) V ráji zumavském [Eldorado in the Bohemian Forest] . (1923) Srul [Srul the Jew]
² ROU KA (2015,18-48)
³ TEMPÍR (1997,208 & 443)
⁴ Like the mention of the Czech Kingdom after 1900 (see the 4th cover from 1904)
⁵ Many thanks to RADIM PEŘEK for introducing us to this fascinating paper!
⁶ KORSELT (1885, Nos.13-14)
⁷ MAŠEK (1896,13)

*Switzerland did not select any currants but all the old European varieties can be found there.*¹ Currants, the selection of which only began after the invention of printing . as Bunyard notes² . have travelled widely. For this modern fruit, there will probably be few regional varieties and pomology must cross borders. The unknown orphan forms (§35), to which we have given provisional names of people committed to the Czech-German entente, were perhaps once known in another corner of Europe. It is said in the Bohemian Forest that, when Christopher Columbus landed in America, a man came up to him and said in a barbarous tongue *«Wítejte! Já jsem n jakej K s ze Stach, hraju na basu»*.³ History omits to say that in the case of his double bass he had brought with him some cuttings of *Gabreta*

If this sketch has managed to suggest that old cultivated red currants are a largely unknown field of study, that they are better understood by including wild species under the guiding light of Bunyard, and that Anderson's morphogenetics can still be of use, this will be more than enough for our contentment.

*so unimportant a thing as a Currant*⁴



¹ MARTIN FREI (2014, private communication)

² BUNYARD (1917,260)

³ «Welcome! Allow me to introduce myself: K s, from Stachy, double bass player»

⁴ BUNYARD (1920,38)

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Ribesia clones from the Alenor garden, Summer 2016

Abbreviations :

Taxon and cultivar: opinion October 2016

Important synonym: 'Holandský Červený' = 'Rote Holländische' = 'Rouge de Hollande' but in English = 'Prince Albert'

cv. / kv. = cultivar (the catalogue retains the language of the source-collection or the prospected country; the names of the old cultivars can be translated, according to the nomenclature code)

NON-x = the name x of the clone in the source-collection is incorrect

orph. = orphan clone (§35)

V56 = Sudeten vestige (rubble) No.56 in the inventory of the Bohemian Forest (VM: Petr Míšek)

patr = patrimonial group : CH = old cultivar from Switzerland not from the gene bank, CS = ditto for the Czechoslovak plains,

ref = gene bank or commercial reference clone, sauv = wild, scien = seedling for scientific testing, ss = deemed a spontaneous seedling of no patrimonial value, sud = deemed a Sudeten cultural relict.

Alenor	Taxon 'cultivar' "clone"	Provenance	patr
řiru 001	R. vulgare 'Třešňový Bílý' "Pardubice"	zahradka Levinských Pardubice, před válkou	CS
řiru 003	R. x koehneanum 'Rondom' "Záblatí"	Záblatí, vyhozený ze soukromého sadu, 60.let	CS
řiru 005	R. x gondouini 'Gabreta' "Záblatí"	okolí Horní Záblatí, 70.let	sud
řiru 008	R. vulgare >x mult. "Prosek"	Prosek, Máchalka, abricoteraie années 1960	CS
řiru 009	R. x gondouini 'Gabreta' "Blanice 1"	Vestigium 2, Zábrdí, samota nad Blanici, 2009	sud
řiru 010	R. cf. x houghtonianum (Jitka) orph. "Stábla"	V3, Stábla sur Záblatí, 2004	sud
řiru 011	R. x gondouini 'Gabreta' TYPE "Milešice S"	V9, Milešice, 2004	sud
řiru 012	R. vulgare 'Rosalinn' (=Rosa Sport) "Haeberli"	Haeberli CH, 17.4.06	réf
řiru 014	R. x gondouini (p>v) (Rackham le Rouge) orph. "Řepěšín"	V37, Řepěšín, 18.4.09	sud
řiru 015	R. x gondouini 'Gabreta' "Kamenná Hlava 40"	V40, Kamenná Hlava, 29.8.09	sud
řiru 016	R. x gondouini 'Gabreta' "Kamenná Hlava 42"	V42, Kamenná Hlava, 29.8.09	sud
řiru 017	R. x pallidum 'Holandský červený' "Březová Lada W"	V56, Březová Lada, 1e de W, 6.9.09	sud
řiru 018	R. x pallidum 'Holandský červený' "Březová Lada Centre"	V56, Březová Lada, 2e de W, 6.9.09	sud
řiru 019	R. x pallidum 'Holandský červený' "Březová Lada E"	V56, Březová Lada, 3e de W, 6.9.09	sud
řiru 020	R. x pallidum 'Rote Holländische' "Pro Specie Rara"	Pro Specie Rara BE-652, 24.3.2010	réf
řiru 021	R. vulgare gr. hypanthe pourpre 'Fertile de Palluau' "PSR"	Pro Specie Rara BE-780, 24.3.2010	réf
řiru 022	R. spicatum (>>) 'London Market' (=Scotch) "PSR"	Pro Specie Rara BE-785, 24.3.2010	réf
řiru 023	R. vulgare 'Laxton's Nr.1' "PSR"	Pro Specie Rara BE-209, 24.3.2010	réf
řiru 024	R. x houghtonianum NON-"Weisse aus Jüterbog" "PSR"	Pro Specie Rara BE-286, 24.3.2010	réf
řiru 025	R. vulgare 'Weisse Kirsch' "PSR"	Pro Specie Rara BE-587, 24.3.2010	réf
řiru 026	R. x houghtonianum NON-"Weisse Versailler" "PSR"	Pro Specie Rara BE-71, 24.3.2010	réf
řiru 027	R. x gondouini (p>v) 'Gondouin Rouge' "PSR"	Pro Specie Rara BE-327, 24.3.2010	réf
řiru 028	R. x koehneanum 'Rondom' "Velké Losiny"	Velké Losiny 31.3.2010	réf
řiru 029	R. vulgare >> 'Jonkheer van Tets' "Velké Losiny"	Velké Losiny 31.3.2010	réf
řiru 030	R. x urceolatum 'Heinemannův pozdní sběr' "Velké Losiny"	Velké Losiny 31.3.2010	réf
řiru 031	R. x pallidum (s>p) 'Vierlandenský' "Velké Losiny"	Velké Losiny 31.3.2010	réf
řiru 032	R. x pallidum 'Holandský červený' "Velké Losiny"	Velké Losiny 31.3.2010	réf
řiru 033	R. vulgare 'Třešňový bílý' "Velké Losiny"	Velké Losiny 31.3.2010	réf
řiru 034	R. vulgare>> 'Red Lake' "Velké Losiny"	Velké Losiny 31.3.2010	réf
řiru 035	R. petraeum var. carpathicum cv.? "Hliník"	V68, Humpolec, Hrad Orlík, 3.4.10	CS
řiru 036	R. x gondouini 'Gabreta' "Milešice W"	V74, Milešice village NW, W en bas. 9.4.10	sud
řiru 037	R. x pallidum 'Holandský červený' "David Vostrovský"	V74, Milešice village NW, E en haut, 9.4.10	sud
řiru 038	R. x pallidum (s>p) (Pernette) orph. "Cudrovice"	V77, bývalé Cudrovice, sud route, 8.5.10	sud
řiru 039	R. trihybr. Satellite Gabreta "Vysoký Les A"	V78, bývalé Cudrovice, samota, 8.5.10	sud
řiru 040	R. vulgare cv. "Bílý z Vysokého Lesa"	V78, bývalé Cudrovice, samota, 8.5.10	sud
řiru 041	R. trihybr. satellite Gabreta "Sviňovice"	V81, Sviňovice belle ruine, 16.5.10	sud

řiru 042	R. vulg. gr. hyp. pourpre 'Kavkazský Červený' "Sestra Barka"	V81, sous Sviňovice u sestry Barky, 16.5.10	sud
řiru 043	R. x gondouini 'Gabreta' "Můstek"	V86, Můstek, 27.6.10	sud
řiru 044	R. trihybr. (Radost) orph. "Na Radosti"	V88, Na Radosti sur Vimperk, 1.8.10	sud
řiru 045	R. petraeum var. carpathicum cv? "Lazebníkův Les"	V90, Lazebníkův Les sur Vimperk, 1.8.10	sauv?
řiru 046	R. petraeum var. bullatum sauv. "François Clot"	CH, Allières, relevé FClot101, 11.8.10	sauv
řiru 047	R. petraeum var. bullatum sauv. "Pierra Devant"	CH, Allières, chemin revers, 11.8.10	sauv
řiru 048	R. vulgare subspontané "Venoge"	CH, Ecublens, berge Venoge, 12.8.10	sauv
řiru 050	R. x gondouini 'Gabreta' "Blanice 2"	V91, Záblatí, sur Blanice, 3.9.10	sud
řiru 052	R. x gondouini 'Gabreta' "Vyšný S"	V109, Vyšný, Sud route, le Ribes A, 29.10.10	sud
řiru 053	R. x pallidum (p>s) (Malina)? "Vyšný N"	V110, Vyšný, Nord route, 29.10.10	sud
řiru 054	R. x gondouini 'Gabreta' "Radvanovice N1"	V114, Radvanovice Nord, 30.10.10	sud
řiru 055	R. x gondouini 'Gabreta' "Radvanovice N2"	V115, Radvanovice Nord, 30.10.10	sud
řiru 056	R. x gondouini 'Gabreta' "Radvanovice N3"	V116, Radvanovice Nord, 30.10.10	sud
řiru 057	R. vulgare>> 'Fays Fruchtbare' "PSR"	Pro Specie Rara (BE-205), 23.11.2010	réf
řiru 058	R. vulgare 'Heros' "PSR"	Pro Specie Rara (BE-309), 23.11.2010	réf
řiru 059	R. vulgare>> 'Red Lake' "PSR"	Pro Specie Rara (BE-778), 23.11.2010	réf
řiru 060	R. x pallidum (s>p) 'Erstling aus Vierlanden' "PSR"	Pro Specie Rara (BE-378), 19.3.12	réf
řiru 061	R. vulgare 'Laxton's Perfection' "PSR"	Pro Specie Rara (BE-783), 23.11.2010	réf
řiru 062	R. cf. x houghtonianum 'Rosa Holländer' "PSR"	Pro Specie Rara (BE-586), 23.11.2010	réf
řiru 063	R. vulgare 'Weisse Langtraubige' "PSR"	Pro Specie Rara (BE-268), 23.11.2010	réf
řiru 064	R. vulgare 'Weisse Transparent' "PSR"	Pro Specie Rara (BE-789), 23.11.2010	réf
řiru 065	R. vulgare>xpetraeum ?'Weisse Holländische' "PSR"	Pro Specie Rara (BE-202), 23.11.2010	réf
řiru 066	R. x gondouini 'Gabreta' "Blažejovice"	V119, Blažejovice, 16.1.2011	sud
řiru 067	R. vulgare>> 'Cherry' "USDA"	USDA, Corvallis NCGR, PI 556298 (19.001), 1.3.11	réf
řiru 068	R. vulgare>> 'Karlstein Red' "USDA"	USDA, Corvallis NCGR, PI 556329 (469.001), 1.3.11	réf
řiru 069	R. vulgare 'Pomona' "USDA"	USDA, Corvallis NCGR, PI 556369 (750.001), 1.3.11	réf
řiru 070	R. vulgare ?'White Dutch' "USDA"	USDA, Corvallis NCGR, PI 556313 (387.001), 1.3.11	réf
řiru 071	R. vulgare 'White Grape' "USDA"	USDA, Corvallis NCGR, PI 617689 (505.001), 1.3.11	réf
řiru 073	R. x pallidum 'Holandský červený' "Dr. Kroupová"	Dr. Kroupová Arnoštov, lesovna Markov <1964	sud
řiru 074	R. x pallidum 'Holandský Červený' "Arnoštov"	Dr. Kroupová Arnoštov, sur place <1970, 19.3.11	CS
řiru 075	R. vulgare hypanthé pourpre 'Chenonceaux'	Pro Specie Rara, Basel (BE 782), 18.3.11	réf
řiru 076	R. x houghtonianum 'Houghton Castle'	Pro Specie Rara, Basel (BE 207), 18.3.11	réf
řiru 077	R. x pallidum 'Holandský červený' "latifundie"	Dr. Kroupová Arnoštov, lesovna Markov <1964, 2011	sud
řiru 078	R. x pallidum 'Holandský červený' "Helena"	Dr. Kroupová Arnoštov, lesovna Markov <1964, 2011	sud
řiru 079	R. trihybr. 'Vítek' "Lípová Hlava"	Kamenná Hlava, V122, 7.5.11	sud
řiru 080	R. x gondouini 'Gabreta' "Kameňák"	Kamenná Hlava, V122, 7.5.11	sud
řiru 081	R. x pallidum (pxs) kv. bílý "7. května"	Kamenná Hlava, V122, 7.5.11	sud
řiru 082	R. x gondouini 'Gabreta' "Kamenná Hlava W1"	Kamenná Hlava, V129, 11.9.11	sud
řiru 083	R. x gondouini 'Gabreta' "Kamenná Hlava W2"	Kamenná Hlava, V131, 11.9.11	sud
řiru 084	R. x gondouini 'Gabreta' "Kamenná Hlava W3"	Kamenná Hlava, V131bis, 11.9.11	sud
řiru 085	R. x gondouini 'Gabreta' "Kamenná Hlava W4"	Kamenná Hlava, V133, 11.9.11	sud
řiru 086	R. x gondouini 'Gabreta' "bouquet final"	Kamenná Hlava, V134, 11.9.11	sud
řiru 087	R. x urceolatum 'Heinemannův pozdní sběr' "Cudrovice"	bývalé Cudrovice W křížovatky, V136, 15.9.11	CS
řiru 088	R. x houghtonianum kv. bílý "Hus NE"	en face Hrad Hus, V138, 15.9.11	sud
řiru 089	R. x houghtonianum samovysev? "Hus E"	en face Hrad Hus, V138, 15.9.11	ss
řiru 090	R. x houghtonianum samovysev? "Hus NW"	en face Hrad Hus, V138, 15.9.11	ss
řiru 091	R. x houghtonianum samovysev? "Hus W"	en face Hrad Hus, V138, 15.9.11	ss
řiru 092	R. x pallidum satellite 'Holandský červený' "Valna"	bývalé Horní Světlé Hory, V140, 4.10.11	sud
řiru 093	R. x gondouini 'Gabreta' "Reif"	bývalé Horní Světlé Hory, V141, 4.10.11	sud
řiru 094	R. petraeum>> (Klostermann) orph. "Světlé Hory"	bývalé Horní Světlé Hory, V144, 900m, 4.10.11	sud
řiru 095	R. x gondouini 'Gabreta' "Franta"	bývalé Horní Světlé Hory, V145, 4.10.11	sud

řiru 096	R. x gondouini 'Gabreta' "Světlé Hory škola"	bývalé Horní Světlé Hory, V147, 4.10.11	sud
řiru 097	R. x gondouini 'Gabreta' "Pohanské Kameny"	bývalé Horní Světlé Hory, V148, 4.10.11	sud
řiru 098	R. x gondouini 'Gabreta' "Küblbeks Gasthaus"	bývalé Horní Světlé Hory, V142, 4.10.11	sud
řiru 099	R. x urceolatum x vulgare 'Rovada' "Starkl"	Starkl 15.3.12	réf
řiru 100	R. vulgare>> ?'Versailleský Bílý' "Starkl"	Starkl 15.3.12	réf
řiru 101	R. x houghtonianum 'Jonkheer van Tets' "Starkl"	Starkl 15.3.12	réf
řiru 102	R. vulgare>> 'Šampaňský Bílý' "Sieberz"	Sieberz 20.3.12	réf
řiru 103	R. x houghtonianum kv. červený "Sruby č.2"	Sruby 440m, V174, 17.3.12	sud
řiru 104	R. vulgare >> kv. červený "Sruby č.13"	Sruby 440m, V176, 17.3.12	sud
řiru 105	R. trihybr. kv. červený "Sruby č.17"	Sruby 440m, V177, 17.3.12	sud
řiru 106	R. vulgare >> ?'Versailleský Bílý' "Sruby č.4"	Sruby 440m, V180, 17.3.12	sud
řiru 107	R. vulgare>> kv? červený "Mysliv NW1"	Mysliv, V184, 18.3.12	sud
řiru 108	R. vulgare>> kv? červený "Mysliv NW2"	Mysliv, V184, 18.3.12	sud
řiru 109	R. vulgare>> ss? "Mysliv S1"	Mysliv, V187, 18.3.12	ss
řiru 110	R. vulgare >x pe-spíc kv. bílý "Mysliv S2"	Mysliv, V187, 18.3.12	sud
řiru 111	R. x houghtonianum ss "Kubička N"	Kubička, V191, 19.3.12	ss
řiru 112	R. vulgare ss "Kubička 3"	Kubička, V192, 19.3.12	ss
řiru 113	R. vulgare>> kv. červený "Kubička 5"	Kubička, V195, 19.3.12	sud
řiru 114	R. vulgare ss "Kubička S"	Kubička, V196, 19.3.12	ss
řiru 115	R. vulgare 'Bar le Duc' "PSR"	Pro Specie Rara, Basel CH, BE-512, 19.3.12	réf
řiru 116	Ribesia 'Werdersche Weisse' "PSR"	Pro Specie Rara, Basel CH, BE-269, 19.3.12	réf
řiru 117	R. vulgare 'Gloire des Sablons' "PSR"	Pro Specie Rara, Basel CH, BE-787, 19.3.12	réf
řiru 118	R. vulgare 'La Turinoise' "PSR"	Pro Specie Rara, Basel CH, BE-784, 19.3.12	réf
řiru 119	R. vulgare 'Rosa Champagne' "PSR"	Pro Specie Rara, Basel CH, BE-701, 19.3.12	réf
řiru 120	R. vulgare gr. hypanthe pourpre 'Versaillaise Rouge' "PSR"	Pro Specie Rara, Basel CH, BE-211, 19.3.12	réf
řiru 121	R. x houghtonianum 'Witte Parel' "PSR"	Pro Specie Rara, Basel CH, BE-72, 19.3.12	réf
řiru 122	R. vulgare cf. 'Gloire des Sablons' "Rose de Corcelles"	Corcelles-le-Jorat CH Le Torel, années 60; 28.7.12	CH
řiru 123	R. vulgare 'Göpertova' "Bojnice"	VÚOOD Bojnice SK, 7.11.2012	réf
řiru 124	R. x houghtonianum 'Houghton Castle' "Bojnice"	VÚOOD Bojnice SK, 7.11.2012	réf
řiru 125	R. vulgare>> 'Karlštejnská Červená' "Bojnice"	VÚOOD Bojnice SK, 7.11.2012	réf
řiru 126	R. vulgare gr. hypanthe pourpre 'Kavkazská' "Bojnice"	VÚOOD Bojnice SK, 7.11.2012	réf
řiru 127	R. vulgare 'Weisse Perle' "Bojnice"	VÚOOD Bojnice SK, 7.11.2012	réf
řiru 128	R. trihybr. 'Palands Sämling' "Klosterneuburg"	Obstwein, Klosterneuburg (A), 1.12.12	réf
řiru 129	R. vulgare>> 'Čisařský Bílý' "Holovousy"	VŠUOH Holovousy, 11.1.13	réf
řiru 130	R. vulgare>> ?'Versailleský Bílý' "Holovousy"	VŠUOH Holovousy, 11.1.13	réf
řiru 131	R. vulgare 'London Grand Ruby' "Holovousy"	VŠUOH Holovousy, 11.1.13	réf
řiru 132	Ribesia mél. 2 cv. "Cauchemar de Ł. nkawska"	Wólka Ł. nkawska (PL), marais, 20.3.13	-
řiru 133	R. x koehneanum 'Rondom' "PSR"	Pro Specie Rara, BE-81, 19.3.13	réf
řiru 134	R. vulgare>> NON-Kaukasische "PSR"	Pro Specie Rara, BE-208, 19.3.13	réf
řiru 135	R. vulgare>> 'Weisse Kaiserliche???' "PSR"	Pro Specie Rara, BE-203, 19.3.13	réf
řiru 136	R. vulgare>> cf. 'Weisse Gondouin' "PSR"	Pro Specie Rara, BE-511, 19.3.13	réf
řiru 137	R. petraeum var. bullatum "Malenovice 2"	Beskydy, Lysá Hora, 968m, 11.8.13	sauv
řiru 138	R. petraeum var. bullatum "Malenovice 3"	Beskydy, Lysá Hora, 968m, 11.8.13	sauv
řiru 139	R. petraeum var. bullatum "Malenovice 1"	Beskydy, Lysá Hora, 968m, 11.8.13	sauv
řiru 140	R. x gondouini 'Gabreta' "Korytarův"	Záblatí, ferme Korytarovi, 2.9.13	sud
řiru 141	R. vulgare "François"	D, Steinberg, Fischerholz, 25.9.13	sauv
řiru 142	R. vulgare "Sonia"	D, Steinberg, Fischerholz, 25.9.13	sauv
řiru 143	R. vulgare "Steinberg 1"	D, Steinberg, Fischerholz, 25.9.13	sauv
řiru 144	R. vulgare>> "Steinberg 2"	D, Steinberg, Fischerholz, 25.9.13	sauv
řiru 145	R. vulgare "Steinberg 3"	D, Steinberg, Fischerholz, 25.9.13	sauv
řiru 146	R. vulgare "Steinberg 4"	D, Steinberg, Fischerholz, 25.9.13	sauv

řiru 147	R. vulgare "Steinberg 5"	D, Steinberg, Fischerholz, 25.9.13	sauv
řiru 148	R. vulgare gr. hypanthe pourpre "Steinberg 6"	D, Steinberg, Fischerholz, 25.9.13	sauv
řiru 149	R. vulgare "Steinberg 7"	D, Steinberg, Fischerholz, 25.9.13	sauv
řiru 150	R. vulgare "Steinberg 8"	D, Steinberg, Fischerholz, 25.9.13	sauv
řiru 151	R. vulgare "Steinberg 9"	D, Steinberg, Fischerholz, 25.9.13	sauv
řiru 152po	R. vulgare "Fischerholz"	D, Steinberg, transect 137H, 47 clones, 26.9.13	sauv
řiru 153	R. cf. spicatum spicatum "Jean-Daniel"	D, Steinberg, Fischerholz, 26.9.13	sauv
řiru 154	R. cf. spicatum spicatum "Ostsee 2"	D, Steinberg, Fischerholz, 26.9.13	sauv
řiru 155po	R. vulgare, v>> & x houghtonianum "Ostsee 1"	D, Steinberg, transect 137M, 21 clones, 26.9.13	sauv
řiru 156	R. cf. spicatum spicatum "Ostsee 3"	D, Steinberg, Fischerholz, 26.9.13	sauv
řiru 157	R. x gondouini cf. 'Gabreta' "Blanice 3"	Záblatí, sur Blanice, V2, 9.2004 & 15.2.14	sud
řiru 158	R. (petraeum-spicatum) cv. "Vraniště J&P"	Volary, 827m, V222, 21.2.14	sud
řiru 159	R. vulgare gr. hypanthe pourpre 'North Star' "Bojnice"	Bojnice 7.3.14	réf
řiru 160	R. vulgare>> kv. bílý "Weishäupl 1143 "	Zhůří/Haidl u Kvildy, V226, 1143m, 22.3.14	sud
řiru 161	R. (petraeum-spicatum) cv. "Kamenná Hlava N"	Kamenná Hlava, V227, 12.4.14	sud
řiru 162	R. x gondouini? Kv. bílý "Kamenná Hlava Návrat"	Kamenná Hlava, V40, 12.4.14	sud
řiru 163	R. x gondouini 'Gabreta' "Dobrá cesta"	České Žleby, Dobrá, V230, vu 25.5.14 (NON-Alenor)	sud
řiru 164	R. vulgare gr. hypanthe pourpre cv. "Křišťanov SE"	Křišťanov, V231, 6.10.14	sud
řiru 165	R. x gondouini 'Gabreta' "Pasovary"	tvrz Pasovary, V235, 1.6.14	sud
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řiru 168	R. (petraeum-spicatum) kv. bílý "Křišťanov W"	Křišťanov, V244, 3.7.14	sud
řiru 169	R. trihybr. 'Vítek' "Bílý z Křišťanova"	Křišťanov, V245, 3.7.14	sud
řiru 170	R. x houghtonianum kv. bílý "Křišťanov-jih"	Křišťanov, V246, 3.7.14	sud
řiru 171	R. x gondouini 'Gabreta' "Obr z Křišťanova"	Křišťanov, V248, 3.7.14	sud
řiru 172	R. vulgare gr. hypanthe pourpre cv. "Křišťanov-Jitka"	Křišťanov, V231, 6.10.14	sud
řiru 173	Ribesia cv. "Kapradník 1"	Kamenná Hlava, V256, 28.10.14	sud
řiru 174	R. x gondouini 'Gabreta' "Kapradník 2"	Kamenná Hlava, V256, 28.10.14	sud
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