

## DIFFERENTIATION OF *ROSA ABIETINA*, *ROSA BALSAMICA* AND GLANDULAR *ROSA CAESIA* S. L. (*ROSA* SECTION *CANINAE*)

### ZUR UNTERSCHIEDUNG VON *ROSA ABIETINA*, *ROSA BALSAMICA* UND DRÜSENREICHER *ROSA CAESIA* S. L. (*ROSA* SEKTION *CANINAE*)

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**Abstract:** *R. abietina* of the Aosta Valley is compared with individuals of other parts of its area as well as with *R. balsamica*, glandular forms of *R. caesia* and *R. corymbifera* var. *deseglisei*. The history of its taxonomy and difficulties in determination are treated. *R. abietina* has a rather variable diameter of the orifice in Aosta and in other parts of the area. Like *R. tomentosa* s. l., a clear assignment to L-type or L/D-type is often impossible. Widely identical glandular forms of *R. caesia* s. l. may be regarded as corresponding D-type of *R. abietina* in some regions. The discus of *R. abietina* is normally  $\pm$  convex, more rarely slightly conical, and not planar as recorded. *R. abietina* is the only species of subsect. *Tomentellae* in Aosta, former records of *R. balsamica* could not be confirmed. The individuals of the Jura Mountains, which are called by GRÉNIER as *R. abietina*, are better attached by morphological features to *R. tomentosa* – following CRÉPIN (1869). This may apply for records of *R. abietina* in the Vosges Mountains too. Records from the Black Forest Mountains are also doubtful and have to be verified.

**Keywords:** *Rosaceae*, *Rosa* subsect. *Tomentellae*, *R. tomentosa*, taxonomy, growth types, orifice, Aosta Valley, Alps, Jura Mountains, Westphalia

**Kurzfassung:** *R. abietina* des Aostatal wird mit Individuen aus anderen Teilen ihres Areals sowie mit *R. balsamica*, drüsenreicher *R. caesia* und *R. corymbifera* var. *deseglisei* verglichen. Am Beispiel des Aostatal werden die vielfältigen taxonomischen und bestimmungstechnischen Schwierigkeiten, auf die man bei der Bestimmung dieser Art trifft, aufgezeigt. Der Durchmesser des Griffelkanals als wichtiges Bestimmungsmerkmal kann in Aosta, aber auch in anderen Teilen des Areals, stark variieren. Ähnlich wie bei *R. tomentosa* s. l. ist bei *R. abietina* eine eindeutige Zuordnung zu den Wuchstypen L oder L/D anhand des Griffelkanals oft nicht möglich. Weitgehend merkmalsgleiche, drüsige Formen von *R. caesia* s. l. können als Wuchstyp D zu *R. abietina* angesehen werden. Der Diskus von *R. abietina* ist gewöhnlich  $\pm$  konvex, seltener leicht konisch und nicht eben wie verschiedentlich angegeben. *R. abietina* ist die einzige Art der subsect. *Tomentellae* in Aosta, frühere Angaben von *R. balsamica* konnten nicht bestätigt werden. Die von GRÉNIER (1865) als *R. abietina* bezeichneten Individuen und ähnliche Formen des Jura-Gebirges sind nach morphologischen Merkmalen besser *R. tomentosa* anzuschließen, wie CRÉPIN (1869) vorschlägt. Das dürfte durchweg auch für Angaben von *R. abietina* aus den Vogesen zutreffen. Angaben der Art aus dem Schwarzwald sind ebenfalls zweifelhaft und zu überprüfen.

**Schlüsselwörter:** *Rosaceae*, *Rosa* subsect. *Tomentellae*, *R. tomentosa*, Taxonomie, Wuchstypen, Griffelkanal, Aostatal, Alpen, Jura-Gebirge, Westfalen

## 1 Introduction

*Rosa abietina* GRENIER ex CHRIST is considered as endemic of the Alps, the French and Swiss Jura Mountains. The centre of distribution is located in the western Alps (HENKER 2000). Eastward the areal reaches to the Alps and Prealps of Bavaria. Single locations in the Black Forest and Vosges Mountains are mentioned in LÜTH (2000, 2003), DRESSLER & al. (2015 ff.) and PAROLLY & ROHWER (2019). An indication by BUCHENAU (1894) near Bremen according to FOCKE is rectified by FOCKE (1900) in *Rosa coriifolia* FRIES var. *cimbrica* FRIDRICHSEN, a glandular form of *Rosa caesia* SM. in Northern Germany. A close relative of *R. abietina* is *Rosa balsamica* BESSER (= *R. tomentella* LÉM.), which is distributed in large parts of Europe. Both species are characterised by hairy, biserrate leaflets with fine glands on the margin and lower surface. Hips and pedicels with stalked glands are typical for *R. abietina*. *R. balsamica* lacks them normally (HENKER 2000). *R. abietina* has  $\pm$  spread sepals, *R. balsamica* reflexed sepals. The leaf surface of typical *R. balsamica* is dark green, shiny and slightly hairy, the veins somewhat deepened. *R. abietina* has similar features of the leaf surface, but often less pronounced. Both species are occurring in the Alps, where identification mistakes and confusions are possible in the case of identification only by means of glands on the pedicels (HENKER 2000). Several forms of *R. balsamica* with glandular pedicel are mentioned especially for the Alps (KELLER 1931).

*R. abietina* and *R. balsamica* are combined by CHRIST (1873) under sect. *Caninae* subsect. *Tomentellae* CHRIST. He described them as intermediate between subsect. *Caninae* and subsect. *Rubigineae* CHRIST. The position of subsect. *Tomentellae* is questioned according recent genetic studies. DE COCK & al. (2008) and DE RIEK & al. (2013) are connecting *R. balsamica* with subsect. *Caninae*. The study of KOOPMAN & al. (2008) points towards a different systematic position of the two species: *R. balsamica* is related with *Rubigineae* (and *Caninae*), *R. abietina* with subsections *Vestitae* CHRIST and *Caninae*. According BALLMER (2018, and additionally by letter) *R. abietina*, but also *R. balsamica* are hybrids of subsections *Caninae* and *Vestitae*. The study of WISSEMAN & RITZ (2005) also indicates relationships of subsect. *Tomentellae* to *Vestitae* and *Caninae*, but a specimen of *R. abietina* also to *Rubiginosae*.

The author has discovered *R. balsamica* in Westphalia and Lower Saxony as a well distinguishable species (KAPLAN 2016a), but made the opposite experience with the species of *Tomentellae* in the Aosta Valley, where the author has been studying the rose flora since 2014 and where both species of *Tomentellae* are recorded by LATTANZI (2012), BOVIO (2014) and BARTOLUCCI & al. (2018). The assignment of diverse rose individuals either to *R. balsamica*, *R. abietina* or glandular forms of *R. caesia* was difficult, the author find out. Not rarely the important features, orifice and position of sepals allowed no certain determination. These difficulties in determination initiat-

ed this study on *R. abietina* and similar taxa in Aosta and moreover for the comparison of *R. abietina* with typical *R. balsamica*. On the basis of specimens of several herbaria which were sighted by the author it has been checked whether the results, which were made in Aosta, are applying to *R. abietina* in other parts of its areal too. Particular attention was paid to the orifice as important feature for discrimination of rose species or rather growth-types of roses.

CHRIST (1873) was the first who has distinguished between roses of the lowlands and the mountains by means of their features. He realized the loose growth of rose species in the lowlands and the mainly dense growth of rose species of the high mountain zone. Latter are among other features also characterised by styles forming a broad, villous cushion on the discus and erect, late falling sepals. CHRIST (1884) and DINGLER (1907) explain the two types more detailed (quoted from REICHERT 1998). The orifice has not been yet observed by these authors. REICHERT (1998) points out the inaccuracy of the term “habit-type” and proposes a short designation for them: L-type and D-type (L standing for loose, D for dense growth). HENKER (2000: p. 37) assigns frequent rose species to the growth types in a clear scheme. Position of sepals and diameter of the orifice are key features in this scheme: sepals reflexed, narrow orifice: L-type, sepals erect, orifice broad (more than 1,2 mm): D-type, sepals spread or irregularly spread (“flatterig” according HENKER), orifice round about 1 mm: L/D-type (intermediate species). The position of sepals on ripening fruits and the diameter of the orifice are also considered as important discrimination features of *R. abietina* and *R. balsamica* (HENKER 2000, FISCHER & al. 2005, BORNAND 2013, LATTANZI 2019).

According to these floras, *R. balsamica* has a narrow orifice and reflexed sepals, *R. abietina* an orifice with diameter round about 1 mm and  $\pm$  spread sepals. Features of the growth types as width of orifice and position of the sepals are determined by the pollen parent according studies of RITZ & WISSEMAN (2003, 2011). Characteristics in section *Caninae* are strongly maternally influenced due to higher maternal proportion of the genome as a result of the unique *Canina* meiosis (TÄCKHOLM 1922). The paternal influence on vegetative characteristics as those of leaves is rather low in hybrids between subsections *Rubiginosae* and *Caninae* as shown by HERKLOTZ & al. (2017). It seems to be somewhat stronger in hybrids between subsections *Vestitae* and *Caninae* according the description of *R.  $\times$ scabriuscula* (*R. tomentosa*  $\times$  *R. canina*) by GRAHAM & PRIMAVESI (1993). As mentioned above, *R. abietina* must be regarded as a hybridogenous species with *Vestitae* as putative ancestors. This could explain the difficulties in distinguishing *R. abietina* and *R. tomentosa* s. l. This problem concerns already the first individuals, which were given the name *R. abietina* as it is shown in the following passages of the text.

## 2 Material and Methods

The dry inner-alpine Valley of Aosta is rich in rose species (compare BOVIO 2014), especially rich appearance of glandular mountain species as *Rosa villosa* L. and *Rosa montana* CHAIX, and glandular forms of widespread rose species are noteworthy. The very glandular sweetbriars are regionally common too; *Rosa elliptica* TAUSCH ascends like *R. villosa* and *R. montana* up to the upper subalpine level. Most of the roses compared in this study are rich in glands too. 160 specimens of *R. abietina*, *R. corymbifera* BORKH. incl. var. *deseglisei* (BOREAU) THIRY, and glandular and typical forms

of *R. caesia* were collected in Aosta by the author. Glandular forms of *R. caesia* are regionally more common in Aosta than the typical form, which is nearly without glands. One specimen of *R. abietina* was collected in the French Jura Mountains. The specimens are deposited in the herbarium of the LWL-Museum für Naturkunde in Münster (MSTR).

Additional specimens of the Valley of Aosta could be studied, which are deposited in the herbarium Bovio (Aosta), the herbarium of the Museo Regionale di Scienze Naturali della Valle d'Aosta (AO) and the herbarium of the Parco Nazionale Gran Paradiso (Cogne, Valnontey). 20 specimens are reviewed, which are collected by L. VACCARI, determined by R. KELLER and kept in the herbarium of the University of Florence (FI). For comparison, herbarium specimens of *R. abietina* from other parts of its area has been evaluated, original herbarium specimens from Botanisches Museum Berlin, Botanische Staatssammlung München, Herbarium É. Chavanne, Moutier (CH), scans of specimens by the Muséum national d'Histoire naturelle, Paris (France), Collection: Vascular plants (P), Nationaal Herbarium Nederland, Bioportal, and Herbarium Senckenbergianum (DRESSLER & al. 2015 ff.). It is possible to determine the diameter of the orifice of dried specimens without destroying the hips. For this purpose, the diameter of styles column shall be measured where the column exits the orifice. Mostly, only a part of the hips allows this. Riper hips are the best once for measuring, as there is little change in the form of hip and orifice by pressing. The orifice does not seem broader in top. In addition, riper fruits are only slightly shrinking during drying. However, these measurements give only ap-

proximate values. The orifice of older dried fruits is mostly about 0,05 mm narrower than of fresh fruits, as measured samples of *R. abietina* have shown. Fresh material was measured with a measuring magnifier (10 x, measurement scale in graduations of 0,1 mm), dried specimens with a binocular and micrometer eyepiece.

### 3 *Rosa abietina* according GRENIER, CRÉPIN, CHRIST, KELLER and HENKER

The French botanist M. CH. GRENIER was the first person who called a rose of the French Jura Mountains near Pontarlier and Brévine *R. abietina* (GRENIER 1865). The resinous scent probably contributed to this name (compare HENKER 2000). The scent is rather strong and may be close to the clear scent of *R. villosa* or *R. montana* (blossoms) as the author could determine in La Fresse near Pontarlier, a location mentioned by GRENIER. The strong scent of this individual stems from exceptionally numerous glutinous glands. GRENIER is using "l'étage du sapin" as altitude indication. However, the habitats of *R. abietina* in the fir-rich mountain level of the Jura Mountains may be less probable as origin of the name.

GRENIER mentioned, inter alia, following features: prickles slender-conical (subulés), some straight, the others inclined (inclinés) or even crooked (courbés); petiol [and rachis] hairy, glandular and with prickles; the upper surface of the leaflets nearly hairless, the lower surface hairy, greyish and covered with glands, biserrate with glandular secondary serration; pedicel and fruit with stalked glands, petals pale rose, sepals spread, than reflexed and falling during colouration of fruits [elsewhere "attached until colouration of fruits"]; the styles

slightly hairy to naked, often connected (soudés) to a column (GRENIER 1865, p. 235). Note to GRENIER'S description of the styles: some of his specimens from the Jura Mountains (o. a. MNHN Paris P03327442) show slender style columns crowned by the stigmas, like the styles of *Rosa agrestis* SAVI. Normally the single styles may protrude at different lengths, hidden by the stigmas. The stigma cushions of *R. abietina* and *R. balsamica* are forming in this way a  $\pm$  small globose head or short column. The form of a bouquet (compare HENKER 2000) with clearly visible styles may mostly be a feature of rather narrow orifices or rather results of ripening and shrinking of the fruits or drying of the specimens.

GRENIER was unsure about the systematic position of *R. abietina* and assigns thus named individuals to *Rosa foetida* BASTARD, which would be only slightly different. *R. foetida* is said to be closely related to *Rosa tomentosa* SM. According to KELLER & GAMS (1923), it is a slightly hairy var. of *R. tomentosa*, strongly glandular like var. *scabriuscula* KELLER (= *Rosa pseudoscabriuscula* [KELLER] HENKER & SCHULZE).

*R. abietina* is also considered by CRÉPIN (1869: p. 246) as very closely related to *R. tomentosa* and placed it together with *R. foetida* in section *Tomentosae* CRÉPIN, which corresponds to *R. tomentosa* SM. s. l. Most probably, he only refers to the individuals of the French Jura Mountains. Later on, *R. foetida* can still be found as variety of *R. tomentosa* SM. (CRÉPIN 1892, reviewed specimens in the herbaria of MNHN Paris), however, and no longer as *R. abietina*. Following CHRIST (1873), CRÉPIN (1892) pointed out the relationship of this species with *R. balsamica*. He names only curved prickles and as synonym only *Rosa dematrancea* LAGG. & PUG. Strange-

ly enough, he mentioned the Dauphine and Savoy regions and not the Jura region as French area of *R. abietina*.

CHRIST (1873) is convinced of the species status of *R. abietina*. He mentions following divergent features of *R. tomentosa*: rich inflorescence with long stalked flowers, large leaflets, acute elongated, large terminal leaflets, the broad glandular serration of the leaflets and the straight or only slightly curved prickles. Features of the *R. abietina* from the Jura Mountains indeed remind us of *R. tomentosa* as will be outlined below. CHRIST establishes Subsection *Tomentellae* with *R. abietina* and *R. balsamica* as single species and different varieties. Common features are hairy, glandularly biserrate leaflets with scattered glands on the lower surface and early falling sepals. These two species are distinguished by CHRIST (1873: 40, 127, 132) as following: *R. balsamica* has broad, hooked prickles, the petiole stalked glands. Typical *R. abietina* has smaller, curved prickles (fig. 6), the petiole nearly sessile glands, the serration of the leaflets is often simpler ("Zahnung in's Einfache oblitterend"). He wrote: serration double and partially simple (especially sterile shoots) to complex (upper shoots). CHRIST describes leaflets of one of the distinguished forms, *Rosa thomasii* PUGET (= *R. abietina* var. *thomasii* [PUGET] KELLER) as nearly simply serrated. The pedicels of *R. abietina* and backs of the sepals are stalked-glandular in contrast to *R. balsamica*. The sepals are reflexed and early falling in *R. balsamica*, spreading or somewhat erect and late [later] falling in *R. abietina*. The hips of *R. balsamica* are broadly oval to globose, of *R. abietina* globose or piriform (fig. 5).

KELLER & GAMS (1923), KELLER (1931) and HENKER (2000, 2017) are following these de-

scriptions widely. Following additions and deviations by KELLER & GAMS and KELLER may be mentioned. According to KELLER & GAMS, the widespread *R. abietina* var. *genuine* GAMS (= f. *typica* CHRIST) and var. *thomasii* are without subfoliar glands, according to KELLER (1931) without or with scattered subfoliar glands. Like CRÉPIN (1892), they include forms of *Rosa corymbifera* (*R. obtusifolia* DESV.) in *R. balsamica* and add several forms of *R. balsamica* with glandular pedicels. For both species, KELLER & GAMS mentioned styles, which are mostly elongated like a column. The changing information on flower colour of *R. abietina* from pale rose (CHRIST) to rose (KELLER & GAMS 1923), rosy red (KELLER 1931) and pale to dark rose or rosy red (HENKER 2000) or normally deep rose (HENKER 2017) is remarkable. According to KELLER & GAMS, the sepals of *R. abietina* are reflexed after flowering, later on more spreading. KELLER & GAMS only described the hips of *R. balsamica* and *R. abietina* as globose to oval (normally globose of *R. abietina*). Indications of piriform hips are lacking. HENKER combines the indications of CHRIST, KELLER & GAMS and KELLER concerning the colour of flowers, the position of sepals and the forms of hips. According to KELLER, the discus of *R. abietina* is planar, rarely conical, mostly weakly. This must be explained as the discus of *R. abietina* is normally  $\pm$  convex, more rarely somewhat conical: in KELLER's and also CHRIST's descriptions the flat form of the discus includes the convex form contrasting conical forms. This is best to be seen in the identification key of CHRIST (1873, p. 210), when he separates *Rosa stylosa* DESV., with marked conical discus from other rose species with hairy leaves and "flat" discus. CHRIST (1873)

includes *R. abietina* of the Jura Mountains into the typical form of this species. In KELLER & GAMS (1923) and KELLER (1931), the author have not discovered indications of *R. abietina* in the Jura Mountains and of piriform hips; on the contrary, KELLER lists several locations of *R. tomentosa* var. *foetida* in the Jura Mountains.

HENKER assigns *R. abietina* to the intermediary L/D-type (among other sepals spreading, diameter of orifice around 1 mm). This classification of *R. abietina* seems to be done in particularly by the spreading petals. Already CHRIST and KELLER (1931, key p. 58/59) are using the position of the sepals in their keys. None of the authors gave a detailed description of the orifice and its variability.

#### 4 *Rosa abietina* in Aosta: review of literature and herbaria

According to LATTANZI (2012, 2017), BOVIO (2014) and BARTOLUCCI & al. (2018), both species of subsect. *Tomentellae*, *R. balsamica* and *R. abietina*, have been found in the Italian Autonomous Region Aosta. This information relates to diverse references.

KELLER (1904 in VACCARI 1904-1911) mentions *R. balsamica* for a number of locations in Aosta. He reviewed the 20 specimens (on 17 sheets) collected by L. VACCARI between 1899 and 1903 (kept in the Herbarium Universitatis Florentinae, FI). Two more recent specimens are kept in the herbarium of the Museo Regionale di Scienze Naturali della Valle d'Aosta (AO) (MUSEO REGIONALE DI SCIENZE NATURALI DELLA VALLE D'AOSTA 2019) and in the herbarium M. BOVIO (Aosta). *Rosa abietina* was collected by PIETRO ROSSI (ROSSI 1927)

near Introd and Arvier, at the entrance of the Valsavarenche. The specimens were reviewed by R. KELLER and are kept in the herbarium of the University of Padua. More recent specimens from Valsavarenche are kept in the herbarium of the Museo Regionale di Scienze Naturali della Valle d'Aosta (AO) and in the herbarium of the Parco Nazionale Gran Paradiso in Cogne/Valnontey. The locations are mentioned in BOVIO (2014). The author have had the opportunity to review these specimens of *R. balsamica* and *R. abietina* with exception of those in Padua (herbarium closed). These are the results of the examinations:

Specimens determined as *Rosa balsamica*:

Herbarium Firenze: None of the 20 specimens collected by L. VACCARI and determined by KELLER can be clearly attributed to *R. balsamica*. That can be explained in the following.

1. KELLER includes *R. corymbifera* p. p. (= *Rosa obtusifolia* Désv.) in *R. balsamica*, in KELLER (1904) as *R. tomentella* var. *obtusifolia* (DÉSV.) R. KELLER. According to HENKER (2000) this taxon is not identical with *R. obtusifolia* used as synonym for *R. balsamica* for instant by PIGNATTI (1982) or KLASTERSKY (1968) in Flora Europaea (= *Rosa obtusifolia* auct. mult.). The inclusion of *R. corymbifera* p. p. in *R. balsamica* is no longer accepted in the modern floras (HENKER 2000, GRAHAM & PRIMAVESI 1993, BORNAND 2013, LAUBER & al. 2018). The leaflets of the corresponding specimens collected by L. VACCARI are uniserrate and the underside of the leaflets are largely without glands. These features exclude *R. balsamica*.

2. Following reason may be the most important: KELLER has modified his system of *Tomentellae*. KELLER has identified the only

actually known species of *Tomentellae* in Aosta (see below) once as *R. balsamica* (KELLER 1904), once as *R. abietina* var. *thomasi* (KELLER in ROSSI 1927). There is an indication for his decision in the year 1904 for *R. balsamica* in KELLER 1899 (p. 88, 89). In this paper, he reports a *R. balsamica* in the neighbourhood of Aosta, in the Valley of Susa. According to his description, this rose resembles *R. abietina* of Aosta in many features. This concerns among others the back of the spread sepals, pedicels and global hips, which are densely covered with stalked glands – like *R. tomentosa*. KELLER follows in his decision for *R. balsamica* an expertise of CRÉPIN. He seems to be surprised about this expertise, because CRÉPIN emphasises the relationship of *R. abietina* and *R. tomentosa*. CRÉPIN (1891) himself notes *R. balsamica* from the same locations, where ROSSI (1927) and KELLER report later *R. abietina*.

3. With one exception, the specimens were collected during the flowering period. Most of them have only young flowers. It is not possible to evaluate the position of the sepals on the ripening hip and the persistence of the sepals. Furthermore, the dried young flowers do not provide much indication of the orifice and his diameter. Nowadays, these characteristics are considered as significant for a definite identification of species of *Rosa* sect. *Caninae*. However, judging by characteristics as the serration, hairiness and glands of the leaves or form and hairiness of the styles, also most of the remaining specimens are not identical with the typical *R. balsamica* as it is described by HENKER (2000), TIMMERMANN (1992) or GRAHAM & PRIMAVESI (1993). Some of the specimens with glandular pedicels and hips correspond with *R. abietina* (fig. 1), other specimens most probably with *R. caesia*.

Herbarium Valle d'Aosta (AO-N.SFV-2638, only studied by photo of the specimen) and herbarium M. BOVIO (no. 2837): The specimen of the herbarium BOVIO is in full bloom, the specimen of the herbarium AO is just after flowering. Preparations of the orifices were measured after drying (herbarium BOVIO: 0,8-0,9 mm, herbarium AO: 0,5-0,9 mm); as the flowers are young, these measurements are likely to differ a little bit from measurements of fresh material. Clear or dark pink petals of both specimens, also pink older petals of the specimen in herbarium AO, do not support the determination as *R. balsamica*. Initially, the author take these specimens for *Rosa subcollina* with glandular leaves. Only when spotting fine stalked glands on pedicels and hips the author identified them as *R. abietina*. The author had not seen so far flowering *R. abietina* and was fixed on pale rose petals as indicated by GRENIER (1865), CHRIST (1873), BINZ & HEITZ (1990), AESCHIMANN & al. (2004, photo) and LAUBER & al. (2018, photo).

There is no conclusive evidence by herbarium specimens supporting the occurrence of *R. balsamica* in Aosta. Studying the rose flora of Aosta during 2014 to 2019, the author have never found any typical *R. balsamica*, even not at indicated locations, where the author have found on the contrary *R. abietina* (see below). *R. balsamica* has still to be confirmed in this region of the Alps.

Specimens determined as *Rosa abietina*:

In the herbarium of Aosta (AO-N.SFV-2884), there is one specimen collected in Valsavarenche near Devioz (Bois de Clin), determined as *R. abietina*. Its pedicels and hips are glandu-

lar, a characteristic of *R. abietina*. Following characteristics, however, indicate a var. of *R. caesia* with glandular pedicels (*R. caesia* var. *bovernieriana* [LAGGER & DELASOIE] KELLER): uniserrate leaflets, all the leaves poor in glands, short pedicels, styles villous, stigmas forming a broad cushion covering most of the disc.

The author noticed the same characteristics, reviewing a similar specimen from Valsavarenche in the herbarium of the PNGP in Cogne/Valnontey. The author have collected comparable specimens near Devioz. Their diameter of orifice is typical for *R. caesia* in Aosta, between (1,1) 1,2 and 1,5 mm (fig. 3).

The roses of the section *Caninae* have no absolutely reliable characteristics. In the most cases, only observing the whole of the important characteristics is leading to a determination (HENKER 2000). In this case, most characteristics, especially the diameter of the orifice, the simple serration of the leaflets without glands and the moderately glandular pedicels, are leading to *R. caesia*. ROSSI (1927) indicates the glandular *R. caesia* var. *bovernieriana* in the area of Degioz, mostly on approx. 1400-1600 m above sea level. The indications of *R. abietina* by ROSSI refer to locations on 800-1000 m at the entrance of the Valsavarenche, one location may be near 1400 m. He indicates exclusively the var. *thomasii* (PUGET) KELLER, which is characterised by pedicels and hips with high density of glands and lacking or rare subfoliar glands.

## 5 Studying *R. abietina* and similar taxa in Aosta

The 41 specimens, collected in different parts of Aosta and finally determined as *R. abietina*,



are conspicuously uniform in various characteristics. Some of the specimens originate from the locations or their neighbourhood, where Keller and ROSSI (1927) have indicated *R. abietina* and KELLER (1904) *R. balsamica*.

These are the features: Prickles of the flowering branches mostly rather weak, curved to weakly curved, more rarely hooked. Petioles and rachis with numerous to single short-stalked glands and single long-stalked glands, densely covered with short hairs; the underside almost with few small prickles.

Leaflets ovate to ovate-lanceolate, nearly uniserrate with few fine glands, more frequently glandular uniserrate to biserrate or clearly glandular biserrate, often various on one individual; serration of young shoot not rarely onion-shaped (as often in *R. tomentosa*); the upper side of the leaflets weakly to modest hairy, hairs attached, often shiny, mostly of pure, somewhat dark green colour; lower surface  $\pm$  hairy, subfoliar glands lacking (not rare) or scarce to abundant; frequently very young leaves of the shoots strongly glandular, the stalked glands mostly very fine and covering the whole lower surface (often 15-20 x enlargement necessary); stipules without or with glands on the lower surface. Subfoliar glands of leaflets and stipules normally disappearing  $\pm$  completely during growth and aging of the leaves; on this behaviour following observation: a dead part of a stipule was still covered with glands whereas the living part of the stipule was completely eglandular. Pedicel usually significantly longer than the hip, locally also individuals with a high proportion of pedicels shorter than the hip; hips globose, the terminal hip of multiflowered inflorescences rarely approximately piriform; pedicel, hip and back of the sepals usually  $\pm$  densely covered with rather fine stalked glands mostly 0,4 – 0,8 (-

1,2) mm in length, acicles (as those of some forms of glandular *R. caesia* s. l. as *Rosa urimensis* LAGGER & PUGET) lacking; occasionally only hips or only pedicels with glands (eastern parts of Aosta with Valchamporcher). Glands of pedicel and hip decreasing during ripening of the fruit, not rarely disappearing  $\pm$  completely apart from small rests or cicatrices (in contrast glandular forms of *R. caesia* s. l. usually with a high proportion of persistent glands on ripe pedicels and hips; glands usually longer stalked). Sepals pinnate with  $\pm$  large lobes, rarely somewhat erect, mostly irregularly spreading (“flutterig”), nearly spreading or nearly reflexed, the enlarged tops turned downwards ( $\pm$  similar to sepals of *R. tomentosa* with spreading sepals), mainly falling before or with ripening of the fruits, in Aosta end of July to middle of August. Very dry periods as in 2017 and 2018 let them fall earlier.

The author never saw hips of the previous year with persistent sepals with one exception. Styles moderate to nearly villous hairy, forming a hemisphere or short conical column, predominantly covering only parts of the discus. Discus weakly to strongly convex or slightly conical. Diameter of orifice varying between (0,4) 0,5 and 1,05 mm (average of 3-12 measurements) (fig. 3). The knowledge about the colour of the sepals is limited. Two herbarium specimens of the eastern part of Aosta (herbarium BOVIO 2837, herbarium AO-N.SFV-2884) show dark rose petals (see above), an old petal of my specimens from Valpelline has still traces of rose. Rubbed glandular leaves (young shoots) and glandular parts of the flowers smell like resin; occasionally the glands are glutinous.

Most of these features are known as typical for *Rosa abietina* (HENKER 2000, CHRIST 1873, KELLER & GAMS 1923, Keller 1931). Alt-

hough in contrast to HENKER (2000), the specimens mainly have a rather narrow orifice and flat discs are absent. *R. abietina* of Aosta stands out by rather low variability in features of the flower and fruit. Few specimens with very narrow orifice of the east of the valley have less glandular pedicels, hips or sepals. It has not yet been fully clarified if this is caused by degradation of glands. Locally, the disc is strongly convex. This feature is combined (as in other roses of section *Caninae*) with a very narrow orifice. The orifice size distribution with two indicated peaks will be caused by these differences in disc (fig. 3). Overall, the bell-shaped frequency distribution of the size categories does not imply two different taxa by means of the orifice. The uniformity of the very fine glands of the leaflets as well as of the fine stalked glands of sepals and hips are striking. The leaves are rather variable in serration and quantum of glands as can be seen from the description above.

BALLMER (2018) has included one of the authors dried specimens in his genetic studies, due to the narrow orifice as *R. balsamica*. It is accordingly pentaploid or most probably *hexaploid*; the result is not unambiguous. Fresh material from the Swiss resulted in pentaploid *R. abietina*. According to BALLMER (by letter, 2018) the swiss *R. abietina* is presumed as a hybrid between *Vestitae* and *Caninae*.

*R. abietina* can be confused in Aosta with glandular forms of *R. caesia* s. l. (incl. *Rosa subcollina* (CHRIST) KELLER). *R. caesia* is indicated by CHRIST (1873) and KELLER (1931) with spreading or somewhat erect sepals. Glandular forms of *R. caesia* s. l. are distributed and frequent in Aosta. Already KEL-

LER (1904) and ROSSI (1927) mentioned different glandular varieties of *R. caesia* and *R. subcollina*. The sepals are persisting rather long; not seldom they are still attached to hips of the previous year. The prickles of glandular as well as not glandular *R. caesia* are usually weakly curved to curved in the flowering branches just like those of *R. abietina* and rarely hooked. One of the glandular forms growing in Valpelline and rarer in the Valley of Cogne corresponds largely to *R. abietina* apart from the wide orifice and the long persistence of the spreading (mostly) or erect sepals: The hips and pedicels are usually densely glandular, the glands somewhat longer than those of *R. abietina*; the leaflets irregularly glandular-biserrate to glandular-biserrate. Like *R. abietina*, their lower surface has many fine glands, at least of some of the very young leaflets. The diameter of orifice is (1,05) 1,1-1,5 (-1,7) mm. The measured values overlap with those of *R. abietina* (fig. 3) very slightly, only with one specimen.

The diameter of orifice of other forms of *R. caesia* s. l., e. g. *R. caesia* var. *bovernieriana*, do overlap with that of *R. abietina*. The variety *bovernieriana* is together with similar forms the locally most common variety of *R. caesia* in the western part of Aosta: leaflets almost exclusively uniserrate, more rarely uni- to biserrate, without or very poor in glands. Pedicels, hips and backs of sepals glandular to glandular-hispid (mainly moderately glandular), sometimes with acicles; the glands rather long stalked. Diameter of orifice wide, 1,1-1,5 (-1,8) mm; locally (e. g. Valley of the Gr. S. Bernard) there are individuals with almost the same features but diameter of orifice 0,8-

1,2 mm and glands of pedicel exclusively dispersed (forms of *R. subcollina*).

There are similarities between *R. abietina* and a form of *Rosa corymbifera*, which is distinguished as *Rosa obtusifolia* DESV. non auct. mult. (see above). The similarities concern particularly form and size of the leaflets. Individuals of *R. corymbifera* with glandulous pedicels, rarer also glandulous hips (*R. corymbifera* var. *deseglisei*) remind even more of *R. abietina*. In contrast to *R. abietina*, the leaves of these taxa are without glands, the sepals reflexed, the petals whitish and the orifice exclusively narrow. Pedicels and hips of *R. deseglisei* are only scarcely to moderately glandulous.

### 6 *Rosa abietina* in other regions

Herbaria specimens of the museums mentioned above has been reviewed with special consideration of the orifice. 41 specimens with suitable fruits could be evaluated. However, the sampling size with 1–5 (-10) fruits per specimen was clearly smaller than that of fresh material. 20 specimens have narrow orifices (diameter of 0,45-0,79 mm) (fig. 4), that corresponds to the L-type. The diameter of orifice of 10 specimens is about 1 mm (0,9-1,2 mm); that corresponds to the L/D-type. 11 specimens have orifices with a diameter of 0,8-0,9 mm; a clear allocation to one of the growth-types does not appear feasible. The L/D-type is more likely if one takes shrinkage of fruits in account.

The approximated values of specimens of the Jura Mountains (MNHN Paris) could be compared with values of fresh material. These are specimens collected by GRENIER in La Fresse near Pontalier. In brackets the measurements of the diameter of orifice and discus index (DI,

discus index: diameter of discus/diameter of orifice):

P03327440 (0,7, 0,5, 0,6 mm; DI 5,4),  
P03327442 (0,6 mm, DI 6),  
P03327443 (0,9 mm, DI 4,5),

Measurements of fresh material: Diameter of orifice 0,7 mm (n = 8), discus index 5,7 (n = 8).

By far most of the specimens have a + convex discus, more rarely a slightly conical discus. The indications of a flat discus (KELLER 1931, HENKER 2000) do not generally apply (see above). The studied specimens are rather variable in hairiness and glands. That applies also to form and size of prickles. The serration of leaflets is often bi- to uniserrat, regionally also more complex (e. g. Jura Mountains, Bavarian Alps). Glands of the petioles and rachis often numerous (in Aosta numerous to scarcely); their form and quantity correspond to quantity of leaflet glands. Shortly stalked glands, added by some longer stalked glands, is typical for the widespread less glandular forms of *R. abietina*. Very glandular leaves are characterised by many distinct types of petiole glands (see below the individuals of the Jura Mountains). Judging from some specimens, the sepals are falling regionally later than in Aosta. Hips and pedicels are almost exclusively + densely covered with stalked glands, which are rather variable in size. Pedicels with only few, mainly small glands are the exception. Individuals with this kind of pedicel may be locally predominant (Bavarian Alps) or the exception among very glandular individuals (valley of Tamina, CH).

*R. abietina* of Aosta resembles individuals of the northern chains of the Swiss Alps. Some of them are determined as var. *thomasi* like those of Aosta by KELLER in ROSSI (1927). Striking regional expressions of characteristics in other regions should be described by *R. abietina* of the Jura Mountains (F, CH) and the valley of Tamina (CH).

French Jura Mountains near river Doubs: The Muséum national d'Histoire naturelle Paris (France) is keeping a number of specimens of this region, collected by GRENIER and named by this author for the first time as *R. abietina*, revised and confirmed by CRÉPIN (P03240815, P03327440 – P03327445, P04202574, P04202575, P04202577). At one of the known locations, the author could additionally study fresh material. Conspicuous characteristics of these  $\pm$  uniform specimens are: young and older stems at least dried clearly dark bluish/purple, fresh young stems light purple; prickles strong, slender and rather long with slightly enlarged basis, slightly curved or nearly straight, less frequent clearly curved in the flowering branches, more frequent on the main shoots or new shoots (M. SIMON, Munster, F., has called my attention to the prickles of the shoots); prickles occasionally laterally compressed, broaden to the base, the sides somewhat sunken (this is a feature occasionally to be seen in *R. tomentosa*); leaves like fruits and sepals with clear scent of resin; petiole and rachis  $\pm$  hairy, with small prickles, with numerous sessile to short-stalked glands of different size, additional long-stalked glands and transitions from long-stalked glands to acicles and small prickles (similar to divers forms of *R. tomentosa* as var. *foetida*); leaflets slightly ovate or elongated-ovate, base round-

ed or slightly cuneate, their upper side hairless to weakly haired, the lower side whitish to brightly grey green and moderately hairy, predominantly glandular bi- to multiserrate; sub-foliar glands usually present and in variable amounts, almost the midrip with numerous glands, the most glandular leaflets rarely with some suprafoliar glands; inflorescences often multiflowered (specimen collected 2019), pedicels longer than hips, hips globose, often piriform or approximate piriform (fig. 5), pedicel and hips with numerous stalked glands, orifice (0,5) 0,7-0,9 mm in diameter, discus  $\pm$  convex; styles very slightly hairy, sepals spreading, during ripening of hips still attached end of August/beginning of September. A specimen of the Swiss Jura Mountains collected by LERCH near Couvet (MNHN Paris P03240815 under *R. tomentosa*) shows a good part of the sepals still attached beginning of October.

The description refers to the specimen that the author has collected in La Fresse and to herbarium specimens (MNHN Paris) of the French and Swiss Jura Mountains on both sides of river Doubs. Individuals further eastwards (herbarium É. CHAVANNE, Moutier, CH) and in the Vosges Mountains (Herbarium Senckenberg) are similar, but more strongly remind us of *R. tomentosa*. The leaves are less glandular, but moderate to tomentose hairy, the leaflets often somewhat less serrated, those of the new shoots partially uniserrated, the serration onion-shaped; the scent of resin not striking (É. CHAVANNE), “leaves or sepals must be rubbed” (M. SIMON, Munster, F). There are only few measurements of the orifice; the diameter of the specimens collected by É. CHAVANNE is very approximately 0,8-1,2 mm. The bushes of the whole Jura Moun-

tains have mostly rather large leaves. Inflorescences with four flowers and more (4-9) amount to about 19 %. For comparison: KELLER (1931) records 11 % for *R. tomentosa* s. l. and 6,6 % for *R. abietina*; the author have determined 6 % for *R. abietina* of Aosta. It is noteworthy that the multiflowered inflorescences of the 10 specimens collected by GRENIER (9) and LERCH (1), most of them in La Fresse, only have a proportion of 8,6 %.

The author shall discuss below why it is better to attach the individuals of the Jura and Vosges Mountains by means of morphological features to *R. tomentosa* s. l.

Valley of Tamina (Swiss, Canton St. Gallen): The herbaria of the Botanical Museum Berlin (B) is keeping 11 specimens, originated from the valley of Tamina (Swiss), collected and determined by DINGLER as *R. abietina* var. *taminae* KELLER. These specimens are remarkable by their very hirsute leaflets, wooly stigmas and strikingly small fruits. The leaves are often unusually large. The stipules of all the specimens are red brown. The leaflets of most of the specimens are scarcely glandular bi- to uniserrate or uni- to biserrate, scarcely glandular on lower surface, at least only on the main nerve, glands clearly stronger than those of individuals in the Aosta Valley. The variety *taminae* is counted amongst the varieties of *R. abietina* without or with scarce glands on the lower surface of the leaflets (KELLER 1931). Hips and pedicels well equipped with rather strong stalked glands with exception of one specimen with only few rather fine glands. The tomentose leaflets and a great proportion of only slightly curved prickles remind of the subsect. *Vestitae*. Striking are two specimens of the upper valley of Tamina.

They are very similar to the 9 specimens of the lower valley in size and hairiness of leaflets

and in size, colour of stipules, size, form and glands of the hip. However, broad orifices, planar discus, stigmas, which are forming a broad villous cushion, and  $\pm$  erect sepals point out the D-type, a glandular form of *R. caesia* s. l. like *R. uriensis*. Further differences are bi- to multiserrate leaflets and a lot of subfoliar glands. The stalked glands of the hips and pedicels are mixed with small acicles to a greater extent than the specimens of the lower valley.

### 7 *Rosa balsamica*

*R. balsamica* in Westphalia and Lower Saxony clearly differentiates from *Rosa abietina* of Aosta. In this region, *R. balsamica* is widely consistent with the description of TIMMERMANN (1992), GRAHAM & PRIMAVESI (1993), HENKER (2000) and LAUBER & al. (2018). Following discriminating features of *R. balsamica* should be mentioned: prickles mostly stouter and more hooked; leaflets to a greater extent oval, shortly acute or rounded, nearly almost distinctly glandular-biserrate, like typical *R. abietina* and var. *thomasi* subfoliar glands in changing quantity and fine, but the main nerve nearly always with glands, usually of dark colour and mostly well visible; like *R. abietina* and glandular forms of *R. caesia* young leaflets often with lot of subfoliare glands, rubbed smelling like resin; the upper side of the leaflets may be similar in both species, but is more variable in *R. abietina* and more specific in *R. balsamica*: dark green and shiny, wrinkled due to deepened veins (TIMMERMANN 1992), at most scarcely hairy. Petals predominantly white, in buds pale rose; at least in parts of Westphalia and Lower Saxony flowers with 4 petals not rare; sepals usually reflexed, occasionally also spread (KAPLAN, unpublished); back of the sepals, pedicel and hip always without glands; according HENKER

(2017) hips and pedicels eglandular, “very rare scarcely glandular” in Central Europe.

Specimens of Lower Saxony (Bad Bentheim) and the Swiss are identified by BALLMER (2018) as hexaploid; according to this author, they are hybrids between the subsections *Caninae* and *Vestitae*.

## 8 Discussion

*R. abietina* does not always fit into the scheme of growth-types that assists in modern floras to identify species of Section *Caninae* (HENKER 2000, 2017, LATTANZI 2019, BORNAND 2013, FISCHER & al. 2005). Although the position of the sepals on ripening fruits is rather constant, mainly  $\pm$  spread to slightly reflexed, the diameter of orifice may considerably vary between (0,4) 0,5 and 1,1 mm on average values. Highest single values are 1,15-1,2 mm.

These characteristics of the orifice are similar in *Rosa tomentosa* s. l. (sect. *Caninae*, subsect. *Vestitae*), which is regarded as relative of *R. abietina* (KOOPMAN & al. 2008, BALLMER 2018). The deviations of the orifice seem to be even somewhat stronger. Narrow and very narrow orifices as well as orifices with diameter round about 1 mm, maximum 1,3 mm (REICHERT 2013, KAPLAN 2016a) are combined with spread, more rarely somewhat reflexed sepals (GRAHAM & PRIMAVESI 1993). Maximum single values are 1,4-1,6 mm. In larger parts of the area  $\pm$  erect and late falling sepals may be combined with narrow and very narrow orifices (KAPLAN 2016a, TIMMERMANN 1992 for *R. pseudoscabriuscula*). The position and persistence of sepals can vary from year to year and between neighbouring bushes. Weather conditions and habitat condi-

tions may have an influence (KAPLAN 2016a). A clear assignment of *R. tomentosa* s. l. to L-type or L/D-type is not always possible, the distinction of *R. tomentosa* and *R. pseudoscabriuscula* difficult (compare REICHERT 2011, 2013). Finally, the scheme of growth types does not apply very well to the *Vestitae* and the *Tomentellae*.

*R. abietina* and glandular forms of *R. balsamica* are easily to confuse (HENKER 2000) and perhaps not always unambiguous to determine. Both species seem to be differently variable. *R. abietina* appears in the whole area very variable in features as petal colour, form, serration, hairiness and glands of leaves, form of prickles as well as diameter of orifice. There is hardly another rose species with as many indicated petal colours. Multiple hybridogenous origin may be an important source of the variability.

Different seed parent (*Caninae* or *Vestitae*) may explain the variability in this rose taxon. According to DE COCK & al. (2008), introgression has great influence on morphological and genetic differentiation within local rose populations (see also HERKLOTZ & al. 2017, JÜRGENS & al. 2007). Low genetic exchange between isolated valleys may support the regional and local differentiation and may explain the extraordinary diversity of *R. abietina* and other rose species in the Alps.

As representative of Sektion *Caninae*, *R. balsamica* is considered too as rather polymorph; this applies particularly hairiness, equipment of glands and form of leaflets (HENKER 2000), but the widespread typical form of *R. balsamica* “is most easily separated” by its characteristic combination of features (GRAHAM &

PRIMAVESI 1993). The author could determine in Westphalia and Lower Saxony an extensive uniformity of features; photo and description in TIMMERMANN (1992) or LAUBER & al. (2018) demonstrate comparable characteristics even in more distant areas. Uniformity of features suggest *R. balsamica* as an apomictic species at least in larger parts of its area. High occurrence of flowers with only four petals and other, but rare malformations of petals in southwestern Lower Saxony and northwest Westphalia may indicate apomixes (fig. 8).

In more peripheral and smaller parts of its area, *R. balsamica* may considerably varying in its features. HENKER (2000) mention a northern form of *R. balsamica* with scarcely hairy leaflets cuneate at base, *R. balsamica* var. *sclerophylla* (SCHEUTZ) CHRIST. However, according to this author, the most important deviations concern absence or presence of glands in the flower area. Forms with glandular pedicels and base of the hips occur predominantly in the Alps (KELLER & GAMS 1923, KELLER 1931) and coastal regions (DE COCK & al. 2008, BAKKER & al. 2011). Moreover, glandular forms of subsection *Tomentellae* cannot be assigned to *R. balsamica* on the basis of a narrow orifice without doubt as shown in the present study. The shape of prickles and position of leaflets, which are considered distinctive features within the *Tomentellae* (CHRIST 1873, KELLER 1931) too, may be also less reliable than anticipated. According to KELLER & GAMS (1923) *R. balsamica* var. *tirolensis* (KERNER) CHRIST and var. *halacsyi* H. BRAUN have for longer time adhering sepals, var. *glaucoides* R. KELLER and var. *tridentina* GELMI rose petals, features more typical for *R. abietina*. For concerning the treatment of *R. balsamica* var. *tirolensis* by CRÉPIN, see below. Different assignment of the only taxon of *Tomentellae* in Aosta by KELLER (1904), KELLER

in ROSSI (1927) and CRÉPIN (1891: 110, 114) are not surprising.

The traditional separation of *R. balsamica* with glandular pedicels and *R. abietina* by morphological means is not satisfying. Perhaps this problem may be solved only by genetic studies. It is to consider whether glandular forms of *R. balsamica* in the Alps and their borders better comply with the morphospecies *R. abietina*. A specimen of *R. balsamica* var. *tirolensis* collected by A. KERNER was identified by CRÉPIN as *R. abietina* (P03240814, stored under *R. tomentosa*). The long, less curved prickles may have inspired CRÉPIN. The key of roses in the first edition of the “Exkursionsflora von Österreich” (ADLER & al. 1994) corresponds to this alternative, but no longer in the second edition (FISCHER & al. 2005). Single and very rare exemplars with glandular pedicels in the area of the typical *R. balsamica* may be hybrids.

Additionally, *R. abietina* can also be confused with *R. uriensis* and similar glandular forms of *R. caesia*. CHRIST (1873, 1874) has considered *R. abietina* in a broad sense. Beside the typical form, the author notes several forms, which are assign by later authors to other species. That may be related to CHRIST’s weighting of features. Beside the glandular hips, the ovate form and the round base of the leaflets play a role (CHRIST 1874). Some of his forms like *R. uriensis* have clear features of mountainous roses (D-type). KELLER (1931) and KELLER & GAMS (1923) put *R. uriensis* (incl. other forms) as *R. afzeliana* FRIES subsp. *uriensis* (Lagg. & Pug.) KELLER & GAMS on the level of *R. caesia* (*R. afzeliana* subsp. *coriifolia* [FRIES] KELLER & GAMS). Typical features that differentiate *R. caesia* and *R. uriensis* from *R. abietina*, are short pedicels, broad villos cushion of styles and broad orifice. The

sepal position of *R. caesia* is not a reliable feature and can be variable. According to KELLER & GAMS (1923), the sepals are spread after flowering, gradually  $\pm$  erect, according to HENKER (2017) during reddening of fruits usually diagonally or steeply erect, more rarely spread, according to TIMMERMANN (1992) after flowering remaining spread to erect on the hips. In the Aosta Valley, the sepals are often spread or irregularly spread during ripening of the fruits. Not rarely this position of sepals can still be seen at fruits of the last year. Even reflexed sepals occur together with broad orifices, although rarely. Drying of specimens may change the position of sepals. Identification mistakes may happen with fresh as well as dried specimens, if only or mainly the petals receive attention.

New discoveries of *R. abietina* are recorded from the Black Forest (LÜTH 2000, 2003). Description and photo are showing typical features of the D-type of roses (but irregularly spread sepals). The new discoveries should be checked to exclude confusion with glandular *R. caesia*. LOOS (2000) and BFN (2020) have unfortunately adopted a broad orifice as feature of *R. abietina* („Griffelkanal deutl. über 1 mm br.“). However, broad orifices are untypical for this species.

This study points out greatest similarity between *R. abietina* and some glandular forms of *R. caesia* s. l. and makes us understand the broad definition of *R. abietina* by CHRIST (1873). A glandular form of *R. caesia* is essentially differing from *R. abietina* in Aosta only in distinctive features of the growth types, in the diameter of the orifice and position of the sepals. The similarities between two growth

types (the united L- and L/D-type as well as D-type) of the valley of Tamina are significant too (fig. 7). A question of matter is if these two pairs of growth types developed from one taxon as adaptations to altitude level or if they are a product of hybridisations with different pollen parents? This question may be solved by future genetic studies.

It may also be difficult to separate *R. abietina* from *R. tomentosa*: Some of the forms assigned by CHRIST (1873, 1874) to *R. abietina*, f. *gisleri* (PUGET) CHRIST, f. *confusa* (PUGET) CHRIST, are regarded by KELLER (1931) and KELLER & GAMS (1923) as forms of *R. tomentosa*; that seems also to apply to *R. abietina* of the Jura Mountains. The systematic position of *R. abietina* of the Jura Mountains is an unsolved question since GRENIER. Different features of these individuals are characteristic of *R. tomentosa* as large slender prickles of slightly curved or straight form (HENKER 2000: prickles of *R. abietina* usually small, slender, slightly curved to falcate or nearly straight, more rarely hooked), pruinose branches, rather large leaves, petioles and rachis often with rather variable glands and prickles, inflorescences strikingly often multi-flowered, pedicels often rather long. Extremely glandular leaves are more characteristic of forms of *R. tomentosa* than of forms of *R. abietina*.

A further question is which kind of features are making the individuals of the Jura Mountains near river Doubs ambiguous (sect. “Ambiguae”) in the eyes of GRENIER? According his description of section *Villosae* GRENIER (including *R. tomentosa*) and section *Ambiguae* GRENIER (GRENIER 1865, p. 230, 235) the moderately hairy leaves in contrast to to-



mentose leaves of sect. *Villosae* and the prickles, which are slender conical and  $\pm$  curved in sect. *Ambiguae*, almost slightly curved in sect. *Villosae*. Also according to SIMON (by letter), *R. abietina* of the Jura and the Vosges regions differ from *R. tomentosa* s. l. in clearly curved prickles of the shoots (according HENKER 2000 the prickles of annual shoots of *R. abietina* rarely even hooky) and in addition in irregularly spread sepals (*R. tomentosa* s. l. with equally spread sepals). However, these two features also occur in *R. tomentosa* s. l., although curved prickles are more rarely. A bush in the Jura Mountains near river Doubs was determined by the author in the field spontaneously as *R. tomentosa* by its tomentose grey green leaves. The sepals are irregularly spread (fig. 9), and some of the prickles are rather curved (fig. 10). The leaflets have the same whitish underside as Grenier's *R. abietina*. Bushes of *R. tomentosa*, that the author have checked with respect to prickles in southwest Lower Saxony, not rarely have single clearly curved prickles, main shoots of some bushes even predominantly curved prickles (fig. 11, fig. 12).

Altogether the individuals of the Vosges region (DRESSLER & al. 2015 ff) and Jura region named as *R. abietina* are demonstrating biggest similarity with *R. tomentosa*. Since curved prickles are not really distinctive features, these individuals should be attached to *R. tomentosa* s. l. The individuals near river Doubs, where GRENIER has found his specimens and to which his description refers, vary somewhat widely by less hairy and extremely glandular leaves and often piriform hips. They should be treated as variety of *R. tomentosa* s. l., probably exactly what CRÉPIN would like to see.

It seems possible that *R. abietina* represents hybrids (hybrid swarms) between subsections

*Caninae* and *Vestitae* or a species, as a result of introgression as well as of past hybridisation associated with isolation, apomixis or autogamy. The following is speaking for species character in Aosta: *R. abietina* is widespread in the mountain level of Aosta, but thereby rather constant in characteristic features. *R. tomentosa* s. l., which may be a pollen parent regarding the spread sepals and the rather variable orifice of *R. abietina*, (RITZ & WISSEMANN 2003, 2011 for *Caninae*  $\times$  *Rubigineae* hybrids) is lacking in Aosta. The common *R. villosa* has a very broad orifice (HENKER 2000, KAPLAN 2016b) and may be involved as seed parent (*R. canina* or *R. corymbifera* as pollen parent).

However, *R. villosa* is growing in the high mountain and subalpine levels; it is only locally in contact with *R. abietina* and the potential pollen parents. *R. villosa* has several striking features, which are not indicated in *R. abietina*, as stolons, straight prickles, glandular petals and large leaflets. GRAHAM & PRIMAVESI (1993) describe the hybrid *R. mollis*  $\times$  *R. canina* as follows (*Rosa mollis* SM. is widely identical with *R. villosa*, KELLNER & al. 2014, KAPLAN 2016b): "General habit of *R. mollis*, but with rather broad-based, curved prickles on the main stems amongst the main armature of straight, patent prickles. [...] Hips are smaller and of varying shapes. Sepals reach an erect position on ripening fruit but fall early." This does not apply to *R. abietina* of Aosta which has always  $\pm$  globose hips and mostly (slightly) curved prickles. *R. abietina* belongs to the rarer species in Aosta and is often growing with single bushes, a possible indication for hybrids, but locally also somewhat cumulatively. At some of these latter locations, the species has been noted persistently for 120-130 years, without disappearing by backcrossing.

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Fig. 1: Glandular pedicels and hips as well as  $\pm$  spread sepals are features of *R. abietina*. Aosta, Valpelline near Doues, Kaplan, July 2017.

Abb. 1: Drüsige Blütenstiele und Hagebutten sowie  $\pm$  gespreizte Kelchblätter sind Merkmale von *R. abietina*. Aosta, Valpelline in der Nähe von Doues, Kaplan, Juli 2017.



Fig. 2: Ripening fruits of *R. abietina*. Fruits and pedicels have lost already a part of their stalked glands. Aosta, Villeneuve Kaplan, August 2018.

Abb. 2: Reifende Früchte von *R. abietina*. Früchte und Blütenstiele haben bereits Teile ihrer gestielten Drüsen verloren. Aosta, Villeneuve, Kaplan, August 2018.

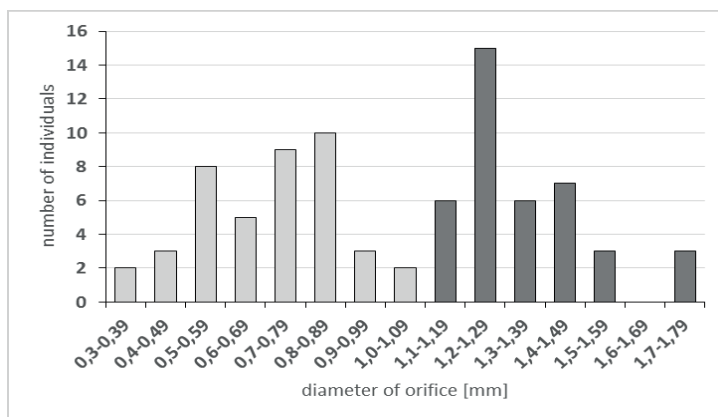


Fig. 3: *R. abietina* and a very similar glandular form of *R. caesia* s. l. in Aosta: diameters of orifices. Grey: *R. abietina*, dark grey: glandular form of *R. caesia* s. l. with widely identical characteristics. The specimens with extraordinary narrow orifices (0,3-0,39 mm) are not to be assign without doubt to *R. abietina*. Very narrow orifices are combined with slightly conical disci.

Abb. 3: *R. abietina* und eine sehr ähnliche Form von *R. caesia* s. l. in Aosta: Durchmesser des Griffelkanals. Grau: *R. abietina*, dunkelgrau: drüsige Form von *R. caesia* s. l. mit größtenteils identischen Merkmalen. Die Exemplare mit außerordentlich schmalen Griffelkanälen (0,3-0,39 mm) sind nicht ohne Zweifel *R. abietina* zuzuordnen. Sehr enge Griffelkanäle sind kombiniert mit leicht konischen Diskussen.

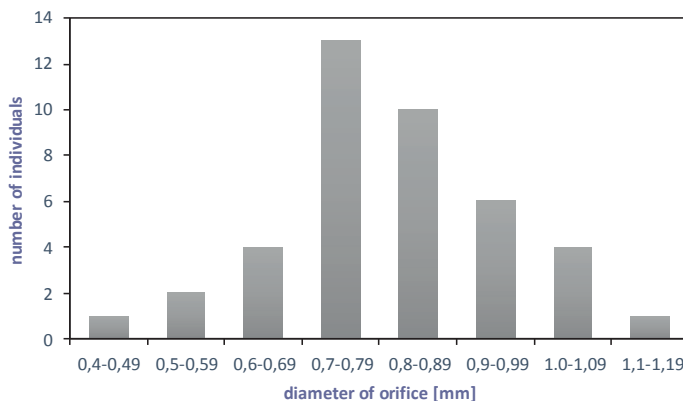


Fig. 4: *Rosa abietina* (entire area excl. Aosta): diameter of orifices; approximate values of herbarium specimens.

Abb. 4: *Rosa abietina* (gesamtes Areal ausg. Aosta): Durchmesser der Griffelkanäle; ungefähre Werte untersuchter Herbarexemplare.



Fig. 5: *R. abietina* in the Jura Mountains near Pontalier. The hips are often piriform, the prickles often long, slender, often straight to slightly curved, the branches light violet and pruinose, dried dark bluish purple, inflorescences often multiflowered, the underside of the leaflets whitish to brightly grey-green. Kaplan, August 2019.

Abb. 5: *R. abietina* im Jura-Gebirge in der Nähe von Pontalier. Die Hagebutten sind oft birnförmig, die Stacheln oft lang, schlank, häufig gerade bis leicht gebogen, die Zweige leicht violett und bereift, getrocknet dunkelbläulich-violett, Blütenstände sind häufig vielblütig, die Unterseite der Blättchen weißlich bis hell grau-grün. Kaplan, August 2019.





Fig. 6: *R. abietina* near Pontalier. Typical slender, nearly straight prickles and clearly curved prickles of older shoots (upper margin of the figure). Kaplan, August 2019.

Abb. 6: *R. abietina* in der Nähe von Pontalier. Typisch schlanke, fast gerade Stacheln und deutlich gebogene Stacheln von älteren Schößlingen (oberer Rand der Abbildung). Kaplan, August 2019.

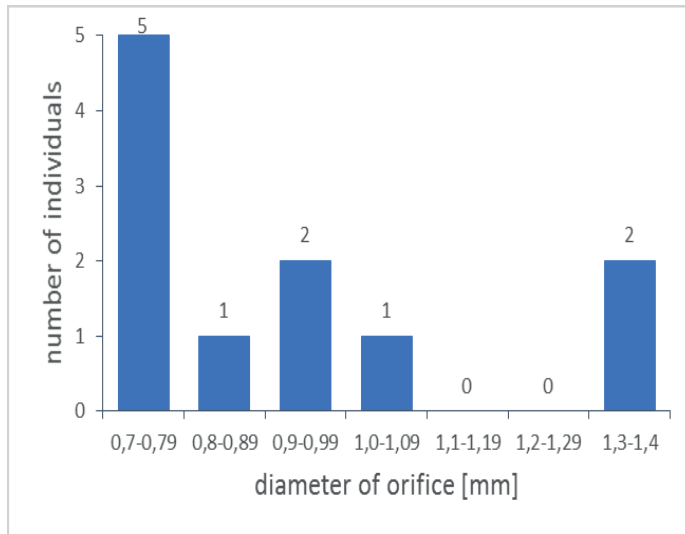


Fig. 7: *R. abietina* and glandular *R. caesia* s. l. of the valley of Tamina (CH): diameter of orifice (approximate values). The specimens were collected by DINGLER as *R. abietina* var. *taminae*. Both individuals with broad orifices are from the upper valley of Tamina. The broad orifices as well as broad, villous style cushions and short pedicels characterised them as D-type of *Caninae*-roses. The extensive conformity of all the individuals in characteristic features is striking.

Abb. 7: *R. abietina* und drüsige *R. caesia* s. l. aus dem Tal von Tamina (CH): Durchmesser des Griffelkanals (ungefähre Werte). Die Exemplare wurden von DINGLER als *R. abietina* var. *taminae* gesammelt. Beide Individuen mit breitem Griffelkanal stammen aus dem oberen Tal von Tamina. Der breite Griffelkanal wie auch der breite Griffelboden und kurze Blütenstiele charakterisieren sie als D-Typ der *Caninae*-Rosen. Die weitestgehende Übereinstimmung in den charakteristischen Merkmalen aller Individuen ist auffällig.



Fig. 8: *R. balsamica* in Westphalia. Flowers with only four petals and malformed petals may point to apomixis, Teutoburger Wald in the West of Tecklenburg-Brochterbeck, Kaplan, June 2019.

Abb. 8: *R. balsamica* in Westfalen. Blüten mit nur vier Kronblättern und missgebildeten Kronblättern deuten auf Apomixis hin. Teutoburger Wald westlich von Tecklenburg-Brochterbeck, Kaplan, Juni 2019.



Fig. 9: *R. tomentosa* s. l. in the Jura Mountains near river Doubs with typical grey-green leaves and irregularly spread sepals. Kaplan, July 2019.

Abb. 9: *R. tomentosa* s. l. im Jura-Gebirge in der Nähe des Flusses Doubs mit typischen grau-grünen Blättern und unregelmäßig gespreizten Kelchblättern. Kaplan, Juli 2019.



Fig. 10: *R. tomentosa* s. l. (same bush as fig. 9). Whitish underside of the leaflets like *R. abietina* of the Jura Mountains (fig. 5, fig. 6), same rather curved prickles in the middle ground. Kaplan, July 2019.

Abb. 10: *R. tomentosa* s. l. (derselbe Strauch wie in Abb. 9). Weißliche Unterseite der Blättchen wie bei *R. abietina* aus dem Jura-Gebirge (Abb. 6, Abb. 6) und die gleichen ziemlich gebogenen Stacheln im Mittelgrund. Kaplan, Juli 2019.



Fig. 11: Shoot with falcate (clearly curved) prickles and with broadened base are at least regionally characteristics of *R. tomentosa* s. l. The figure illustrates a main shoot of *R. tomentosa* s. l. in Bad Bentheim, Zum Tüschbrook, Lower Saxony. Kaplan, February 2020.

Abb. 11: Schößling mit sichelförmigen (deutlich gebogenen) Stacheln und mit breiter Stachelbasis sind zumindest regionale Merkmale von *R. tomentosa* s. l. Die Abbildung zeigt einen Hauptschößling von *R. tomentosa* s. l. in Bad Bentheim, Zum Tüschbrook, Niedersachsen. Kaplan, Februar 2020.



Fig. 12: Shoots of *R. tomentosa*: falcate prickles with broadened base. Bad Bentheim, Alter Postweg, Lower Saxony. Kaplan, February 2020.

Abb. 12: Schößlinge von *R. tomentosa*: sichelförmige Stacheln mit breiter Basis. Bad Bentheim, Alter Postweg, Niedersachsen. Kaplan, Februar 2020.