

Some notes on the genus *Epipactis*

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Samenvatting

Gedurende een excursie in het Val d'Escreins (F) werden enkele exemplaren van *E. atrorubens* gevonden op 2570 m hoogte. Tot nu toe werd *E. atrorubens* niet hoger dan 2380 m gevonden. In Andalusië werden twee groeiplaatsen van *E. lusitanica* bezocht. De afmetingen van de planten vielen binnen de specificaties van de soort zoals beschreven door Tyteca. Opvallend was dat de pH-waarden van de bodemon monsters van de groeiplaatsen verschilden van de opgaven door Tyteca.

Aan de hand van afwijkende zuiltjes zoals die gevonden worden bij *E. phyllanthes*, *E. leptochila* en *E. muelleri* komen de auteurs tot de conclusie dat alleen de morfologie van het zuiltje niet voldoende is om te komen tot een sluitende classificering van de verschillende *Epipactis*-soorten. Er zal bij het geslacht *Epipactis* altijd rekening gehouden moeten worden met een afwijkende morfologie van het zuiltje (vooral bij autogame soorten), zonder dat dit leidt tot een afsplitsing als eigen soort.

Summary

During an excursion in the Val d'Escreins (F) some plants of *E. atrorubens* were found at 2570 m. Up to now *E. atrorubens* was not found growing above an altitude of 2380 m. In Andalusia (S) two sites of *E. lusitanica* were found. The plants matched the description given by Tyteca, but the pH-values of the growing places differed from the measurements of Tyteca. After describing deviant columns of *E. phyllanthes*, *E. leptochila* and *E. muelleri* the authors come to the conclusion that column morphology

is important in classification, but only using the column morphology in determination of an *Epipactis*-species may lead to the wrong conclusions. When dealing with the genus *Epipactis* one should always be aware of the possibility of plants having a deviant column (occurring regularly in autogamous species), but this does not imply that those plants should be considered as independent species.

Zusammenfassung

Während einer Exkursion im Val d'Escreins (F) wurden einige Exemplare von *E. atrorubens* in einer Höhe von 2570 m. gefunden. Bis jetzt wurde *E. atrorubens* nicht höher als 2380 m gefunden. In Andalusien (S) wurden an zwei Stellen Exemplare von *E. lusitanica* gefunden, die in allen wichtigen Merkmalen mit der Originalbeschreibung von Tyteca übereinstimmen. Auffallend waren die Ergebnisse der pH-Messungen, die von den Daten von Tyteca abwichen. Nach einer Beschreibung abweichender Säulchen von *E. phyllanthes*, *E. leptochila* und *E. muelleri* kommen die Autoren zur Schlussfolgerung, dass man bei der Klassifikation der Gattung *Epipactis* nicht nur von der Morphologie des Säulchens ausgehen kann. Bei der Gattung *Epipactis* muss man sich immer davon bewusst sein, dass abweichende Säulchen auftreten können (vor allem bei den autogamen Arten), ohne dass dies bedeutet, dass man diese Pflanzen als separate Arten betrachten soll.

1. *Epipactis atrorubens* at high altitude

The Queyras region is situated in the south-east of France. This region is well known among botanists for its rich flora. For the orchid-lovers *Nigritella corneliana* is one of the reasons to visit



Epipactis lusitanica
Elvira, 10th April 1995

this region. This orchid can form extensive populations, which are usually situated on the slopes facing north (Presser 2000).

During an excursion in July 1995 we visited the Val d'Escreins, situated southeast of Guillestre. One of the summits of the park is the Col de la Coulette, a mountain certainly worth visiting for its rich flora. At 2570 meters we found, to our great surprise, some plants of *Epipactis atrorubens*. Two plants were only vegetative, while two other plants were about one week before anthesis. The site was located on a ridge facing southwest, sheltered from the weather by rocks. The accompanying plants were among others: *Silene acaulis*, *Silene rupestris*, *Viola calcarata*, *Sedum atratum*, *Erysimum decumbens*, *Myosotis alpestris*, *Astragalus alpestris* and the endemic *Berardia subacaulis*.

It was quite a surprise finding *E. atrorubens* at

this altitude, because all authors (for example Buttler 1986, Baumann & Künkele 1988, Delforge 1994, Baumann & Künkele 1998, Lorenz 1998, Presser 2000) mention 2380 meters altitude as being the upper limit for this species. The only *Epipactis* that can be found at a higher altitude is *Epipactis persica*, which is known to grow up to a height of 2700 meters. One might add *E. helleborine* which, according to Baumann & Künkele grows up to a height of 3700 meters, but most likely these dates are based on Asian plants.

2. *Epipactis lusitanica* in Andalusia (Spain)

Up to now this species, described by Tyteca in 1988, remained rather unknown to most orchid searchers, probably due to the fact that most attention of the orchid-lovers is paid to the eastern Mediterranean region. On the 21st of April 1995 we visited a site near the village of Casares, about 30 km north-east of Gibraltar. The site is situated at 380 meters altitude, is covered with *Quercus suber* and is extensively grazed by goats. The site is inclining and shows gradients from basic to more acid soil. On the highest part of the site, on calcareous soil some orchids like *Limodorum trautmanii*, *Ophrys tenthredinifera* and *O. ciliata* are found. In the lower, more acid part of the terrain we found *Neotinea maculata*, a species of little alkaline to weakly acid terrains, along with *Serapias parviflora*, *S. lingua* and *Epipactis lusitanica*.

Epipactis lusitanica is characterised by short leaves, mostly oval, more or less in two distinct rows, with normally sinuate margins, a bronze green inflorescence that is densely pubescent, a long upper internode, widely opened flowers, and an epichile that is broader than large, its apex pointing backwards. Sometimes the flowers are purple-violet like *E. atrorubens*.

In order to be able to compare our plants with the original description, we took some measurements. The means as calculated ($n = 10$) are given in table 1. All our measurements fall within the specifications as given by Tyteca (1988).

The plants are clearly allogamous: there is a good nectar production, the viscidium is functional and the flowers are well visited.

<i>Epipactis lusitanica</i>	Tyteca	Claessens & Kleynen
Height	20-50 cm	30 cm
Length inflorescence	6-17 cm	12,5 cm
Length last internode	3-8 cm	4,2 cm
Number of flowers	5-25	20
Number of leafs	4-9	7
Length x width	3,5-6,5 x	4,7x3,5 cm
largest leaf	2,3-4 cm	

Table 1: Comparison of the original description as given by Tyteca and the means of the plants we measured.

Near the site, in a wood with *Pinus halepensis* we also found *E. tremolsii*. Around the site with *E. lusitanica* we found some transitions towards *E. tremolsii*. These plants were characterised by leaves that were more regularly placed along the stem, pointing in all directions with longer lowest bracts and flowers that were more intensely coloured.

A second site of *E. lusitanica* was found near Elvira (about 10 km south-east of Marbella), at 20 meters height, see picture on page 97. Here we found one very typical plant of *E. lusitanica*. It was quite interesting to see that *E. tremolsii* grew only 2 meters further. The two *Epipactis*-species were growing in sand in an open *Pinus halepensis*-wood. They were accompanied by numerous *L. trabutianum*. We measured the pH of both sites of *E. lusitanica*. Our findings: Casares: pH 6,6; Elviria: pH 8,4. For the Portugal populations Tyteca found pH values of 4 to 5. This finding might indicate that *E. lusitanica* is, at least in other sites, not as much tied to acid soils as found by Tyteca.

Changes of column structure in some *Epipactis*-species

For most orchid genera the structure of the gynostemium is a discriminative factor, widely used in systematics (Claessens & Kleynen, 1998). In the genus *Epipactis* the old species (e.g. *E. helleborine*, *atrorubens*, *microphylla* etc.) can be determined by using the column structure (Claessens & Kleynen, 1991). During the last years however, we made some observations which



Epipactis phyllanthes
St. Trojan, Île de l'Oleron
10th June 1995

show that the morphology of the gynostemium can change without affecting the general appearance of the plants.

On the Ile d'Oléron a quite particular form of *Epipactis phyllanthes* is found. At first sight these plants fit well into the description of the variety *pendula* as given by Young (1952, p. 267), but a closer look reveals that these plants possess a viscidium (an illustration can be found in Claessens & Kleynen 1994, photo 1). Observations made in 1995 proved that all the plants had a viscidium, though it wasn't functional: the structure of the pollinia was too loose to let them be transported by an insect. Finding a viscidium puzzled us for a long time, because in the description of *E. phyllanthes* it clearly states the lack of a viscidium. According to Delforge (1997)

in some years the plants of the Ile d'Oléron have pollinia that show a relative coherence which might allow allogamy. He considers those plants to be merely a variety of *E. phyllanthus* and therefore described them as *E. phyllanthus* var. *olacionensis*.

It is interesting to see how autogamy in *E. phyllanthus* is made possible. There can be seen several changes in the structure of the gynostemium: the anther is connected to the base of the gynostemium by a thin filament, which brings the anther closer to the stigma. The top of the stigmatic surface is reduced, so that the grains of pollen can drop left or right of the viscidium onto the stigmatic fluid.

The anther has, well before anthesis, already opened and permits the pollinia, which are already deposited in the clinandrium, to come into contact with the stigma. Directly after the impregnation of the pollen grains with the stigmatic fluid the pollen tubes begin to grow, which can best be observed left and right of the viscidium. By means of the impregnation the pollinia are fixed and immobilised, a feature that can be observed in many autogamous species.

In the *E. phyllanthus* of the Ile d'Oléron we observed a particularity of the gynostemium that facilitates autogamy. During anthesis the filament of

the anther grows, thus pushing both anther and pollinia towards the upper stigmatic rim. But at the same time the pollinia are already immobilised after contact with the stigmatic fluid. As a result the anther and pollinia can not move forward, so the back of the anther is lifted, by this movement pushing the pollinia deeper into the stigmatic fluid. When comparing the pictures on page 79, it shows that on the photo above the anther is clearly lifted, thus creating a hole between anther and clinandrium. Maybe Krösche (1936, p. 383) observed the same phenomena in *E. latifolia* (= *helleborine*) var. *praematura*. He mentions an anther, placed a little higher because of a filament which, the long term, creates a hole above the clinandrium.

So here the combination of growth of the filament, which causes a movement of the pollinia towards the stigma, combined with a reduced upper stigmatic rim, which facilitates the contact between pollinia and stigmatic fluid, make autogamy easier and more efficient.

In July 1998 two of us (J. K. & J. C.) visited the locus classicus of *E. peitzii* (Wucherpfennig & Neumann 1996), kindly guided by Mr. H. Neumann. On this occasion we also visited a very interesting site of *E. leptochila* near Molsberg. At first sight it seemed as if we were dealing with

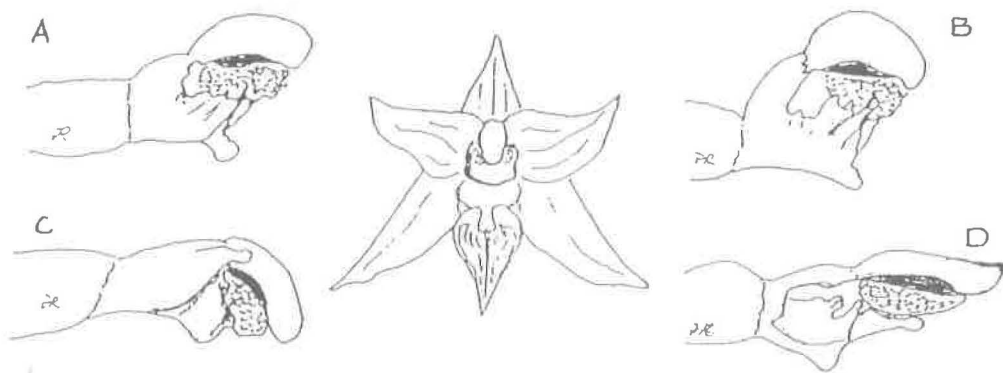
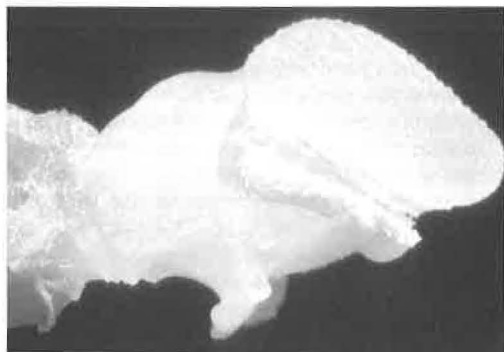


Figure 1

Four various column forms of Thuringian *Epipactis leptochila* (longitudinal section of the column), which in Thuringen are existing with all sorts of transitions between them. Note that the typical column of *E. leptochila* has often developed more or less significant rudimentary staminodes (also see Godfery 1920, plate 553, fig. 1)

Drawings: J. Reinhardt



E. Phyllanthos
Columns in early stage before anthesis



E. Phyllanthos
Sideview column; pollinia pushed forward by a long filament

perfectly normal *E. leptochila*, with the characteristic habitus and the typical flowers with the long lateral sepals and the long-pointed lip. A closer look revealed that the column was quite deviating from the type: the clinandrium, which is normally well developed with *E. leptochila*, was reduced to a small rim, just as we know it from *E. muelleri*. *E. leptochila* is well known for its polymorphy (Claessens & Kleynen 1999), and the finding of this special morph fits well into the large scale of forms that can be found.

In Thüringen one of us (J. R.) observed exactly the same phenomena. The Thüringen plants are

in accordance with the typical *E. leptochila* regarding the essential characteristics (habitus, flowers patent and bell-shaped, hypochile deep, hemispherical, reddish inside and containing nectar; epichile long and acuminate, more or less sagittate, not reflexed; anther with a long filament).

The construction of the column shows considerable differences. The stigma is not quadrangular and oblique to the floral axis but stands almost vertical to the axis of the flower (adaxial). The anther is elongated, overhanging the upper edge of the stigma for at least two thirds of its length. The Thüringen form usually shows no viscidium, it even lacks in the bud stage. As in the Molsberg type, the clinandrium is reduced to a small rim enabling the friable pollinia to fall directly onto the stigma. This column shows a lot of resemblance with the column-shape of *E. muelleri*.

Another conspicuous characteristic is the often deeply spliced, two-lobed form of the stigma. Sometimes the form shows two little teeth at the upper left and right corners of the stigma (rudimentary staminodes) and a conical remnant of the rostellum, which probably represents Krösches forma *tridentifera* (Krösche 1930). But autogamous species regularly show deviating stigmatic forms, which are of no taxonomic importance, as we stated before (Claessens & Kleynen 1997).

The Thüringen plants sometimes are cleistogamic because of the considerable aridity (Reinhardt 1985). It is important though to state that we are dealing here with true *E. leptochila*. The described forms show the important variability of the column in *E. leptochila*, comparable with the great diversity of column-form found in the north-western European *E. phyllanthos* (Young 1952).

We stated before (Claessens & Kleynen 1999) that original description of the Godfery-type of *E. leptochila* (Young 1962), referred to a very strong type concerning habitus and floral elements. In connection with the diversity of *E. leptochila* Young stated that: "The floral architecture shows some variability mainly in the breadth of the labelum and the shape of the column" (Young 1962, p. 131). During the course of time this phenomenon has been ignored by a lot of authors and



Epipactis leptochila; longitudinal section of the column; the photo clearly shows the backwards curled rostellum and the rudimentary clinandrium
Molsberg, 19th July 1999

researchers. Nieschalk & Nieschalk discussed the variability of *E. leptochila* as early as 1970, but it wasn't until recently that more attention was paid to this diversity (Reineke & Rietdorf 1989, Mrkvicka 1990, Tausch 1992, 1995, Claessens & Kleynen 1995, 1999, Mereda 1996, Gévaudan 1999, Presser 2000).

Another interesting morphological change of the column that can be found, is the appearance of a viscidium in *E. muelleri*, a species known to have a highly reduced clinandrium and no viscidium at

all. In Thüringen some *E. muelleri* developed a clinandrium as well as a rostellum with a viscidium. This phenomena can be observed in one or several flowers of the same inflorescence, more rarely in every flower of an inflorescence. The viscidium is never functional, parts of the pollinia can glide downwards left and right of the viscidium. The stigmatic surface is not vertical but oblique to the floral axis. This year one of us (J.K.), kindly guided by Angelika and Heinz Baum, also found *E. muelleri* with a clearly developed viscidium. Inspection revealed, that this viscidium was functional: it was possible to withdraw small parts of the pollinia by means of the viscidium. This change of column structure is not the result of hybridisation, although hybrids are known (Bayer 1986, Tausch 1988). Habit and other characteristics clearly indicate that those aberrant forms are true *E. muelleri*. We consider the form having a viscidium to be an atavistic form, pointing to a descent from allogamous ancestors.

Summarising we conclude that deviant column forms regularly occur in the genus *Epipactis*, especially in the autogamous species. Therefore one should always be careful when determining an *Epipactis*. One should use all the characteristics given of a certain species and check them on various plants, before coming to conclusions. The genus *Epipactis* is well known for its polymorphism, and therefore a different column form doesn't imply that this plant (or population) should be considered as belonging to a separate species. When using a species concept that is too narrow, one can distinguish many species, but this certainly doesn't do justice to the polymorphic nature of this genus.

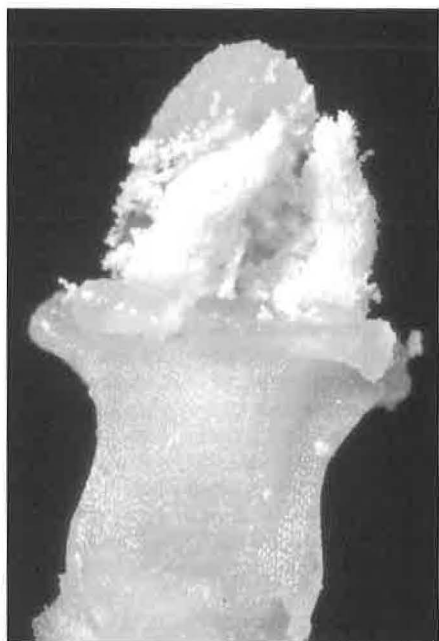
We wish to express our grateful thanks to Mr. Heinz Neumann, Koblenz and Angelika and Heinz Baum, Köln, for guiding us to several *Epipactis* sites. We thank Mr. Heinz Schneider, Göllingen, for helping us locating populations of *E. muelleri* for study. Photography: Jean Claessens & Jacques Kleynen

Literature

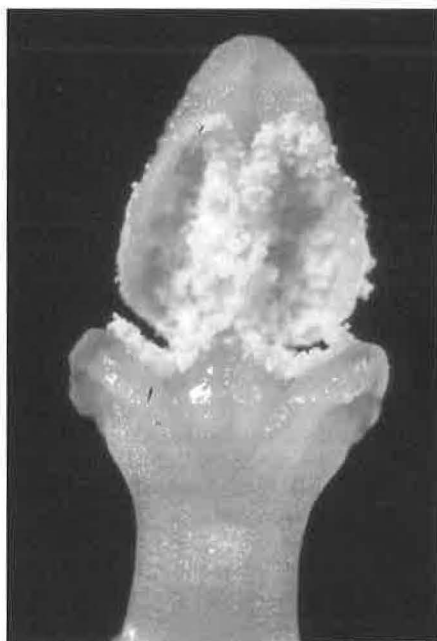
- Baumann, H. & Künkele, S. (1988): Die Orchideen Europas. Kosmos Naturführer, Franckh'sche Verlags-handlung, W. Keller & Co., Stuttgart, 192pp.
- Baumann, H. & Künkele, S. (1998): Die Orchideen in der neuen Flora: Die Farn- und Blütenpflanzen Baden-Württembergs. Jber. Naturwiss. Ver. Wuppertal 51: 113-123.
- Bayer, M. (1986): Interspezifische Hybriden der Gattung *Epipactis* Zinn in Baden-Württemberg. Mitt. Blatt. Arb. Kr. Heim. Orch. Baden-Württ. 18(2): 192-210.
- Buttler, K. P. (1986): Orchideen. Die wildwachsenden Arten und Unterarten Europas, Vorderasiens und Nordafrikas. Steinbachs Naturführer, Mosaik Verlag, München, 288pp.
- Claessens, J. (1992): Enige opmerkingen over de orchideeën in Andalusië (Spanje). Eurorchis 4: 37-51.
- Claessens, J. & Kleynen, J. (1994): Quelques espèces allogames et autogames du genre *Epipactis* en France. L'Orchidophile (114): 210-218.
- Claessens, J. & Kleynen, J. (1995): Allogamie- und Autogamie-Tendenzen bei einigen Vertretern der Gattung *Epipactis*. Ber. Arbeitskr. Heim. Orch. 12(2): 4-16.
- Claessens, J. & Kleynen, J. (1999): Quelques réflexions sur le polymorphisme dans le genre *Epipactis*. Natural. belges 80 (Orchid. 12): 333-342.
- Delforge, P. (1994): Guide des Orchidées d'Europe, d'Afrique du Nord et du Proche Orient. Delachaux et Niestlé, Lausanne - Paris, 480pp.
- Delforge, P. (1997): *Epipactis phyllanthos* G. E. Smith en France et Espagne - Données nouvelles, révision systématique et conséquences taxonomiques dans le genre *Epipactis*. Nat. Belges 78, 3 (Orchid. 10): 233-256.
- Gévaudan, A. (1999): *Epipactis leptochila* (Godf.) Godfery - Variabilité des populations des Alpes et du Jura français, considérations systématiques et taxonomiques. Natural. belges 80 (Orchid. 12): 278-279, 343-371.
- Godfery, M. J. (1920): *Epipactis viridiflora* Reich. J. Bot. (London) 58: 33-37.
- Godfery, M. J. (1921a): *Epipactis leptochila* Godf. J. Bot. (London) 59: 146-147.
- Godfery, M. J. (1921b): *Epipactis viridiflora* J. Bot. (London) 59: 205.
- Godfery, M. J. (1922): *Epipactis leptochila* Godf. J. Bot. (London) 60: 364.
- Godfery, M. J. (1933): Monograph and Iconograph of native British Orchidaceae. Cambridge University Press, Cambridge.
- Keller, G. & Schlechter, R. (1972): Monographie und Iconographie der Orchideen Europas und des Mittelmeergebietes. Autorisierter Nachdruck. Otto Koeltz Verlag, Koenigstein-Taunus BRD.
- Krösche, E. (1930): Vergleichende Betrachtungen des *Epichils* und *Gynostems* aus der Gesamtart *Epipactis latifolia* All. Feddes Rept. 27: 379-383.
- Kümpel, H. (1982): Zur Kenntnis von *Epipactis leptochila* (Godf.) Godfery. Mitt. Arb. Kr. Heim. Orchid. DDR 11: 29-35.
- Kümpel, H. (1996): Die wildwachsenden Orchideen der Rhön - Lebensweise, Verbreitung, Gefährdung, Schutz. G. Fischer Verlag, Jena, 141 p.
- Lorenz, R. & K. (1998): Zum Stand der Kartierung der Orchideen Südtirols. Jber. Naturwiss. Ver. Wuppertal 51: 124-190.
- Mereda, P. jun. (1996): *Epipactis komoricensis*, spec. nova, Orchidaceae - Eine neue autogame Sitterart aus dem *E. leptochila*-Aggregat aus der Slowakei. Preslia 68: 125-134.
- Mrkvicka, A.C. (1990): Beobachtungen an *Epipactis*-Arten in Niederösterreich. Mitt. Blatt. Arb. Kr. Heim. Orch. Baden-Württ. 22: 325-331.
- Nieschalk, A. & Nieschalk, Ch. (1970): Die Gattung *Epipactis* (Zinn) emend. L. C. Rich. (Stendelwurz, Sumpfwurz, Sitter) in Nordhessen, ein Beitrag zur *Epipactis*-Forschung in Deutschland. Abh. Ver. Naturk. Kassel 63: 1-40.
- Nieschalk, A. & Ch., Reichling, L. & Young, D. P. (1970): Die Gattung *Epipactis*. Jahresber. Naturwiss. Ver. Wuppertal Heft 23: 43-50, 96-97, 98-103.
- Presser, H. (2000): Die Orchideen Mitteleuropas und der Alpen. Variabilität, Biotope, Gefährdung. Ecomed, Landsberg/Lech, 2. Auflage.
- Reineke, D. & Rierdorf, K. (1989): Der Orchideenbestand in der natürlichen Einheit Baar - Hochmulde. Mitt. Blatt. Arb. Kr. Heim. Orch. Baden-Württ. 21(2): 167-178.
- Reinhard, H. R., Götz, P., Peter, R. & Wildermuth, H. (1991): Die Orchideen der Schweiz und angrenzender Gebiete. Fototar AG, Druck + Verlag, Egg, X + 348pp.
- Reinhardt, J. (1985): Bemerkungen zum Vorkommen der *Epipactis leptochila* (Godf.) Godfery und *Epipactis muelleri* Godf. im Dün - Eine Zusammenfassung der Untersuchungsergebnisse aus den Jahren 1979-

1984. Mitt. Arb. Kr. Heim. Orch. DDR 14: 70-75.
- Tausch, F. (1988): *Epipactis* x *heterogama* Bayer in Osthessen. Ber. Arb. Kr. Heim. Orch. 5(1/2): 121-123.
- Tausch, F. (1992): Bemerkenswerte *Epipactis*-Vorkommen in Niedersachsen, Osthessen und Unterfranken. Ber. Arb. Kr. Heim. Orch. 7(2): 111-122, 199.
- Tausch, F. (1995): Beobachtungen an autogamen *Epipactis leptochila* in Hessen und Thüringen. Ber. Arb. Kr. Heim. Orch. 12(1): 91-101.
- Tyteca, D. (1988): Orchidées du Portugal. – 15 - *Epipactis lusitanica* sp. nov. L'Orchidophile (84): 217-222.
- Tyteca, D. (1994a): Notes sur les *Epipactis* du Vaucluse. L'Orchidophile (1 12): 135-140.
- Tyteca, D. (1994b): Notes sur les *Epipactis* du Vaucluse - Rectificatif et addendum. L'Orchidophile (113): 171-172.
- Young, D. P. (1952): Studies in the British *Epipactis* III. *Epipactis phyllanthes* G. E. Sm., an overlooked species. Watsonia 2: 253-259
- Young, D. P. (1952): Studies in the British *Epipactis* IV. A revision of the *E.phyllanthes*- *vectensis*- *pendula* group. Watsonia 2: 259-276
- Young, D. P. (1962): Studies in the British *Epipactis* V. *Epipactis leptochila*, with some notes on *E. dunensis* and *E. muelleri*. Watsonia 5(3): 127-135.
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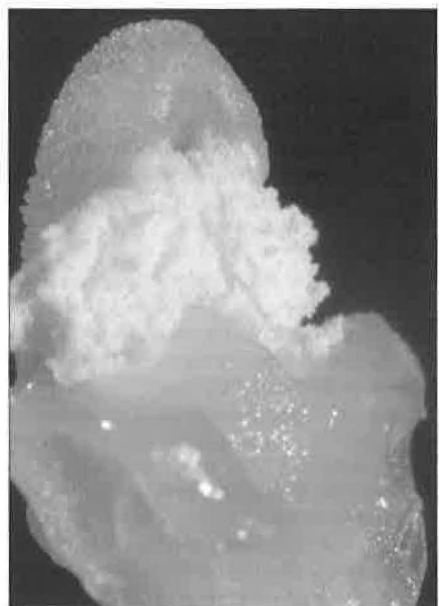
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- 1 *Epipactis leptochila*; bottom view of the column;
Molsberg, 19th July 1999
- 3 *Epipactis leptochila*; front view of the column;
Thüringen, 3th July 2000
Photo: Jürgen Reinhardt
- 2 *Epipactis leptochila*; bottom view of the column,
pollinia removed, rostellum visible as a triangular
point; Molsberg, 19th July 1999
- 4 *Epipactis leptochila*; front view of the column,
rostellum and viscidium visible;
Thüringen, 3th July 2000; Photo: Jürgen Reinhardt



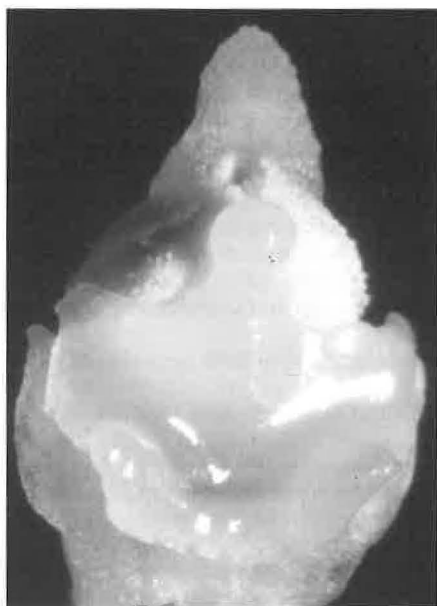
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Epipactis leptochila, sideview column, Molsberg, 19th July 1999



Epipactis muelleri, sideview flower with well developed vicidium. Weyerer Wald, 17th July 2000