

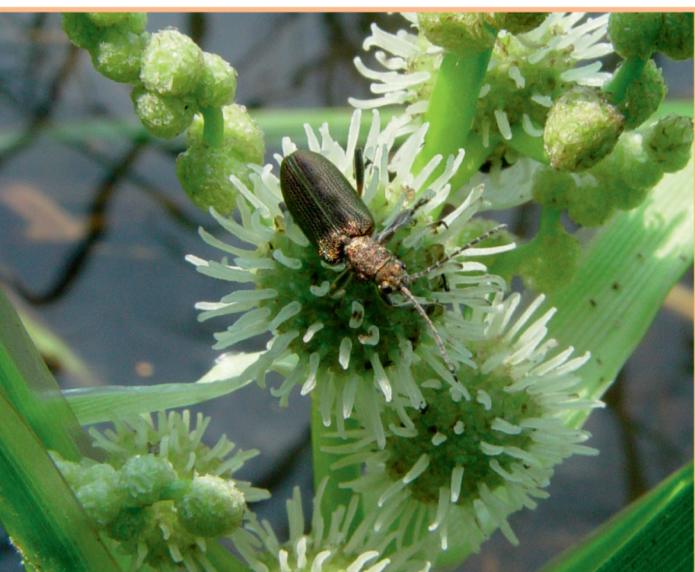
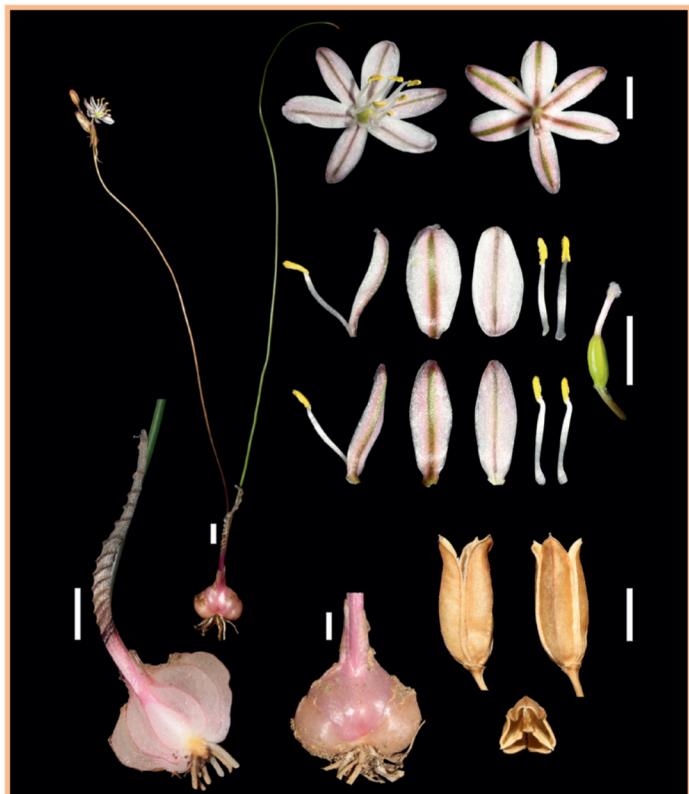
ANNALES REI BOTANICAE

PHYTON



VOL. 60 | 2020

FOUNDED IN 1948 BY PROF. DR. F. WEBER AND PROF. DR. F.J. WIDDER, UNIVERSITY OF GRAZ, AUSTRIA



PHYTON (Horn, Austria)

The journal PHYTON was established in 1948 by Prof. Dr. Friedl WEBER and Prof. Dr. Felix J. WIDDER, the heads of the former Institutes of Plant Physiology and of Botany at the University of Graz. Papers from all fields of plant sciences are still considered for publication in PHYTON.

From volume 57 onwards, all research contributions are published in English. Manuscripts should be submitted to the managing editor, who will confirm receipt and forward every manuscript to an editor of our editorial board (unless stated otherwise, the editors are affiliated with the Institute of Biology, University of Graz):

Managing editor:

Christian SCHEUER <christian.scheuer@uni-graz.at>

Editors for plant physiology, anatomy, biochemistry, autecology and related fields

Alexandra JAMMER

Maria MÜLLER

Editors for plant systematics, evolution, morphology, geobotany and related fields

Anton DRESCHER

Nejc JOGAN (Biotechnical Faculty, University of Ljubljana)

Michael PINTER (Universalmuseum Joanneum, Graz)

Wolfgang SCHÜHLY

Urban ŠILC (Jovan Hadži Institute of Biology, SAZU, Ljubljana)

The authors are requested to consult the 'Information and Instructions for Contributors' at

<<https://biologie.uni-graz.at/de/phyton>>

or <<https://dev.verlag-berger.at/res/user/berger/media/2590.pdf>>

Manuscripts, proofs and correspondence concerning editorial matter can also be directed to
Managing Editor PHYTON, Holteigasse 6, 8010 Graz (Austria, Europe)

Cover illustration: Holotype specimen of *Spiraea naxiorum*, Rosaceae (top left, © Roman BUSINSKÝ); *Tenicroa unifolia*, Hyacinthaceae (top right, © Michael PINTER); *Sparganium erectum*, Typhaceae, with the beetle *Plateumaris* cf. *sericea* feeding on stigmatic exudates (bottom, © Gerhard GOTTSBERGER).

Beginning with PHYTON Volume 57, the articles are also published *instant online*.

Subscription orders and other business communication should be directed to the publisher

VERLAG FERDINAND BERGER & SÖHNE GES.M.B.H.

Wiener Straße 80, 3580 Horn (Austria, Europe) <verlag@berger.at>

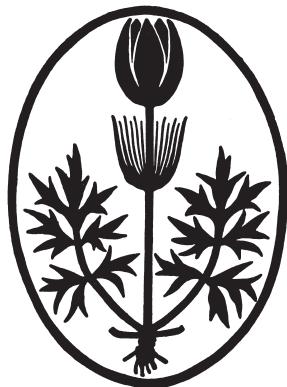
Beginning with PHYTON Volume 49, pdf files of single articles can be purchased at
<<https://www.verlag-berger.at/?listview&link=0323000>>

PHYTON Volume 1–50 (1948–2010) are accessible at the literature database of the
'Biologiezentrum' in Linz at
<http://www.zobodat.at/publikation_series.php?id=6793>

Indexed/abstracted in Current Contents, Science Citation Index, Biological Abstracts and
Current Advances in Plant Science

PHYTON

ANNALES REI BOTANICAE



VOL. 60, 2020

Alle Rechte vorbehalten
© 2021 by Verlag Ferdinand Berger & Söhne GesmbH, 3580 Horn, Österreich
www.verlag-berger.at

www.phyton.at

VERLAG FERDINAND BERGER, HORN, AUSTRIA

EDITORIAL NOTE

In agreement with the publishing house, Verlag Ferdinand Berger & Söhne GesmbH, the editorial board of 'PHYTON Annales Rei Botanicae' decided in 2017 to provide **instant online** publication, like our mycological sister journal 'Sydowia' published by Verlag Berger.

In the meantime, we tried to maintain the frequency of two printed PHYTON issues per volume, but in 2019 we finally had to accept that many interesting manuscripts are submitted or finalized too late in the year to fill a first printed issue which could appear between June and August. Therefore, the publisher and the editorial board decided in March 2020 to follow the example of 'Sydowia' once more: Starting with the present volume 60, only **one printed volume** will be published per year.

This decision was accompanied by some minor changes in the style of literature citations which should be observed before submitting a manuscript (<https://biologie.uni-graz.at/de/phyton>):

References in the text are now given in brackets, either as AUTHOR (1999), or as (AUTHOR 1999). Especially when referring to voluminous sources (standard handbooks, floras), authors are still encouraged to cite also the page number, either as AUTHOR (1999: 999), or as (AUTHOR 1999: 999).

In the full citations under 'References' at the end of the paper, the titles of journals and series will not be abbreviated anymore. This might seem inconvenient at the first glance, but the standard online collections of such abbreviations are no more complete, and the development of scientific publications worldwide has become too dynamic.

There is only one important exception: Standard abbreviations for journal titles and important taxonomic literature (e.g., as provided by IPNI or by the series 'Taxonomic Literature' in Regnum Vegetabile) can still be used for "short citations" in papers dealing with taxonomy and/or nomenclature, for instance: *Bellis perennis* L., Sp. Pl. 2: 886 (1753), where "Sp. Pl." stands for "Species plantarum", a classic work by LINNAEUS.

Graz, December 2020

Christian Scheuer

CONTENTS

Editorial note	II
GHAFFAR N., JAVAD S., FARRUKH M. A., AKHTAR I. & TARIQ A. 2020. Optimization of parameters for micro-wave-assisted extraction of phenolics and flavonoids from <i>Euphorbia hirta</i> by response surface methodology	1
HASSANEIN A. M., AZOOZ M. M., LOUTFY N. & BASSIONY A. 2020. Assessment of genetic diversity and salt tolerance of ten faba bean (<i>Vicia faba</i>) cultivars in relation to seed germination, seedling growth and molecular approach	11
GOTTSBERGER G. 2020. <i>Sparganium erectum</i> (<i>Typhaceae</i>) and its ambophilous characteristics	21
INIĆ S. & KREMER D. 2020. Fran Kušan and the first university botanical garden of medicinal and poisonous plants in Southeast Europe	27
LI J., WANG R., KUANG P., ZHANG Q., SHAN M. & LIU X. 2020. In-situ symbiotic germination of <i>Cymbidium tortisepalum</i> var. <i>longibracteatum</i> F1 hybrid seeds associated with the wild variety (<i>Orchidaceae</i>)	41
HASSANEIN A. M., MOHAMED A. H., ABD ALLAH H. A. & ZAKI H. 2020. Seed germination, seedling growth, protein expression and chromosomal abnormalities in relation to aluminum tolerance of faba bean (<i>Vicia faba</i>) cultivars	49
PINTER M., MARTÍNEZ-AZORÍN M., CRESPO M. B., ALONSO-VARGAS M. Á., PFOSSER M. & WETSCHNIG W. 2020. A taxonomic revision of <i>Tenicroa</i> (<i>Hyacinthaceae, Urgineoideae</i>) – including four new species and two new combinations	61
MARKOVIĆ M. & GRBIĆ M. 2020. Influence of carbon source, MS medium strength and pH on in vitro regeneration of the endangered psammophyte <i>Dianthus giganteiformis</i> subsp. <i>kladovanus</i> from different explant types	93
KOLANOWSKA M. & SZLACHETKO D. L. 2020. <i>Crocodeilanthe</i> (<i>Orchidaceae</i>) in Colombia, an underestimated diversity – new species and additions to the national orchid flora	105
HASSANEIN A. M., SALEM J. M., HASSAN R. A. & SOLTAN D. M. 2020. Morpho-molecular characterization and differential totipotency of three <i>Solanum</i> taxa	145
BELAID F., AMRANI S., BLOEM E. & BELKEBIR A. 2020. Structures and chemical compounds causing integumentary inhibition of <i>Erythrina corallodendron</i> seeds in Algeria	161
BUSINSKÝ R. 2020. Taxonomic revision of the <i>Spiraea japonica</i> complex (<i>Rosaceae</i>)	173

New taxa, new combinations, typifications

<i>Crocodeilanthe allenii</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	107
<i>Crocodeilanthe asymmetrica</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	108
<i>Crocodeilanthe barkleyi</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	109
<i>Crocodeilanthe bialata</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	110
<i>Crocodeilanthe bogotensis</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	111
<i>Crocodeilanthe bordoncillensis</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	112
<i>Crocodeilanthe cesarensis</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	113
<i>Crocodeilanthe cochleata</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	113
<i>Crocodeilanthe cordilabia</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	114
<i>Crocodeilanthe cundinamarcae</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	115
<i>Crocodeilanthe deltoidea</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	116
<i>Crocodeilanthe dodsonii</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	117
<i>Crocodeilanthe fosteri</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	117
<i>Crocodeilanthe fusisepala</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	118
<i>Crocodeilanthe garayi</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	119
<i>Crocodeilanthe garcia-barrigae</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	120
<i>Crocodeilanthe gustavo-romeroi</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	121
<i>Crocodeilanthe jaramilloi</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	122
<i>Crocodeilanthe killipii</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	122
<i>Crocodeilanthe lancipetala</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	123
<i>Crocodeilanthe mantae</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	124
<i>Crocodeilanthe spiniae</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	125
<i>Crocodeilanthe ovatipetala</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	126
<i>Crocodeilanthe papillipetala</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	127
<i>Crocodeilanthe pubescens</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	127
<i>Crocodeilanthe purpurea</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	128
<i>Crocodeilanthe putumayoensis</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	129
<i>Crocodeilanthe ramiro-medinae</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	130
<i>Crocodeilanthe rectangularis</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	131
<i>Crocodeilanthe recurvilabia</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	132
<i>Crocodeilanthe renilabia</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	133
<i>Crocodeilanthe romero-castanedoii</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	134
<i>Crocodeilanthe rostriformis</i> (ZAMBRANO & SOLANO) KOLAN. & SZLACH., comb. nova (Orchidaceae)	144
<i>Crocodeilanthe saccata</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	134
<i>Crocodeilanthe schneideri</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	136
<i>Crocodeilanthe schultesii</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	136
<i>Crocodeilanthe sibundoyensis</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	137
<i>Crocodeilanthe suborbiculata</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	138
<i>Crocodeilanthe undulata</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	139
<i>Crocodeilanthe uvaegelata</i> (L. E. MATTHEWS) KOLAN. & SZLACH., comb. nov (Orchidaceae)	144
<i>Crocodeilanthe vallecaucana</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	140
<i>Crocodeilanthe velaticauloides</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	140
<i>Crocodeilanthe warszewiczii</i> KOLAN. & SZLACH., spec. nova (Orchidaceae)	141
<i>Spiraea bodinieri</i> H. LÉV., lectotypification (Rosaceae)	182
<i>Spiraea bodinieri</i> H. LÉV. var. <i>concolor</i> H. LÉV., lectotypification (Rosaceae)	182
<i>Spiraea bumalda</i> BURV., lectotypification (Rosaceae)	176
<i>Spiraea callosa</i> THUNB., lectotypification (Rosaceae)	176
<i>Spiraea celtifolia</i> BUSINSKÝ, spec. nova (Rosaceae)	204
<i>Spiraea esquirolii</i> H. LÉV., lectotypification (Rosaceae)	186
<i>Spiraea expansa</i> WALL. ex K. KOCH, lectotypification (Rosaceae)	207
<i>Spiraea fastigiata</i> WALL. ex C. K. SCHNEID., lectotypification (Rosaceae)	207
<i>Spiraea formosana</i> HAYATA var. <i>brevistyla</i> HAYATA, lectotypification (Rosaceae)	188
<i>Spiraea fritschiana</i> C. K. SCHNEID., lectotypification (Rosaceae)	213
<i>Spiraea japonica</i> L. f., lectotypification (Rosaceae)	176
<i>Spiraea japonica</i> L. f. var. <i>acuminata</i> FRANCH., lectotypification (Rosaceae)	186

<i>Spiraea japonica</i> L. f. var. <i>fortunei</i> (PLANCH.) REHDER, lectotypification and epitypification (Rosaceae) ..	182
<i>Spiraea japonica</i> L. f. subsp. <i>glabra</i> (REGEL) KOIDZ., neotypification (Rosaceae)	178
<i>Spiraea japonica</i> L. f. var. <i>glabra</i> KOIDZ., neotypification (Rosaceae)	178
<i>Spiraea japonica</i> L. f. var. <i>kweichowensis</i> (T. T. YU & L. T. LU) BUSINSKÝ, comb. nova et stat. nov.	
(Rosaceae)	185
<i>Spiraea japonica</i> L. f. var. <i>stellaris</i> REHDER, lectotypification (Rosaceae)	186
<i>Spiraea japonica</i> L. f. var. <i>vulcanica</i> BUSINSKÝ, var. nova (Rosaceae)	183
<i>Spiraea koreana</i> NAKAI, lectotypification (Rosaceae)	214
<i>Spiraea koreana</i> NAKAI [var.] <i>macrogyna</i> NAKAI ex NAKAI, lectotypification (Rosaceae)	214
<i>Spiraea laxiflora</i> LINDL., lectotypification (Rosaceae)	210
<i>Spiraea micrantha</i> HOOK. f., lectotypification (Rosaceae)	201
<i>Spiraea morrisonicola</i> HAYATA, lectotypification (Rosaceae)	194
<i>Spiraea morrisonicola</i> HAYATA var. <i>hayatana</i> (H. L. Li) BUSINSKÝ, comb. nova et stat. nov,	
lectotypification and epitypification (Rosaceae)	195
<i>Spiraea naxiorum</i> BUSINSKÝ, spec. nova (Rosaceae)	191
<i>Spiraea ovalifolia</i> (FRANCH.) BUSINSKÝ, stat. nov., lectotypification (Rosaceae)	211
<i>Spiraea pumila</i> hort. ex ZABEL, neotypification (Rosaceae)	176
<i>Spiraea purpurea</i> HAND.-MAZZ., lectotypification (Rosaceae)	197
<i>Spiraea robusta</i> HAND.-MAZZ., lectotypification (Rosaceae)	200
<i>Spiraea teniana</i> REHDER, lectotypification (Rosaceae)	189
<i>Spiraea vacciniifolia</i> D. DON, neotypification (Rosaceae)	208
<i>Spiraea velutina</i> C. K. SCHNEID., lectotypification (Rosaceae)	200
<i>Tenicroa appplanata</i> M. PINTER, MART.-AZORÍN, M. B. CRESPO & WETSCHNIG, spec. nova (Hyacinthaceae)	64
<i>Tenicroa exuvia</i> (JACQ.) SPETA, epitypification (Hyacinthaceae)	67
<i>Tenicroa fibrosa</i> M. PINTER, MART.-AZORÍN, M. B. CRESPO & WETSCHNIG, spec. nova (Hyacinthaceae)	70
<i>Tenicroa filifolia</i> (JACQ.) OBERM., epitypification (Hyacinthaceae)	72
<i>Tenicroa flexuosa</i> (ADAMSON) M. PINTER, MART.-AZORÍN, M. B. CRESPO & WETSCHNIG, comb. nova	
(Hyacinthaceae)	76
<i>Tenicroa fragrans</i> (JACQ.) RAF., epitypification (Hyacinthaceae)	77
<i>Tenicroa namibensis</i> M. PINTER, MART.-AZORÍN, M. B. CRESPO & WETSCHNIG, spec. nova (Hyacinthaceae) ..	83
<i>Tenicroa polyantha</i> M. PINTER, MART.-AZORÍN, M. B. CRESPO & WETSCHNIG, spec. nova (Hyacinthaceae)	84
<i>Tenicroa unifolia</i> (A. V. DUTHIE) M. PINTER, MART.-AZORÍN, M. B. CRESPO & WETSCHNIG, comb. nova	
(Hyacinthaceae)	86

New syntaxa

CONTENTS

Editorial note	II
BELAID F., AMRANI S., BLOEM E. & BELKEBIR A. 2020. Structures and chemical compounds causing integumentary inhibition of <i>Erythrina corallodendron</i> seeds in Algeria	161
BUSINSKÝ R. 2020. Taxonomic revision of the <i>Spiraea japonica</i> complex (<i>Rosaceae</i>)	173
GHAFFAR N., JAVAD S., FARRUKH M. A., AKHTAR I. & TARIQ A. 2020. Optimization of parameters for microwave-assisted extraction of phenolics and flavonoids from <i>Euphorbia hirta</i> by response surface methodology	1
GOTTSBERGER G. 2020. <i>Sparganium erectum</i> (<i>Typhaceae</i>) and its ambophilous characteristics	21
HASSANEIN A. M., AZOOZ M. M., LOUTFY N. & BASSIONY A. 2020. Assessment of genetic diversity and salt tolerance of ten faba bean (<i>Vicia faba</i>) cultivars in relation to seed germination, seedling growth and molecular approach	11
HASSANEIN A. M., MOHAMED A. H., ABD ALLAH H. A. & ZAKI H. 2020. Seed germination, seedling growth, protein expression and chromosomal abnormalities in relation to aluminum tolerance of faba bean (<i>Vicia faba</i>) cultivars	49
HASSANEIN A. M., SALEM J. M., HASSAN R. A. & SOLTAN D. M. 2020. Morpho-molecular characterization and differential totipotency of three <i>Solanum</i> taxa	145
INIĆ S. & KREMER D. 2020. Fran Kušan and the first university botanical garden of medicinal and poisonous plants in Southeast Europe	27
KOLANOWSKA M. & SZLACHETKO D. L. 2020. <i>Crocodeilanthe</i> (<i>Orchidaceae</i>) in Colombia, an underestimated diversity – new species and additions to the national orchid flora	105
LI J., WANG R., KUANG P., ZHANG Q., SHAN M. & LIU X. 2020. In-situ symbiotic germination of <i>Cymbidium tortisepalum</i> var. <i>longibracteatum</i> F1 hybrid seeds associated with the wild variety (<i>Orchidaceae</i>)	41
MARKOVIĆ M. & GRBIĆ M. 2020. Influence of carbon source, MS medium strength and pH on in vitro regeneration of the endangered psammophyte <i>Dianthus giganteiformis</i> subsp. <i>kladovanus</i> from different explant types	93
PINTER M., MARTÍNEZ-AZORÍN M., CRESPO M. B., ALONSO-VARGAS M. Á., PFOSSER M. & WETSCHNIG W. 2020. A taxonomic revision of <i>Tenicraea</i> (<i>Hyacinthaceae</i> , <i>Urginoideae</i>) – including four new species and two new combinations	61