**EDITORIAL****Alan Paton, Ray Harley, Tivvy Harvey***Herbarium, Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3AE, UK*

Welcome to this edition of *Vitex*, a new name for the *Lamiales Newsletter*. As we mentioned in the Editorial of the last edition, the New Ordinal Classification for the Families of Flowering Plants (APG, Ann. Missouri Bot. Gard. 85: 531 - 553), includes many families such as Acanthaceae and Scrophulariaceae within the Lamiales. We wish to concentrate this Newsletter on the study of the Labiatae, and therefore have chosen *Vitex*, one of the basal genera of the family, as its title. Although focusing primarily on the Labiatae, we are still happy to include articles placing the family in a wider context. As many of our readers continue to have an interest in the Verbenaceae (now restricted to tribe *Verbenoideae*), we are happy to include articles on that family, even though it is more distantly related to the Labiatae.

2001 will mark the tenth anniversary of the Advances in Labiate Science Conference held at Kew.

This edition of the Newsletter reports on two projects which have benefited enormously from the contacts made at that time: the family treatment for Kubitzki's *Families and Genera of Flowering Plants*; and Frodin and Govaert's *World Checklist and Bibliography of the Labiatae*. We feel that the time is due for another conference to enable discussion on recent work and to identify the priority areas for further research. We would be happy to help publicise a conference if there were anyone willing to devote the necessary time, resources and commitment into running it.

As ever the success of *Vitex* depends on the readers' willingness to send us articles and comments. Please continue to send your valuable contributions and comments on the future of the newsletter to Y.Harvey@rbgkew.org.uk; Tel. +44 20 8332 5238; Fax. +44 20 8332 5278. (Note change of numbers).

CONTENTS

Editorial	1
The families and genera of Vascular Plants (Ed. K. Kubitzki <i>et al.</i>)	1
A World checklist and Bibliography of Lamiales <i>sensu stricto</i>	2
Diversity and Evolution in <i>Salvia</i> – Presentation of a new research project	3
In search of Labiatae in Eastern Brazil	5
Three new neo-clerodane diterpenoids from <i>Ajuga reptans</i> and one, 14, 15-dehydroagjugareptansin, with antifeedant activity against larvae of <i>Spodoptera littoralis</i>	7
Flora Mesoamericana – Labiatae	10
Requests	11
Bibliography of recent taxonomic publications	12

THE FAMILIES AND GENERA OF VASCULAR PLANTS (Ed. KUBITZKI *et al.*)**Ray Harley***Herbarium, Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3AE, UK*

The Families and Genera of Vascular Plants (Ed. K. Kubitzki *et al.*) is a modern treatment of the ferns, fern allies and seed plants at the familial and generic level. This can be seen as a much needed replacement for Engler & Prantl's *Die Natürlichen*

Pflanzenfamilien. So far three volumes have been published. The first volume, treating Pteridophytes and Gymnosperms, was published in 1990, one volume of Dicotyledons: Magnoliid, Hamamelid and Caryophyllid families (1993) and

two volumes of Monocotyledons (1998). The Asteridae are scheduled to appear in two volumes.

I was originally asked to undertake the writing of the text of Labiatae for the series under the volume editor- ➤

ship of Joachim Kadereit, Mainz University. My response was that there had been very substantial changes in our concept of the family Labiatae with respect to its delimitation from Verbenaceae, and it would be more logical to try to incorporate these changes, even if they were at that time still only sketched out in a preliminary manner. It would therefore make better sense to consider the Lamiales (*sensu stricto*) together. I fully realized at this time, that I might be taking on a very difficult task: to expound in conventional taxonomic terms, and using morphological characters to define taxa which were originally delimited by cladistic analysis. However we were still unaware that the ongoing molecular studies would completely revolutionize our thinking on the “Lamiales”. Nevertheless, the preliminary nature of much of this evidence will make it impossible in the short term

to arrive at a final consensus. The published treatment will no doubt represent the best compromise at the time, but certainly the groups I am responsible for no longer represent a “natural group”, but diverse elements within a larger Lamiales that includes Scrophulariaceae and its allies. The final subfamilial classification of the Labiatae is still not fully decided, although much is now clear. The main group which is problematic is the *Viticoideae*, which consists of various elements which do not cluster to form a clade. The work hopefully will provide a modern treatment which will show where further research is needed.

Fortunately, there have been many specialists willing to contribute to the groups which I offered to coordinate. These include: Sandy Atkins (Verbenaceae), Andrei Budantsev (*Nepetinae*; *Lamioideae* in part),

Phil Cantino (Phrymaceae; *Aju-goideae*; *Lamioideae* in part; *Scutellarioideae* in part; *Menthinae* in part), Barry Conn (*Prostantheroideae*), Sebsebe Demissew (Cyclocheilaceae), Ray Harley (*Hyptidinae*, *Menthinae* in part), Tatiana Krestovskaya (*Lamioideae* in part), Ramón Morales (*Salviineae* in part; *Menthinae* in part), Alan Paton (*Scutellarioideae* in part; *Ociminae*; *Plectranthinae*), John Rourke (Stilbaceae, including Retziaceae), Olof Ryding (*Lamioideae* in part), Karen Sidwell (*Salvia*), Tim Upson (*Lavanduleae*). Avicenniaceae is now placed in Acanthaceae according to the latest molecular data. Some groups are still untreated, though deadlines are all but upon us. Some groups are still without an author: some *Mentheae*, *Elsholtzieae*, *Symphorematoideae*, Nesogenaceae for example. Offers would be welcome!

A WORLD CHECKLIST AND BIBLIOGRAPHY OF LAMIALES *sensu stricto*

D. G. Frodin, R. Govaerts and collaborators

Herbarium, Royal Botanic Gardens, Kew, Richmond, Surrey TW9 3AE, UK

There has been a long-standing interest in the drupaceous-fruited Lamiales (the Lamiales of Bentham and Hooker and, with variations, of most subsequent authors until the 1990s) at the Kew Herbarium, starting with Ray Harley and continuing with Alan Paton, Sandy Atkins and others. The Royal Botanic Gardens hosted a successful conference on Labiatae (as one of the two major families in the order as it was then known) in 1991 and this has been followed by the *Lamiales Newsletter*. Several flora accounts along with many revisionary and other studies have appeared over more than three decades, and further research is underway. At present a ‘genera of Lamiales’ is in preparation, partly as a vehicle for exposition of the new arrangement of genera and families within the order.

The World Checklists and Bibliographies were initiated in 1994 as a collaborative undertaking by David Frodin and Rafaël Govaerts (Global Data Projects) with the initial aim of furnishing synonymised checklists, with selected bibliographies, of families and other groups of particular interest to current research and other activities at Kew. Three Checklists have been published to date and a fourth, on Euphorbiaceae (with Pandaceae), is expected to appear in March 2000. A number of other families are currently in preparation.

Among the projected Checklists is one for Lamiales. Preparation of this began in 1996 with the compilation first of an annotated bibliography (by Frodin) and then of the checklist proper (by Govaerts). Work towards a first draft is now

substantially complete and it is expected this will be ready for review by March 2000. It will encompass 305-310 genera and about 8900 species in Lamiaceae, Verbenaceae, and the traditionally associated (and often subsumed) Avicenniaceae, Chloanthaceae, Cyclocheilaceae, Nesogenaceae, Phrymaceae, Stilbaceae and Tetrachondraceae. When published, it will represent the first such account at species level since the mid-nineteenth century.

For such a work we would, not unnaturally, like to invite collaboration from anyone who has at least some specialist knowledge of particular genera or larger taxa and its key literature. If readers are so interested, please let us know and we would be happy to send a copy of the appropriate account. Your com-

ments will be gratefully received and we will credit you with co-authorship. The more informed opinion we are able to obtain, the better the World Checklist will be, and more truly a collective effort.

To conclude, the reader may ask, why cover only the ‘classical’ Lamiales? It is true that contemporary research in phylogeny and

molecular systematics has shown that the traditional distinctions between that order and the Scrophulariales (largely corresponding to the Personatae of Bentham and Hooker) as well as the Plumbaginaceae – notably in vernalization and fruit structure – do not hold and that only an expanded Lamiales will satisfy strict phylogenetic criteria. A more detailed scheme of

internal relationships has, however, yet to be worked out; furthermore, as one of the more successful groups of modern flowering plants some 21 000 or more species are in all now included. It has therefore seemed to us that maintaining the classical circumscription represents the most practical course from our point of view.

DIVERSITY AND EVOLUTION IN SALVIA — PRESENTATION OF A NEW RESEARCH PROJECT

Regine Claßen-Bockhoff* & Thomas Speck†

* Institut für Spezielle Botanik und Botanischer Garten, Universität Mainz, Germany

† Plant Biomechanics Group, Botanischer Garten der Universität Freiburg, Germany

Salvia (700-900 species) is a worldwide distributed genus comprising woody shrubs, perennial, and annual plants. The most striking character of the genus is the unusual form and function of the two stamens which are modified to act as levers. Morphologically the lever arms are produced by the connective (Troll, 1928), which is usually restricted to the sterile part between the two thecae of an anther, but in *Salvia* is extended in various ways. Usually only the upper arm of each staminal lever bears a fertile theca while the lower part which is highly variable in size, shape and structure is sterile or produces a reduced amount of pollen (Hedge, 1974). The sterile parts narrowing the entrance of the corolla tube are pushed aside by the flower visitors searching for nectar. This way the fertile thecae come down and cause nototribic pollen transfer.

Though the lever mechanism in *Salvia* has been known since the times of Sprengel (1793) only a few papers deal with its evolutionary significance (e.g. Himmelbauer & Stibal, 1931). Current research proceeds from the high structural diversity of the stamens and their significance relative to flower biology. The question has to be

answered, how may the structure of the stamens influence the sexual reproduction of the plants concerned? It is assumed that the different sizes, weights, structural details and additional appendages of the connective arms select for specific pollinators and thus influence the process of speciation.

To test this hypothesis a multidisciplinary approach has been initiated which will be continued for several years. It includes aspects of floral and fruit morphology, developmental dynamics, plant architecture, sexual reproduction, biomechanics, taxonomy and systematics (fig. 1). To start with, the c. 40 European and circum-mediterranean species (Hedge, 1972) have been selected for phenological, reproductive biological and morphological studies. A large number of them are cultivated in the Botanical Garden of Mainz University, but field trips will also be necessary in future. In cooperation with the technical workshop of Freiburg University an instrument to measure the leverage has been developed. It still has to be optimised and tested in detail, but preliminary measures illustrate that forces of 1-20 milliNewtons are needed to move the lever of differ-

ent *Salvia* species, and that in ornithophilous species a significantly higher force is needed than in melittophilous species.

The research project started only last year. We gratefully use the opportunity to present our project in the Lamiales Newsletter to stimulate further discussion or even cooperation in this subject. If you have any contributions please contact classenb@mail.uni-mainz.de

References

- Hedge, I. C. (1972). *Salvia*. In Tutin, T. G. *et al.* Flora Europaea: 188-192. University Press, Cambridge.
- Hedge, I. C. (1974). A revision of *Salvia* in Africa including Madagascar and the Canary Islands. Notes Roy. Bot. Gard. Edinburgh 33: 1-121.
- Himmelbauer, W. & Stibal, E. (1931). Entwicklungsrichtungen in der Blütenregion der Gattung *Salvia*. 1.-3. Biologia Generalis 8: 449-474, 9: 129-150, 10: 17-47.
- Sprengel, C. K. (1793). Das entdeckte Geheimnis der Natur im Bau und in der Befruchtung der Pflanzen. Berlin.

Trapp, A. (1956). Botanische Studien: Zur Morphologie und Entwicklungsgeschichte der Staubblätter sympetaler Blüten. Fischr, Jena.

Troll, W. (1928). *Roscoea purpurea* SM., eine Zingiberacee mit Hebelmechanismus in den Blüten. Mit Bemerkungen über die Entfaltungsbewegungen der fertilen Staubblätter von *Salvia*. Planta 7: 1-28.

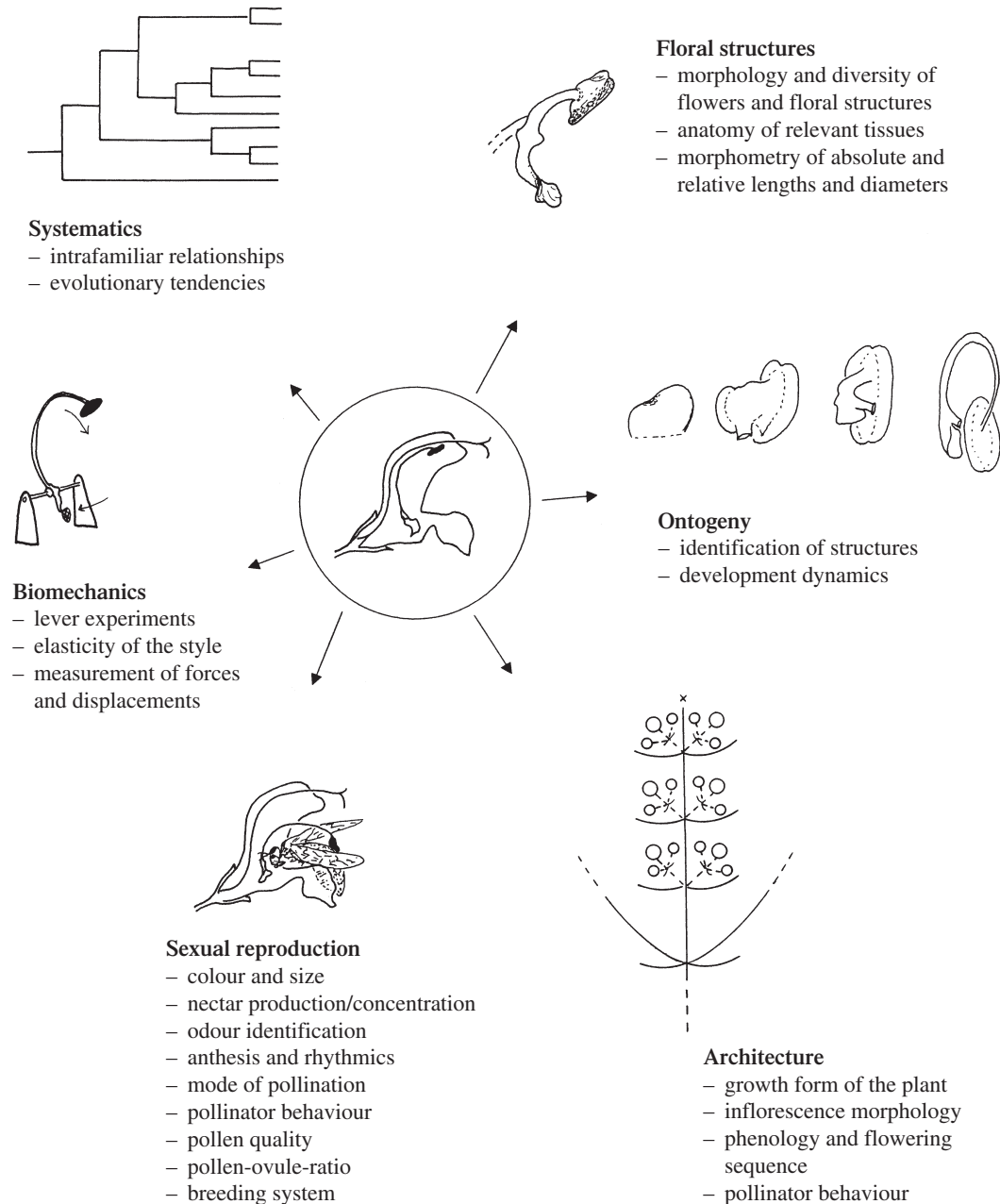


Fig. 1: Diversity and evolution in *Salvia*. Diagrammatic presentation of the different aspects involved in the new research project (Ontogeny after Trapp, 1956).

IN SEARCH OF LABIATAE IN EASTERN BRAZIL

Ray Harley

Herbarium, Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3AE

My own interest in Brazilian Labiatae can be said to stem from August 1968, when, as a newly appointed research botanist at the Royal Botanic Gardens, Kew, I found myself in northern Mato Grosso, Brazil, hot, sweaty and very dusty, watching a very small solitary bee pollinating the savanna labiate *Eriope crassipes* (*Ocimeae: Hyptidinae*). It was then that I decided to devote myself to the systematics of Brazilian Labiatae. Little did I realize that this same year would see the death of the doyen of New World Labiatae, Carl Epling. So, in a sense I feel that I picked up his mantle, at least as far as the South American Labiatae are concerned.

Brazil is a very big country, over 4,300 km from North to South and about the same from East to West, having a common border with all the other South American countries, apart from Chile and Ecuador. The country possesses two huge river systems, the Rio Amazonas in the north and the Rio Paraná in the south, but does not contain any part of the great Andean mountain chain extending north to south in western South America. The geological history of much of Brazil relates to the weathering and partial uplift of the Brazilian Shield south of the Amazon and its counterpart, the Guiana Shield, north of the Amazon. These two ancient Pre-Cambrian land masses composed of acidic and often metamorphosed sandstones, were affected by the subsequent uplift of the Andes, which is composed mainly of much younger rocks, often providing soils richer in nutrients. This uplift also helped to give rise to the Amazon basin as we see it today.

As a result of the influence of a series of climatic conditions acting upon this geological diversity, Brazil has a wide range of ecosystems, from semi-desert, savanna and montane through to tropical rainforest, swamp and mangrove as well as temperate grasslands and forest in the extreme south. This is very much reflected in its diverse fauna and flora, and of course its Labiate flora, with something like 27 genera and 512 species to date. This statistic includes those genera which until recently were included in Verbenaceae, but have since been removed, such as *Vitex* (34 spp. recorded from Brazil), *Clerodendrum* (8 spp.) and *Aegiphila* (61 spp. to date). The remainder of the account, however, deals mainly with the traditional Labiatae, with which I am more familiar.

The Labiatae of Brazil are very different from those found in north temperate regions. The *Ocimeae* (*Nepetoideae*) are particularly characteristic of the tropical region. The *Lamioideae*, so diverse in the north temperate zone, are represented by just a single native species, *Stachys micheliana*, which occurs mainly in temperate South Brazil, and here also is found another large group of *Nepetoideae*: tribe *Mentheae*, although many of the genera centred there are different from those occurring in the northern hemisphere: *Glechon*, *Rhabdocaulon*, *Hoehnea* and *Hesperozygis*.

Tropical extra-Amazonian Brazil is also very different from the Andean region in western South America. Many of the Andean genera, especially *Nepetoideae* tribe *Mentheae*, have a north temperate origin. These include *Salvia*, *Clinopodium*, which now including *Gardoquia* and most

New World taxa formerly placed in *Satureja* (see Cantino & Wagstaff 1998, Harley and Granda in press), as well as *Scutellaria* (*Scutellarioideae*) and *Stachys* (*Lamioideae*). Many of these are large-flowered species, often adapted to pollination by hummingbirds, with bright red or orange as well as purple corollas. *Lepechinia*, which has its greatest diversity in the Andes, extends northwards to Mexico, and probably has a southern origin.

South of the Amazon basin, Brazil is dominated by savanna and drier forest formations which favour a rich Labiate flora. Overlying the Brazilian Planalto and occupying a large area of central Brazil, is the *cerrado* with a wide range of *Hyptidinae*, and where *Mentheae* are absent apart from *Rhabdocaulon denudatum*, a slender subshrub with reduced leaves, winged stems, and long, creamy white flowers, and a few *Salvia* species (especially sect. *Rudes*, with blue or white flowers). This section has been the subject of a recent revision by Elide dos Santos (1994). *Cerrado* genera of *Ajugoidae* include *Amasonia* (c. 6 spp.) with large, slightly pendent flowers, and *Aegiphila* a large genus of trees and climbers with dense cymes of small, creamy flowers, at least some species of which are dioecious. Another *cerrado* Ajugoid is the remarkable *Clerodendrum ekmanii* from Mato Grosso and Paraguay, a low subshrub with showy long-tubular flowers, no doubt pollinated by some long-tongued hawkmoth. All these genera were formerly included in Verbenaceae

North-east Brazil is generally much drier, with a very pronounced and extended dry season. The state of N. ➤

E. Brazil with the greatest variety of ecosystems is Bahia, and it is in this state that much of Kew's Brazilian fieldwork since 1971 has been carried out. Recently, a large "Flora of Bahia Project" has been started, funded by both Federal and State institutions. This project is based in various centres in the state, including the fine herbarium (CEPEC) at Itabuna, on the coast, and the State University of Feira de Santana, and is in collaboration, among others, with the University of São Paulo, the Royal Botanic Gardens Kew and the New York Botanical Garden. About the size of France, Bahia's ecosystems range from semi-arid thorn forests (*caatinga*) in the lowlands, seasonal savanna (*cerrado*) especially in the western uplands, "*campo rupestre*" - rupes-tral vegetation in the upper montane zone (900–2000 m) known as the Chapada Diamantina, and a great variety of forests from altitudinal cloud forests, dry deciduous seasonal forests, to wet non-seasonal Atlantic rain-forests on the coast.

I have listed (Harley 1996) a total of 10 genera and 87 species of Labiatae native to Bahia state, of which 35.6% are endemic to the state. Only five of these species (*Salvia*: 2 spp. and *Scutellaria*: 3 spp.) are not members of tribe *Ocimeae*. However the recent discovery of a red-flowered *Salvia* in the dry interior, may represent a new taxon. The *Ocimeae* are well represented by the subtribe *Hyptidinae*: *Hyptis* (50 species), *Eriope* (7), *Hypenia* (5), *Marsypianthes* (2), *Peltodon* (1) and *Rhaphiodon* (1). 17 of these species have been described as new since studies commenced and a number are awaiting publication, so every field trip has the added excitement of finding further novelties.

In the Bahian lowlands, coastal sites have few Labiatae, though one: *Eriope blanchetii* is unique among Brazilian Labiatae in occurring

exclusively in coastal dunes. The lowland *caatinga* thorn scrub and woodland, which surrounds the Chapada, provide a few Labiate species not found in the mountains, notably the large, bushy shrub *Hyptis martiusii*, whose pale, perfumed flowers in small heads, are much visited by butterflies, and the shrubby, blue flowered *H. fruticosa*. *H. leucocephala*, which grows in seasonally flooded low areas, is a prostrate sub-shrub with white-tomentose heads of pink flowers. Its strongly aromatic foliage is sometimes collected for medicine. More herbaceous species are annual weeds such as *H. suaveolens* and *H. pectinata*. Another characteristic genus is the related, monotypic *Rhaphiodon* (*R. echinus*), a prostrate herb with aromatic leaves and long-pedunculate spherical heads of bright purple flowers. The calyces are spinose, the head falling as a spiny burr, presumably often distributed by animals. One of the commonest Labiatae, often occurring in secondary areas in the *caatinga*, is the highly perfumed Basil: *Ocimum campechianum*, an annual herb, often used to flavour drinks. Another frequent species, *O. americanum*, usually found with it, is introduced from Africa. However, Verbenaceae, such as *Lantana*, *Lippia*, *Stachytarpheta*, *Bouchea* and *Priva* are more often encountered in these semi-arid areas.

It is in the mountains however, that the Labiatae show their greatest diversity, especially in the northern extension of the Serra do Espinhaço, known as the Chapada Diamantina. This region is a prolific centre of plant diversity (Giulietti et al. 1997). The endemic species grow especially in the campo rupestre, where rock outcrops and humid montane grasslands, over coarse acid sands or black humus-rich soils, predominate. Many of the plants are low subshrubs and the ecosystem, with its seasonal cli-

mate, is ideal for Labiatae. Certainly for those interested in Labiatae, the flora of these mountains acts like a magnet, as it is here that many new taxa can be expected. Every unexplored mountain is potentially the home of yet another new species. When in the field, my cry "*Eriope* - espécie nova!" to my companions, became almost a joke, as they looked to the heavens in mock despair - "not another one!" I could hear them say! Genera such as *Hyptis* and *Eriope* show a high level of local speciation and endemism, perhaps due to local edaphic and biotic conditions acting on small isolated populations. It is about 5 hours drive from the university town of Feira de Santana, inland from the capital Salvador, to the nearest point of the Chapada Diamantina. There, one can hope to find new species of *Hyptis* or *Eriope*, as well as of a whole range of other plant groups which seem to have gone "speciation crazy" in the mountains.

Some of my earliest studies involved *Eriope*. Some species exhibit a "greasy pole" syndrome of characters, with elongate, wand-like, fistulose flowering stems, which are glabrous with a pruinose waxy coating below the inflorescences. These, together with the dense bristly hairs at the stem-bases, prevent ants from climbing up to steal the nectar and accidentally trigger the explosive pollination mechanism. The flowers are relatively large, in *E. luetzelburgii* reaching 1.5 mm long on long drooping pedicels.

Hyptis is a huge genus, widespread through the warmer parts of North and South America. Most species occur in the cerrados of Central and Eastern Brazil. *Hyptis* has recently been divided into three, with two new genera: *Hyptidendron* (including a number of savanna trees such as *H. canum*

and *H. asperrimum*), and *Hypenia* (Harley 1988). The component species of *Hypenia* show a much closer relationship to *Eriope* than to the rest of *Hyptis*. While the inflorescence of *Hyptis* is usually clearly cymose, though often congested to form a capitulum, the cymes of *Eriope* and often *Hypenia* are reduced to single flowers, the inflorescences thus appearing long and racemose. Ruth Atkinson has recently completed a detailed study of this group and has suggested combining *Hypenia* with *Eriope*. One group of *Hypenia* species, restricted to the cerrado, is remarkable for its long, tubular, red corollas often pollinated by hummingbirds.

Many of the recently discovered species in the Chapada Diamantina of Bahia are of striking appearance. One such is *Hyptis hagei* from the mountains around Lençóis. A bushy shrub with small rigid leaves and long tubular

deep pink flowers, its relationships are obscure, though morphologically it shows many characters similar to the Central American *H. asperifolia*. Another group which has a major centre of diversity in the Bahian mountains is section *Polydesmia*, characterized by having congested cymules, associated with usually conspicuous bracts. On the Pico das Almas, a new species: *H. silvinae*, with salmon pink flowers, was discovered in 1977. Twelve years later, to the north, were found populations with bright red flowers, the only known red-flowered species in the genus! Meanwhile, three newly discovered species of sect. *Polydesmia*, all growing within a 20 km radius, are still awaiting publication.

Much work is still needed to be done in the Chapada, especially as it is an ideal area to study plant speciation, phytogeography and vegetational history.

References

- Giulietti, A. M., Pirani, J. R. & Harley, R. M. (1997). Serra do Espinhaço Range region. In Macbryde, O., Centres of Plant Diversity. The Americas. 2: 397-404. I.U.C.N. Publications. Washington.
- Harley, R. M. (1996). The Labiatae of Bahia: a preliminary checklist. *Sitientibus* 15: 11-21.
- Harley, R. M. & Granda, P. (in press). A list of species of Tropical American *Clinopodium* (Labiatae), with new combinations. *Kew Bull.*
- Cantino, P. D. & Wagstaff, S. J. (1998). A Reexamination of North American *Satureja* s.l. (Lamiaceae) in light of molecular evidence. *Brittonia* 50: 63-70.
- dos Santos, E. P. (1994). Genre *Salvia* L. section *Rudes* (Benth.) Epl. (Lamiaceae). *Systematique et phylogenie*. Publ. Paris: Universite Pierre et Marie Curie, xv, 247 p. (1994).

THREE NEW NEO-CLERODANE DITERPENOIDS FROM *AJUGA REPTANS* AND ONE, 14,15-DEHYDROAJUGAREPTANSIN, WITH ANTIFEEDANT ACTIVITY AGAINST LARVAE OF *SPODOPTERA LITTORALIS*.

Paul David Bremner

Current address: Antioxidant Research Centre, Guy's King's and St Thomas' School of Biomedical Sciences, Guy's Campus, Hodgkin Building (3-Fl.), King's College, St Thomas' Street, London.

Ajuga has proved a rich source of compounds with biological activity to disrupt the development and/or feeding of insect larvae. The interest in *Ajuga* species containing such compounds began with the discovery of phytoecdysteroids in some Japanese species⁽¹⁾. The potential of phytoecdysteroids to disrupt insect development was quickly recognised from their structural similarity to the insect moulting hormone, ecdysone. A number of compounds of this class have been assayed and have shown activity to disrupt the normal development of insect larvae⁽²⁾. The occurrence and

biological activity of *Ajuga* sourced phytoecdysteroids has been reviewed⁽³⁻⁶⁾. Insect antifeedant activity in *Ajuga* species was first discovered in *Ajuga remota* Wall. ex Benth. following a chemical screening of East African plants that had withstood a locust infestation⁽⁷⁾. Three isoperenoid clerodane compounds⁽⁸⁾ belonging to the neo-clerodane diterpenoid class, were discovered to be responsible for the activity and were named ajugarin I, II and III⁽⁹⁾. *Ajuga* and other Lamiaceae species are a particularly rich source of neo-clerodane diterpenoids^(10, 11). However, only a

limited number of these compounds possess significant insect antifeedant activity^(12,13).

Ajuga reptans L. was selected for study⁽¹⁴⁾ due to the high level of insect antifeedant activity associated within ethanol extracts of this plant⁽¹⁵⁾ that could not be accounted for by the neo-clerodane diterpenoids already isolated from *A. reptans*⁽¹²⁾. Therefore a chemical analysis was undertaken to elucidate the chemical basis of insect resistance in *A. reptans*. Biological assays were central in this study to first identify the anti-insect activity,

their subsequent use to direct bioactivity led isolation procedures and finally to identify the antifeedant level of each isolated compound.

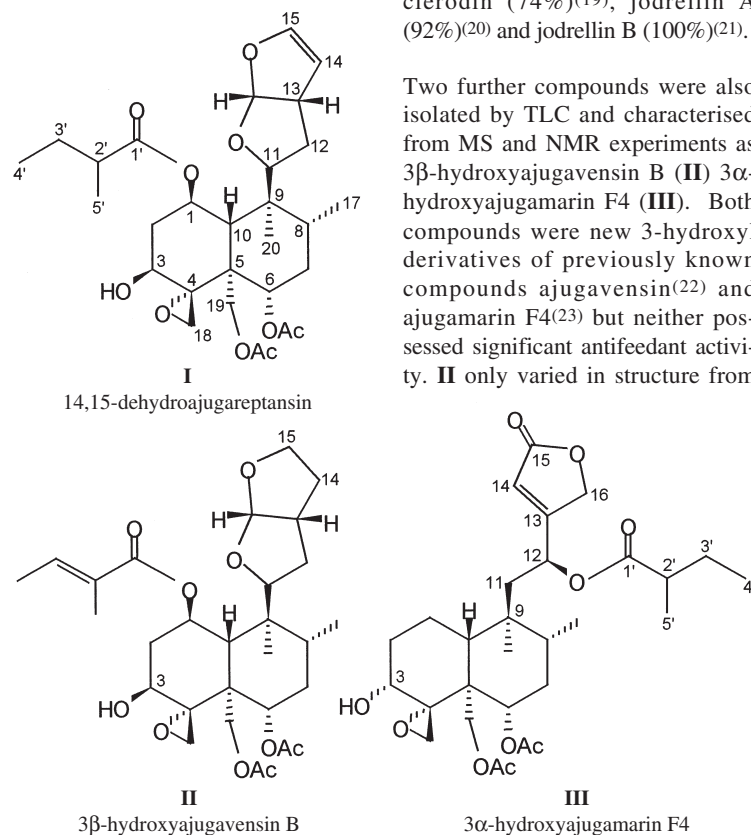
The principal biological assays employed were based on either incorporating dried, ground plant material into an artificial rearing diet for *Spodoptera littoralis* Boisduval (Egyptian Cotton Leafworm) or an assay designed to assess the antifeedant activity of extracts in solution. The former assay was utilised in the early part of the study to determine if the plant material was biologically active at disrupting larval development. The conclusions of this period in the study showed that leaf material of *A. reptans* was more effective than root material at reducing larval weight gain.

The second assay was based on a glass fibre disc assay (GFDA) that enabled the calculation of an antifeedant index (%) against larvae of *S. littoralis*⁽¹³⁾. The index identifies both phagostimulants (negative values) and antifeedants (positive values). This GFDA was used extensively during the bioactivity led isolation of antifeedant compounds from *A. reptans*. An acetone extract of *A. reptans* cv Catlin's Giant was prepared and fractionated using silica column chromatography (CC). By employing the GFDA, those fractions eluting late with chloroform and chloroform:methanol were identified as having the highest level of activity (index >60%). Therefore, it was these fractions that were pursued to isolate the active components. Repeated CC in elutions of hexane and ethyl acetate yielded semi-purified extracts with very high activity (>85%). However, the fractions proved to be complex mixtures of compounds with similar polarity that were not easily resolved by CC.

Analytical thin-layer chromatography was used to isolate five compounds from active fractions, some fractions weighing as little as 10 mg.

The TLC plates were eluted in a mixture of chloroform and ethyl acetate (1:2) and the chromatograms visualised following the application of acidified (H₂SO₄) ethanol, containing ammonium molybdate, and heating. This reagent revealed compounds as dark blue/purple spots on a light blue background. Although the R_f-values of some compounds were similar, there remained enough distance between them to scrape off bands and recover the purified compounds in methanol.

All five compounds were tested for insect antifeedant activity in the GFDA and two were shown to have potent antifeedant activity (97% and 92% - **I**). Unfortunately, only one of these compounds (**I**) was pure enough for investigation by mass spectrometry (MS) and nuclear magnetic resonance (NMR) experiments. The carbon (¹³C) and proton (¹H) results showed signals characteristic



of the *neo*-clerodane class and indeed were almost identical to those of ajugareptansin^(14, 16, 17), one of three *neo*-clerodane diterpenoids previously isolated from *A. reptans*⁽¹⁸⁾. The only area of difference in the spectra of **I** was assigned to C-14 and C-15, on the C-9 hexahydrofurofuran side-chain, for the presence of a double bond between C-14/15. Therefore **I** was named as 14,15-dehydroajugareptansin, a new *neo*-clerodane diterpenoid. The antifeedant index results (n=10) for ajugareptansin and 14,15-dehydroajugareptansin at 100 ppm were -41% and 92% (P<0.05), respectively. These results clearly showed the structure-function relationship for the enhancement of activity of a *neo*-clerodane diterpenoid possessing C-14/15 unsaturation. This result was in agreement with reports for other antifeedant active *neo*-clerodane diterpenoids, all possessing the same unsaturated hexahydrofurofuran moiety, such as clerodin (74%)⁽¹⁹⁾, jodrellin A (92%)⁽²⁰⁾ and jodrellin B (100%)⁽²¹⁾.

Two further compounds were also isolated by TLC and characterised from MS and NMR experiments as 3β-hydroxyajugavensin B (**II**) 3α-hydroxyajugamarin F4 (**III**). Both compounds were new 3-hydroxyl derivatives of previously known compounds ajugavensin⁽²²⁾ and ajugamarin F4⁽²³⁾ but neither possessed significant antifeedant activity. **II** only varied in structure from

ajugareptansin in the ester group at C-1 on the decalin portion of the molecule, being a tigloyl, rather than a 2-methylbutyryl group. But the inactivity of the compounds shows that this structural feature appears not to influence the feeding response of the *S. littoralis* larvae. Indeed, the structural features of the *neo*-clerodane diterpenoids that have been shown to be important in activity are maintaining the structural integrity of the parent compound possessing a C-9 hexahydrofurofuran side-chain, C-4/18 epoxide and C-6 and C-19 acetate groups⁽¹⁹⁾.

Ajugamarin F4 was a more unusual finding for a European *Ajuga* species because *neo*-clerodane diterpenoids possessing a C-9 butenolide group are more commonly found in species of the Far East and Africa⁽¹⁰⁾. In addition this compound also contained the C-3 hydroxyl group, common to many *neo*-clerodane diterpenoids from *Ajuga* but in the opposite α-orientation.

This chemical and biological investigation of insect resistance in *A. reptans* has revealed one new insect antifeedant active *neo*-clerodane diterpenoid and a further two new compounds of the same class. The scope for study within the species is still open to discover new active compounds as demonstrated by at least one in this study that remained unidentified. But perhaps of even greater opportunity is the understudied nature of this genus (ca. 65 species) which, of the few studied are known to be rich in *neo*-clerodane diterpenoids. Recent reports of *neo*-clerodane diterpenoids from *Ajuga* spp. have widened the scope of investigation within the genus⁽²⁴⁻²⁶⁾ but only one reported any biological activity^(27, 28). *A. iva* is of particular note in respect of insect antifeedant activity because, from among a number of ethanol extracts prepared from different *Ajuga* species, *A. iva* possessed the most potent activity

(100%)⁽¹⁵⁾. *Neo*-clerodane diterpenoids have been isolated from this species but were shown to be inactive as insect antifeedants⁽¹²⁾. However, the activity of the crude extract has recently been partially explained by the isolation of an antifeedant *neo*-clerodane diterpenoid⁽²⁹⁾ and perhaps more await discovery.

References

1. Imai, S., Toyosata, T., Sakai, M., Sato, Y., Fujioka, S., Murata, E. & Goto, M. (1969). Isolation of cyasterone and ecdysterone from plant materials. *Chem. Pharm. Bull.* 17: 340-342.
2. Kubo, I. & Hanke, F.J. (1986). Multifaceted chemically based resistance in plants. In Cooper-Driver, G.A., Swain, T. & Conn, E.E. (eds.) *Chemically Mediated Interactions Between Plants and Other Organisms. Recent Advances in Phytochemistry*, vol. 19, pp. 171-194. Plenum, New York.
3. Camps, F. (1991). Plant ecdysteroids & their interaction with insects. In Harborne, J.B. & Tomás-Barberán, F.A. (eds.) *Ecological Chemistry and biochemistry of Plant Terpenoids. Proceedings of the Phytochemical Society of Europe*, vol. 31, pp. 331-376. Clarendon Press, Oxford.
4. Camps, F. & Coll, J. (1993). Insect alleochemicals from *Ajuga* plants. *Phytochem.* 32: 1361-1370.
5. Saatov, Z., Syrov, V.N., Mamatkhanov, A.U. & Abubakirov, N.K. (1994). Phytoecdysteroids of plants of the genus *Ajuga* and their biological activity. *Chem. Nat. Comp.* 30: 138-145.
6. Sláma, K., Abubakirov, N.K., Gorovits, M.B., Baltaev, U.A. & Saatov, Z. (1993). Hormonal activity of ecdysteroids from certain Asiatic plants. *Insect Biochem. Molec. Biol.* 23: 181-185.
7. Meinwald, J., Prestwich, G.D., Nakanishi, K. & Kubo, I. (1978).

Chemical ecology: Studies in East Africa. *Science* 199: 1167-1173.

8. Merritt, A.T. & Ley, S.V. (1992). Clerodane diterpenoids. *Nat. Prod. Rep.* 9: 243-287.

9. Kubo, I., Kido, M. & Fukuyama, Y. (1980). X-ray crystal structure of 12-bromoajugarin-I and conclusions on absolute configuration of ajugarins. *J. Chem. Soc.: Chem. Commun.* pp. 897-898.

10. Rodríguez-Hahn, L., Esquivel, B. & Cárdenas, J. (1994). Clerodane diterpenes in Labiatae. In Hertz, W., Kirby, G.W. Moore, R.E., Steglich, W. and Tamm, Ch. (eds.) *Progress in the Chemistry of Organic Natural Products*, vol. 63, pp. 107-196. Springer-Verlag, Vienna.

11. Piozzi, F. (1997). *Neo*-clerodane diterpenoids from Labiatae. *Gazz. Chim. Ital.* 127: 537-543.

12. Bellés, X., Camps, F., Coll, J. & Piulachs, M.D. (1985). Insect antifeedant activity against larvae of *Spodoptera littoralis* (Boisd.) (Lepidoptera). *J. Chem. Ecol.* 11: 1439-1445.

13. Simmonds, M.S.J., Blaney, W.M., Esquivel, B. & Rodríguez-Hahn, L. (1996). Effects of clerodane-type diterpenoids isolated from *Salvia* spp. on feeding behaviour of *Spodoptera littoralis*. *Pest. Sci.* 47: 17-23.

14. Bremner, P.D. (1997). Chemical Basis of Insect Resistance in *Ajuga reptans* (L.). PhD Thesis, London University.

15. Simmonds, M.S.J. & Blaney, W.M. (1992). Labiatae-insect interactions: effects of Labiate-derived compounds on insect behaviour. In Harley, R.M. and Reynolds, T. (eds.) *Advances in Labiate Science*. pp. 375-392. Royal Botanic Gardens, Kew.

16. Camps, F., Coll, J., Cortel, J. & Messegue, A. (1979). Ajugareptansin, a new diterpenoid from *Ajuga reptans* (L.). *Terah. Lett.* pp. 1709-1712.

17. **Bremner, P.D., Simmonds, M.S.J., Blaney, W.M. & Veitch, N.C.** (1998). *Neo-clerodane diterpenoid insect antifeedants from Ajuga reptans* cv Catlins Giant. *Phytochem.* 47: 1227-1232.
18. **Camps, F., Coll, J. & Cortel, A.** (1981). Two new clerodane diterpenoids from *Ajuga reptans* (Labiatae). *Chem. Lett.* pp. 1093-1096.
19. **Blaney, W.M., Simmonds, M.S.J., Ley, S.V. & Jones, P.S.** (1988). Insect antifeedants: a behavioural and electrophysiological investigation of natural and synthetically derived clerodane diterpenoids. *Entomol. Exp. Appl.* 46: 267-274.
20. **Anderson, J.C., Blaney, W.M., Cole, M.D., Fellows, L.E., Ley, S.V., Sheppard, R.N. & Simmonds, M.S.J.** (1989). The structure of two clerodane diterpenoid potent insect antifeedants from *Scutellaria woronowii* (Juz); Jodrellin A and B. *Terah. Lett.* 30: 4737-4740.
21. **Cole, M.D., Anderson, J.C., Blaney, W.M., Fellows, L.E., Ley, S.V. Sheppard, R.N. & Simmonds, M.S.J.** (1990). *Neo-clerodane insect antifeedant from Scutellaria galericulata*. *Phytochem.* 29: 1793-1796.
22. **Malakov, P.Y., Papanov, G.Y., Perales, A., de la Torre, M.C. & Rodríguez, B.** (1992). The absolute stereochemistry of ajugavensins, *neo-clerodane diterpenoids from Ajuga genevensis* – A revision of the C-1 configuration of ajugavensins A and B. *Phytochem.* 31: 3151-3153.
23. **Shimomura, H., Sashida, Y. & Ogawa, K.** (1989). *Neo-clerodane diterpenes from Ajuga decumbens*. *Chem. Pharm. Bull.* 37: 996-998.
24. **de la Torre, M.C., Rodríguez, B., Bruno, M., Piozzi, F, Vassallo, N., Bondi, M.L. & Servettaz, O.** (1997). *Neo-clerodane diterpenoids from Ajuga australis* and *A. orientalis*. *Phytochem.* 45: 121-123.
25. **Beauchamp, P.S., Bottini, A.T., Caselles, M.C., Dev, V., Hope, H., Larter, M., Lee, G., Mathela, C.S., Melkani, A.B., Millar, P.D. Miyatake, M., Pant, A.K., Raffel, R.J., Sharma, V.K. & Wyatt, D.** (1996). *Neo-clerodane diterpenoids from Ajuga parviflora*. *Phytochem.* 43: 827-834.
26. **Malakov, P.Y. & Papanov, G.Y.** (1998). Areptins A and B two new *neo-clerodane diterpenoids from Ajuga reptans*. *Phytochem.* 49: 2443-2447.
27. **Chen, H., Tan, R.X., Liu, Z.L., Zhang, Y. & Yang, L.** (1996). Antibacterial *neo-clerodane diterpenoids from Ajuga lupulina*. *J. Nat. Prod.* 59: 668-670.
28. **Chen, H., Tan, R.X., Liu, Z.L., Zhao, C.Y. & Sun, J.** (1997). A clerodane diterpene with antibacterial activity from *Ajuga lupulina*. *Acta Cryst. Sect. C-Cryst. Struct. Commun.* 53: 814-816.
29. **Bond, M.L., Al-Hillo, M.R.Y., Ladjel, S., Bruno, B., Piozzi, F. & Simmonds, M.S.J.** (In Press). Occurrence of the antifeedant 14,15-dihydroajugaritin in the aerial parts of *Ajuga iva* from Algeria. *Biochemical Systematics and Ecology*.

Acknowledgements

Prof. W.M. Blaney and Prof. M.S.J. Simmonds for supervision of the PhD and to the BBSRC (formerly AFRC) for funding the project. The work was carried out in the laboratories of the Zoology Department, Birkbeck College, University of London and Jodrell Laboratory, Royal Botanic Gardens, Kew.

FLORA MESOAMERICANA – LABIATAE

Karen Sidwell

Department of Botany, The Natural History Museum, Cromwell Road, London SW7 5BD

The first major regional flora ever written in Spanish, Flora Mesoamericana is a collaborative effort of the Missouri Botanical Garden, the Instituto de Biología of the National Autonomous University of Mexico (UNAM), the Natural History Museum, London, and numerous specialists world-wide. In Spanish, the Flora describes, for the first time, all the vascular plants growing in the southeasternmost states of Mexico (including the Yucatán Peninsula) and all the Central American republics. The project publishes its results in an Internet version (W3FM), as well as in

printed volumes. W3FM first appeared on the Internet in 1994 from the Natural History Museum, London. It is currently being made available from a Missouri Botanical Garden server and was converted to a real-time version during October 1997. Visit our site at <http://www.mobot.org/MOBOT/fm/>. Dr Karen Sidwell is employed full time on the Flora Mesoamericana project at The Natural History Museum, London and is currently coordinating the treatment of Labiatae for Flora Mesoamericana. Initial estimates, shown in table 1 below, suggest that there are around 27 genera

and 150 species to be covered for the Flora. The largest genera are *Hyptis*, *Salvia* and *Scutellaria* are all being undertaken by Dr Sidwell with supervision and advice from relevant Labiatae experts. Dr Maru García Peña from MEXU is also writing several genera for the Flora. However, many of the smaller Labiate genera have yet to be assigned to particular authors. Botanists who are experts in any of the genera listed and who are able to offer to write a treatment for Flora Mesoamericana or have any comments on the table should contact: Dr Karen Sidwell, email: k.sidwell@nhm.ac.uk.

Table 1: An estimated list of the genera and number of species of Labiatae to be covered by Flora Mesoamericana.

Genus	Author	Total spp.	Estimated no. spp. in Flora	Flora Mesoamericana Author
<i>Asterohyptis</i>	Epling	3	3	
<i>Catoferia</i>	(Benth.)Benth.	4	4	
<i>Chaunostoma</i>	Donn. Sm.	1	1	
<i>Clerodendrum</i>	L.	400	2	
<i>Clinopodium</i>	L.	12	1	
<i>Cumila</i>	Royen ex. L.	15	1 sp. complex	Garcia Pena (MEXU)
<i>Hedeoma</i>	Pers.	38	1	Garcia Pena (MEXU)
<i>Hyptis</i>	Jacq.	300	28	Karen Sidwell (BM)
<i>Leonotis</i>	(Pers.) R.Br.	15	1	Garcia Pena (MEXU)
<i>Leonurus</i>	L.	3	1, introduced	
<i>Lepechinia</i>	Willd.	55	5	
<i>Marsypianthes</i>	Mart. ex Benth.	6	1	
<i>Mentha</i>	L.	25	cultivated	
<i>Monarda</i>	L.	12	? cultivated	
<i>Neoeplingia</i>	Ramam., Hiriart & Medrano	1	1? too far N	
<i>Ocimum</i>	L.	65	3	Garcia Pena (MEXU)
<i>Poliomintia</i>	A.Gray	7	1	Garcia Pena (MEXU)
<i>Plectranthus</i>	L'Hérit	350	c. 1, introduced	
<i>Prunella</i>	L.	4	1, introduced	
<i>Rosmarinus</i>	L.	3	1, cultivated	
<i>Salvia</i>	L.	500-900	50	Karen Sidwell (BM)
<i>Scutellaria</i>	L.	350	15	Karen Sidwell (BM)
<i>Stachys</i>	L.	300	5	Garcia Pena (MEXU)
<i>Teucrium</i>	L.	100	3	Karen Sidwell (BM)
<i>Trichostema</i>	L.	16	? too far N	

REQUESTS

This column has been compiled from the returned database questionnaires sent with the last Newsletter mailing. Correspondents are reminded that seed requests must be for scientific study and any commercialisation should be done only with the prior informed consent of the country of origin. Collection of material should comply with the national access laws pertaining to plant genetic resources and permit regulations of the country of origin.

Prof. Dr. E. Wollenweber, Institut für Botanik der TU, Schnittspahnstraße 3, D-64287, Darmstadt, Germany (wollenweber@bio.tu-darmstadt.de) would like Lamiaceae with aromatic scent, in particular from

semi-arid regions, for his work on the occurrence and distribution of flavonoid aglycones in lipophilic plant exudates.

Prof. Giovanni Vannacci, Dip. to Coltivazione e Difesa delle Specie Legnose, Sezione Patologia Vegetale, Via del Borghetto 80, I 56124 PISA, Italy (gvan@agr.unipi.it) would like seeds of *Ocimum* species.

Dr. Tim Upson, Cambridge University Botanic Garden, Cory Lodge, Bateman Street, Cambridge, CB2 1JF, UK (tmu20@cam.ac.uk) would like *Lavandula* species especially from NE tropical Africa and the Arabian Peninsula, and *Sabaudia*,

especially *Lavandula atriplicifolia* (*Sabaudia atriplicifolia*) from Saudi Arabia and Yemen.

Prof. Kurt Aitzetmuller, Institute for Chemistry and Physics of Lips, Piusallee 76, D - 48147 Munster, Germany (aitzetz@uni-muenster.de) would like seeds of *Panzerina* spp., *Oncinocalyx* spp. & *Spartothamnella* spp. and all the closest phylogenetic relatives of *Lamium*, *Teucrium*, *Thymus*, *Phlomis* & *Panzerina*.

Dr. A. J. Solomon Raju, Assistant Professor, Dept. of Environmental Sciences, Andhra University, Visakhapatnam 530 003, India would like material of *Stachytarpheta* and *Anisochilus*.

Janet Barber, Dept. of Botany, Bio 311, University of Texas, Austin, TX 78713, USA (barberj@uts.cc.utexas.edu) would like seeds and/or leaf material of known provenance from continental species of *Sideritis* (Europe, N. Africa).

Dra Elaine Elisabetsky, Laboratorio de Etnofarmacologia, ICBS, Universidade Federal do Rio Grande do Sul, C.P. 5072, 90041-970 Porto Alegre - RS, Brazil (elisasky@vortex.ufrgs.br.) helped establishing a soap factory at the "Chico Mendes" Extractive Reserve - with women experimenting with their ethnobotanical knowledge to produce medicinal, hygiene and general purpose soaps. She would like to identify socially responsible entrepreneurs interested in marketing/buying/sell-

ing these products and wonders if any of the Lamiales Newsletter subscribers could help or know of any such person.

John Covanes, Director of Research, Botresearch, 23410 Harpergate, Spring, Tx 77373, USA (botresearch@hotmail.com or fax: +1 281 355 1857) is currently looking for a source of *Phlomis* seed for the next segment of his studies. Botresearch is a company that does tissue culture via organogenesis to provide either explants or plantlets to other researchers or botanical gardens and arboreta to assure their longevity, in addition to looking at anatomical structures and conducting physiological studies. It is not a commercial tissue facility.

Dr Zoltán Kereszty, Institute of Ecology and Botany of the Hungarian Academy of Sciences, H-2163 Vácrtót, Hungary (Kereszty@botanika.botanika.hu) is currently working on a revision of *Verbena* and would be grateful for any herbarium specimens, papers, seeds (especially species missing in European garden collections), illustrations and photographs of this genus.

Dr David Frodin, Herbarium, Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3AE, UK (d.frodin@rbgkew.org.uk) is currently preparing a world checklist and bibliography of Lamiales (with Raphaël Govaerts and collaborators). He is particularly keen to receive literature about this family and its allies.

semeistva gubotsvetnykh (Lamiaceae) flory Azerbaidzhana. Izv. Akad. Nauk Azerb. Biol. Nauk, no. 3-4: 26-32 (1991).

Rana, TS, Nath, B, Datt, B. A census of the family Lamiaceae nom. alt. Labiatae in Western Himalayas. In Gupta, BK, ed., Higher plants of Indian Subcontinent: vol 6. pp. 31-55 (1997). Dehra Dun: Bishen Singh Mahendra Pal Singh.

Salimena Pires, FR, Giulietti, AM. Flora da Serra do Cipo, Minas Gerais: Verbenaceae. (Flora of the Serra do Cipo, Minas Gerais: Verbenaceae). Bol. Bot. Univ. Sao Paulo 17: 155-186 (1998).

Velazquez, D. Clave para los generos de Lamiaceae en Venezuela. Acta Bot. Venezuel. 20(1): 1-42 (1997).

GENERAL

Aitzetmuller, K. Seed oil fatty acids in the Labiatae. Lamiales Newsl. no. 5: 3-5 (1997)

Aitzetmuller, K, Tseveguren, N. Phlomic acid in *Lamioideae* seed oils. Lamiales Newsl. no. 6: 13-16 (1998).

Boscaiu, M, Riera, J, Estrelles, E, Guemes, J. Chromosome numbers of several Lamiaceae from Spain. Folia Geobot. 33(2): 187-199 (1998).

Cantino, PD. Labiatae as a case study in phylogenetic nomenclature. Lamiales Newsl. no. 6: 3-6 (1998).

Cantino, PD, Wagstaff, SJ, Olmstead, RG. *Caryopteris* (Lamiaceae) and the conflict between phylogenetic and pragmatic considerations in botanical nomenclature. Syst. Bot. 23(3): 369-386 (1998 publ. 1999).

Hostettmann, K et al. Chemistry, biological and pharmacological properties of African medicinal plants. Proceedings of the First International IOCD-Symposium, Victoria Falls, Zimbabwe, February 25-28, 1996. Zimbabwe: University of Zimbabwe Publications, 1996. 226 p. ISBN: 0908307594.

Lawrence, BM. Progress in essential oils. Perfum. Flavor. 23(1): 39-50 (1998).

Lawrence, BM. Progress in essential oils. Perfum. Flavor. 23(3): 63-82 (1998).

Mendez Santos, IE. Evaluacion morfoanatomica de los generos cubanos de *Lantaneae* (Verbenaceae) en Cuba. (Morpho-anatomic evaluation of the Cuban genera of *Lantaneae* (Verbenaceae) in Cuba). Rev. Jard. Bot. Nacion. Univ. Habana 19: 17-40 (1998).

Miralles, J. Distilled Labiatae oils from Spain. Perfum. Flavor. 23(3): 15-17 (1998).

Montes, MA et al. Antibacterial activity of essential oils from aromatic plants growing in Chile. Fitoterapia 69(2): 170-172 (1998).

Olmstead, RG, Reeves, PA, Lepschi, BJ. Confirmation of a monophyletic *Chloanthoideae* (Lamiaceae) comprising tribes *Chloantheae* and *Prostanthereae*. Lamiales Newsl. no. 6: 7-10 (1998).

Orsini, G, Velazquez, D. Tipos del Herbario Nacional de Venezuela (VEN): 2. Labiadas (Lamiaceae). Acta Bot. Venezuel. 19(2): 67-78 (1996).

Orsini, G, Velazquez, D, Rinaldi, M. Estudio palinologico de la subtribu *Mentheae* (Lamiaceae) en el Parque Nacional "El Avila", Venezuela. Acta Bot. Venezuel. 19(2): 47-66 (1996).

Perez, G, Vega, N, Fernandez, Alonso, JL. Studies on Colombian Labiatae lectins. Lamiales Newsl. no. 6: 6-7 (1998).

Tiwari, R. Fungitoxicity of volatile constituents of some higher plants against predominant storage fungi. Indian Phytopathol. 50(4): 548-551 (1997).

Tseveguren, N, Aitzetmuller, K, Werner, G. Fatty acids of some central Asian Labiatae. Lamiales Newsl. no. 5: 6-8 (1997).

Tucker, AO, Maciarello, MJ. Some Toxic Culinary Herbs in North America. In Contis, ET et al. (Eds.). Developments in Food

Science 40. Food Flavors: Formation, Analysis and Packaging Influences. Proceedings of the 9th International Flavor Conference, Limnos, Greece, 1997: 401-414 (1998).

Wagstaff, SJ et al. Phylogeny in Labiatae s.l., inferred from cpDNA sequences. Pl. Syst. Evol. 209(3-4): 265-274 (1998).

Weber, CW et al. The nutritional and chemical evaluation of chia seeds. Ecol Food Nutrition 26: 119-125 (1991).

ACANTHOLIPPIA

Furlan, I, D'Ambrogio, A, Frayssinet, N. Comportamiento meiotico y estudio morfoanatomico de la antera apendiculada de *Acantholippia seriphioides* (Verbenaceae). Fyton 62(1-2): 223-230 (1998).

ACROCEPHALUS (see HAUMANIATRUM)

AEGIPHILA

Fernandez Alonso, JL. Sobre la identidad de *Aegiphila reticulata* Mold. ("Verbenaceae") y *Rondeletia pubescens* H.B.K. (Rubiaceae). Rev. Acad. Colomb. Cienc. Exact. Fis. Nat. 22(85): 591-593 (1998)

AJUGA

Ghisalberti, EL. Biological and pharmacological activity of naturally occurring iridoids and secoiridoids. Phytomedicine 5(2): 147-163 (1998).

Kim, JW. (A distribution of *Ajuga spectabilis* Nakai (Labiatae) of Korean endemic plant). Korean J. Pl. Taxon. 22(1): 47-49 (1992).

Stirling AMcG, comp. Short notes. Glasgow Nat. 23(2): 54-62 (1997).

Varol, O, Ilcim, A, Tatli, A. New observation on two poorly known Turkish species. Thaiszia 8(1): 53-56 (1998).

Velazquez, D, Orsini, G. Aportes al conocimiento de la familia Lamiaceae en Venezuela: 1. *Ajuga, Teucrium* y *Scutellaria*. Acta Bot. Venezuel. 20(1): 93-115 (1997).

BIBLIOGRAPHY OF RECENT TAXONOMIC PUBLICATIONS

The following list of publications has been abstracted from the Kew Record of Taxonomic Literature and from the Kew Economic Botany Bibliographic Database (March 1998 - November 1999), and we are, again, extremely grateful to the editors and compilers for their assistance in preparing this bibliography (Ann McNeil and Mark Nesbitt). Regrettably, as in LN6 our selection from the Economic Botany Database is not complete due to space constraints. It should be pointed out that our Economic database compilers record data significantly differently from the Kew Record compilers. There has been a tendency to call authors "anon". To rectify this situation, some of the ANON authored publications listed in previous newsletters will appear here again - this time with their named authors. If you too have been relegated to ANON please inform the eds, and we will endeavour to reinstate you! As was the case for the last newsletter, some authors have sent us noti-

fication of publications not listed on the "Kew Record" and these have also been included. Where possible articles are listed under the applicable genus, or occasionally, tribe or family - and are arranged alphabetically. Where a number of references to different taxa in the Lamiales are made in a single paper they have tended to be listed under the "General" heading. Any title enclosed completely within brackets is the English translation of a title written in a "symbol" font such as Arabic, Chinese, Japanese or Russian. All diacritical marks have been removed to facilitate editing.

FLORA

Carauta, S de A. Labiatae da Reserva Florestal "Vista Chinesa", Rio de Janeiro. Albertoa, n.s., no. 1: 3-4 (1999).

Fu, LK, Chen, TQ, Lang, KY, Hong, T, eds. Higher plants of China: volume 9. Loganiaceae-Lamiaceae (Labiatae): 627p, 32p. of col. plates. Qingdao: Qingdao Publishing House, 1999.

Harley, RM. The Labiatae of Bahia: A preliminary check-list. Sitientibus 15: 11-21 (1996).

Harley, RM. Labiatae. In Jorgensen, PM., Léon-Yáñez, S (Eds). Catalogue of the Vascular Plants of Ecuador: 519-526 (1999). Missouri Botanical Garden Press.

Hedge, IC, Clement, RA, Paton, AJ, Phillipson, PB. Flore de Madagascar et des Comores: famille 175. Labiatae, 293p. (1998). Paris: Museum National d'Histoire Naturelle.

Landolt, E. Beitrage zu Flora der Stadt Zurich: VI. Dicotyledonen 4 (Umbelliferae bis Labiatae). (Contributions to the flora of the city of Zurich: VI. Dicotyledones 4 (Umbelliferae to Labiatae). Bot. Helvetica 108(1): 39-56 (1998).

Morales, R. Las labiadas de la Comunidad de Madrid. (The Labiatae of the community of Madrid). Bot. Complutensis, no. 22: 9-62 (1998).

Orlova, SYa, Chapari, NM, Zeinalova, AZ. Osobennosti anatomicheskogo stroeniya lista endemichnykh predstavitelei

ALOYSIA

Bonzani, NE, Filippa, EM, Barboza, GE. Particularidades epidermicas en algunas especies de Verbenaceae. (Epidermical peculiarities of some Verbenaceae). An. Inst. Biol. Univ. Nac. Auton. Mex., Bot. 68(2): 47-56 (1997 publ. 1998).

ANISOCHILUS

Stephen, D, Vajravelu, E. Notes on the occurrence of *Wahlenbergia hookeri* and *Anisochilus verticillatus* in Tamil Nadu. J. Bombay Nat. Hist. Soc. 94(3): 594-595 (1997).
Thoppil, JE, Jose, J. Karyomorphometrics and essential oil analysis in *Anisochilus* Wall. ex Benth. Philippine J. Sci. 127(2): 103-109 (1998).

AVICENNIA

Bousquet Melou, A, Fauvel, MT. Inter-specific variation in the concentration of two iridoid glucosides in *Avicennia* L. (Avicenniaceae Endl.). Biochem. Syst. Ecol. 26(8): 935-940 (1998).
Ewel, KC et al. Different kinds of mangrove forests provide different goods and services. Global Ecol. Biogeogr. Lett. 7(1): 83-94 (1998).
Shah, MJ et al. Male contraceptives from traditional drugs (plant based). Hamdard Med. 60(2): 34-36 (1997).

BALLOTA

Ezer, N, Sahin, FP, Toker, MC. Morphological and anatomical investigations of *Ballota nigra* L. subsp. *anatolica* P.H. Davis used as folk medicine. Israel J. Pl. Sci. 47(1): 43-48 (1999).

BETONICA

Krestovskaya, TV, Vasileva, IM. Palinologicheskoe izuchenie vidov rodov *Stachys* i *Betonica* (Lamiaceae). (Palynological study in the genera *Stachys* and *Betonica* (Lamiaceae)). Bot. Zhurn. 82(11): 30-41 (1997).

BYSTROPOGON

Hernandez, E, Garcia, D. *Bystro-pogon odoratissimus* Bolle en el Macizo de Teno (Tenerife, Islas Canarias). Bot. Macaronesica no. 23: 313-315 (1996, publ. 1998).

CALAMINTHA

Fraternale, D, Giamperi, L, Ricci, D, Manunta, A. Composition of essential oil as a taxonomic marker for *Calamintha nepeta* (L.) Savi ssp. *nepeta*. J. Essent. Oil Res. 10(5): 568-570 (1998).
Marcu, N, Bogrug, M, Dragalin, I. Continutul si componenta chimica a uleiului volatil din plantele de *Calamintha* Mill. (The content and chemical composition of the volatile oil from *Calamintha* Mill.). Izv. Akad. Nauk Resp. Moldova, Biol. Khim. no.4(277): 10-14 (1995).

CALLICARPA

Atkins, S. Plant portraits: 363. *Callicarpa japonica*: Labiatae. Curtis's Bot. Mag. 16(2): 79-83 (1999).
Kawakubo, N. Evolution of cryptic dioecy in *Callicarpa* (Verbenaceae) on the Bonin Islands. In Stuessy, TF, Ono M, eds. Evolution and speciation of island plants: pp. 155-168. Cambridge: Cambridge University Press,
Kim, H. Morphological variation of the *Callicarpa japonica* complex in Eastern Asia. J. Pl. Biol. 41(4): 283-292 (1998).
Kim, H, Song, MJ. (Numerical analysis of *Callicarpa mollis* complex using morphological characters). Korean J. Pl. Taxon. 27(2): 137-156 (1997).
Kim, H, Song, MJ. A taxonomic study of the genus *Callicarpa* in Korea based on RAPD analysis. Korean J. Pl. Taxon. 29(2): 111-121 (1999).

CARYOPTERIS

Cantino, PD, Wagstaff, SJ, Olmstead, RG. *Caryopteris* (Lamiaceae) and the conflict between phylogenetic and pragmatic consid-

erations in botanical nomenclature. Syst. Bot. 23(3): 369-386 (1998 publ. 1999).

CLERODENDRUM

Barua, KN, Bossiya, CL. Comparative leaf architecture of N.E. Indian species of *Clerodendrum* Linn. J. Pl. Anat. Morphol. 7(2): 126-132 (1997).
Daniel, P, Rajendran, A. Critical comments on *Clerodendrum farinosum* (Roxb.) Wallich ex Steudel (Verbenaceae). Bull. Bot. Surv. India 35(1-4): 110-114 (1993 publ. 1997).
Herman, PPJ. The leaf anatomy of two *Clerodendrum* species (Verbenaceae). S. Afr. J. Bot. 64(4): 246-249 (1998).
Kakule, K. Resume de these: Une reconnaissance des savoirs paysans. Plantes medicinales et medicine veterinaire traditionnelle d'Afrique Centrale. Ethnopharmacologia (22): 58-64 (1998).
Kereszty, Z. SEM analysis on the leaf epidermis of the Cuban *Clerodendrum* taxa (Verbenaceae). Acta Bot. Hung. 38(1-4): 353-368 (1993-4, publ. 1994?).
Rajendran, A, Daniel, P. A new species of *Clerodendrum* (Verbenaceae) from northeastern India. J. Bombay Nat. Hist. Soc. 95(1): 99-101 (1998).
Rajendran, A, Daniel, P. The status and affinities of *Clerodendrum macrostachyum* Turcz (Verbenaceae). Bull. Bot. Surv. India 35(1-4): 121-123 (1993, publ. 1997).
Steane, DA, Scotland, RW, Mabblerley, DJ, Olmstead, RG. Molecular systematics of *Clerodendrum* (Lamiaceae): ITS sequences and total evidence. Amer. J. Bot. 86(1): 98-107 (1999).

CLINOPODIUM

Cantino, PD, Wagstaff, SJ. A reexamination of North American *Satureja* s.l. (Lamiaceae) in light of molecular evidence. Brittonia 50(1): 63-70 (1998).

COLEUS (see PLECTRANTHUS)

CUNILA

Garcia Pena, M del, R, Tenorio Lezama, P. Especie nueva *Cunila* (Lamiaceae) del estado de Durango, Mexico. (A new species of *Cunila* (Lamiaceae) from Durango, Mexico). An. Inst. Biol. Univ. Nac. Auton. Mex., Bot. 68(1): 1-5 (1997).

DICRASTYLIS

Rye, BL, Trudgen, ME. A taxonomic revision of *Dicrastylis* sect. *Dicrastylis* (Lamiaceae subfamily *Chloanthoideae*). Nuytsia 12(2): 207-228 (1998).

DRACOCEPHALUM

Herloff, B, Bergstrom, I. Tva vagkantsinkomlingar: turkisk drakblomma *Dracocephalum moldavica* och smultronmalla *Chenopodium capitatum*. (Two roadside aliens: *Dracocephalum moldavica* and *Chenopodium capitatum*). Svensk Bot. Tidskr. 92(6): 357-358 (1998).
Toma, C, Toniuc, A, Verdes, C. Morpho-anatomical researches on the pericarp of some Labiatae species. An. Sti. Univ. "Al. I. Cuza" Iasi, Biol. Veg. 44: 1-12 (1998).

DURANTA

Martinez, S, Mulgura de Romero, ME. Yemas axilares multiples, morfologia y tipologia de la inflorescencia en *Duranta* (Verbenaceae-*Citharexyleae*). (Multiple axillary buds, morphology and typology of the inflorescence in *Duranta* (Verbenaceae-*Citharexyleae*)). Bol. Soc. Argent. Bot. 33(1-2): 113-122 (1997).

ELSHOLTZIA

Tucker, AO, Maciarello, MJ. Volatile oil of *Elsholtzia stauntonii* Benth. J. Essent. Oil Res. 7: 653-703 (1995).

EREMOSTACHYS

Koul, AK. Is *Eremostachys superba* Royle ex Benth. really at the verge

of extinction? Curr. Sci. 73(4): 313-314 (1997).

FARADAYA

Grayer, RJ, de Kok, RPJ. Flavonoids and verbascoside as chemotaxonomic characters in the genera *Oxera* and *Faradaya* (Labiatae). Biochem. Syst. Ecol. 26(7): 729-741 (1998).
de Kok, RPJ. The biology and systematics of *Oxera*, *Faradaya* and *Hosea* (Labiatae). Oxford: Rogier PJ de Kok, 1997 (PhD thesis).
de Kok, RPJ. *Oxera*, *Faradaya* and *Hosea*, systematics and conservation. Lamiales Newsl. no. 6: 1-3 (1998).
de Kok, RPJ, Mabblerley, DJ. The genus *Faradaya* (Labiatae). Blumea 44(2): 321-342 (1999).

GLECHOMA

Hutchings, MJ, Price, EAC. *Glechoma hederacea* L. (*Nepeta glechoma* Benth., *N. hederacea* (L.) Trev.). J. Ecol. 87(2): 347-364 (1998).

GMELINA

Barrett, RL et al. Trials of secondary exotic hardwoods in Rhodesia. Forest Research Paper No. 4. Rhodesia: Rhodesia Forestry Commission Research Division, 1976. 50p.
Mabblerley, DJ. On *Neorapinia* (*Vitex* sensu lato, Labiatae-*Viticoideae*). Telopea 7(4): 313-317 (1998).
Nwonwu, FOC. A comparison of *Gmelina arborea* yields in the Derived and Guinea Savanna zones of Nigeria. Discovery Innov. 9(3&4): 167-172 (1998).
Ologe, KO. Sustainable development in Nigeria's dry belt: problems and prospects. Proceeding of the NEST Annual Workshop held in October 1990 in Kano, Nigeria. Nigeria: Nigerian Environmental Study/Action Team (NEST), 1991. 112p. ISBN: 9783120328.

HANCEOLA

Paton, A, Ryding, O. *Hanceola*, *Siphocranion* and *Isodon* and their position in the *Ocimeae* (Labiatae). Kew Bull. 53(3): 723-731 (1998).

HAUMANIASTRUM

Brooks, RR et al. Phytomining. Trends Pl. Sci. 3(9): 359-362 (1998).
Paton, A. Provisional generic delimitation in the *Haumaniastrum/Acrocephalus* complex (Labiatae). In van der Maesen, LJG, van der Burgt, XM, van Medenbach de Rooy, JM, eds. The biodiversity of African plants: proceedings XIVth AETFAT congress, 22-27 August 1994, pp. 507-512 (1996). Wageningen, The Netherlands. Dordrecht: Kluwer Academic.

HEMIZYGIA

Paton, A. New records and new combinations in *Hemizygia* and *Syncolostemon* (Labiatae). Kew Bull. 53(2): 483-485 (1998).

HOSEA

de Kok, RPJ. The biology and systematics of *Oxera*, *Faradaya* and *Hosea* (Labiatae). Oxford: Rogier PJ de Kok, 1997 (PhD thesis).
de Kok, RPJ. *Oxera*, *Faradaya* and *Hosea*, systematics and conservation. Lamiales Newsl. no. 6: 1-3 (1998).

HYPTIS

Aluri, AJS, Vergara-Santana, MI, Juarez, SL. Floral Ecology, Carinal-Lobe Release, Pollination and Reproductive Success in the Wild and Domesticated Forms of *Hyptis suaveolens* (L.) Poit. (Lamiaceae) in Mexico. Plant Species Biol. 12: 61-68 (1997).
Chowdhury, AR, Raina, RM. Chemical studies on essential oil from *Hyptis suaveolens* Poit. growing around Lucknow. J. Non-Timber Forest Prod. 5(3-4): 138-139 (1998).
Harley, RM. Studies on *Hyptis* Jacq. (Labiatae) in the Venezuelan Guyana. Notes on New World Labiatae: 11. Kew Bull. 53(4): 973-976 (1998).

Harley, RM. A revision of *Hyptis* sect. *Polydesmia* subsect. *Malvastra* (Labiatae) in the neotropics. Kew Bull. 54(2): 395-404 (1999).
Harley, RM, Salimena Pires, F. Two Brazilian *Lippia* species belong to *Hyptis* (Labiatae). Kew Bull. 53(2): 452 (1998).

HYSSOPUS

Mikolas, V. *Hyssopus officinalis* L. – a protoergasiophytophyte of Slovakian flora. In Elias, P (ed.), Invasions and invasive organisms, pp. 158-166. Nitra (1997).

ISODON

Morton, JK. New names in *Plectranthus* (Lamiaceae) and allied genera from the Ethiopian region. Novon 8(3): 265-266 (1998).
Paton, A, Ryding, O. *Hanceola, Siphocanion* and *Isodon* and their position in the *Ocimeae* (Labiatae). Kew Bull. 53(3): 723-731 (1998).

LAMIUM

Loos, GH. *Lamium* subgen. *Galeobdolon*. Die Goldnesselgruppe in Thuringen: Anmerkungen und vorläufiger Bestimmungsschlüssel. Inform. Flor. Kart. Thuringen no.14: 8-9 (1998).
Park, SJ, Kim, YS. (A taxonomic study on the genus *Lamium* (Lamiaceae) in Korea). Korean J. Pl. Taxon. 25(2): 103-122 (1995).

LANTANA

Bonzani, NE, Filippa, EM, Barboza, GE. Particularidades epidermicas en algunas especies de Verbenaceae. (Epidermal peculiarities of some Verbenaceae). An. Inst. Biol. Univ. Nac. Auton. Mex., Bot. 68(2): 47-56 (1997, publ. 1998).
Deka, MK et al. Effects of indigenous plants extracts on fecundity and viability of eggs of tea mosquito bug. Geobios 25(2&3): 160-165 (1998).
Deka, MK et al. Antifeedant and repellent effects of pongam (*Pongamia pinnata*) and wild sage (*Lantana camara*) on tea mosquito

bug (*Helopeltis theivora*). Indian J. Agric. Sci. 68(5): 274-276 (1998).
Frei, B et al. Medicinal and food plants: Isthmus Sierra Zapotec criteria for selection. Angew. Bot. 72(3,4): 82-86 (1998).
Mendez Santos, IE. A new species of *Lantana* (Verbenaceae) from Cuba. Kew Bull. 54(2): 487-490 (1999).
Muhayimana, A, Chalchat, JC, Garry, RP. Chemical composition of essential oils of *Lantana trifolia* L. from Rwanda. J. Essent. Oil Res. 10(5): 547-549 (1998).

Verma, DK et al. Antifungal activity of triterpenoids from *Lantana indica* root. Fitoterapia 69(2): 188-189 (1998).

LAVANDULA

Barnes, J. Focus on phytotherapy. Pharm. J. 260 (6976): 67-68 (1998).
Head, J. The genus *Lavandula*. The Lavender Bag 11: 21-23 (1999).
McNaughton, V. Plant Portrait: *Lavandula × intermedia* ‘Grosso’. The Lavender Bag 8: 7-8 (1998).
Ramsamy, K. Lavenders at Downview Prison. The Lavender Bag 9: 11-12 (1998).
Tucker, AO, Hensen, KJW. The Cultivars Of Lavender And Lavandin (Labiatae). Bailey 22(4): 168-177 (1985).
Tucker, AO, Maciarello, MJ, Howell, JT. The Effect Of Sand Topdressing And Fertilizer On Inflorescence And Essential Oil Yield In “Dutch” Lavandin. HortScience 19(4): 526-527 (1984).

Tucker, AO, Maciarello, MJ, Howell, JT. A Preliminary Analysis of Some Lavender and Lavandin Cultivars. Perfumer & Flavorist 9: 49-52 (1984).
Williamson, EM. Patents alert. Phytother. Res. 12(3): 225-226 (1998).
Yates, C. *Lavandula pinnata* – the real McCoy or going native in Lanzarote. The Lavender Bag 9: 8-10 (1998).

LEONURUS

Tasdemir, D, Calis, I, Sticher, O. Labdane diterpenes from *Leonurus persicus*. Phytochemistry 49(1): 137-143 (1998).

LEUCAS

Ryding, O. Phylogeny of the *Leucas* group (Lamiaceae). Syst. Bot. 23(2): 235-247 (1998).
Singh, V. A new species of *Leucas* R. Br. from India. J. Econ. Taxon. Bot. 21(3): 743-745 (1997, publ. 1998).

LIPPIA

Bonzani, NE, Filippa, EM, Barboza, GE. Particularidades epidermicas en algunas especies de Verbenaceae. (Epidermal peculiarities of some Verbenaceae). An. Inst. Biol. Univ. Nac. Auton. Mex., Bot. 68(2): 47-56 (1997, publ. 1998).
Mulgura de Romero, ME, Martinez, S, Suyama, A. Morfologia de las inflorescencias en *Lippia* (Verbenaceae). (Morphology of inflorescences in *Lippia* (Verbenaceae)). Darwiniana 36: 1-12 (1998).
Silva, O et al. Plant extracts antiviral activity against Herpes simplex virus type 1 and African swine fever virus. Int. J. Pharmacog. 35(1): 12-16 (1997).
Tucker, AO, Maciarello, MJ, Espaillat, JR, French, EC. The Essential Oil of *Lippia micromera* Schauer in DC. (Verbenaceae). J. Essent. Oil Res. 5: 683-685 (1993).

MARRUBIUM

de Souza, MM et al. Analgesic profile of hydroalcoholic extract obtained from *Marrubium vulgare*. Phytomedicine 5(2): 103-107 (1998).

MENTHA

Baser, KHC, Kurkcuglu, M, Tarimcilar, G, Kaynak, G. Essential oils of *Mentha* species from northern Turkey. J. Essent. Oil Res. 11(5): 579-588 (1999).

Chou, GX, Zhou, RH. (The variation and chemotypes of the essential oil components in wild *Mentha haplocalyx* Briq. in China). J. Pl. Resourc. Environ. 7(3): 13-18 (1998).

Fraga, BM. Natural sesquiterpenoids. Nat. Prod. Rep. 15(1): 73-106 (1998).

Gavalas, N, Bosabalidis, AM, Kokkini, S. Comparative study of leaf anatomy and essential oils of the hybrid *Mentha × villosa-nervata* and its parental species *M. longifolia* and *M. spicata*. Israel J. Pl. Sci. 46(1): 27-33 (1998).

Lebeau, J, Lambinon, J. Notes breves sur certaines centurries. No.11569. *Mentha × piperita* L. subsp. *nepetoides* (Lej.) Lebeau = *M. × nepetoides* Lej. (*M. aquatica* L. × *M. spicata* L. subsp. *spicata*). Soc. Ech. Pl. Vasc. Eur. Bassin Medit. Bull. 20(1982-1983): 53-54 (1985).

Mimica Dukic, N, Gasic, O, Janicic, R, Kite, G. Essential oil composition of some populations of *Mentha arvensis* L. in Serbia and Montenegro. J. Essent. Oil Res. 10(5): 502-506 (1998).

Stepanek, J. Maty (*Pulegium a Mentha*) v Ceske republice: 1. Puvodni a zplanujici druchy. (*Pulegium* and *Mentha* in the Czech Republic: 1. Autochthonous and introduced species). Zpravy Ceske Bot. Spol. (Prague) 33(1): 1-28 (1998).

Stepanek, J. Maty (*Pulegium a Mentha*) v Ceske republice: 2. Krizenci. (*Pulegium* and *Mentha* in the Czech Republic: 2. Hybrids). Zpravy Ceske Bot. Spol. (Prague) 33(2): 101-144 (1998).

Stoeva, T, Ivancheva, S, Behar, M. Flavonoids, phenolic and triterpenic acids in the *Mentha spicata* (L.) Huds. group from Bulgaria. Phytologia Balcanica 3(1): 89-93 (1997).

Tarimcilar, G, Kaynak, G. A new record for the flora of Turkey. Lagasalia 20(1): 113-115 (1997).

Voirin, B, Bayet, C, Faure, O, Jullien, F. Free flavonoid aglycones as markers of parentage in *Mentha aquatica*, *M. citrata*, *M. spicata* and *M. × piperita*. Phytochemistry 50(7): 1189-1193 (1999).

Yu, LJ, Cui, JZ, Zhang, DW, Wang, FC. (Study on morphology of foliar glandular hairs in *Mentha sachalinensis* Kudo). Bull. Bot. Res. North-East. Forest. Univ. 17(1): 75-78 (1997).

Zaidi, F, Voirin, B, Jay, M, Viricel, MR. Free flavonoid aglycones from leaves of *Mentha pulegium* and *Mentha suaveolens* (Labiatae). Phytochemistry 48(6): 991-994 (1998).

MICROMERIA

Marin, PD, Duletic Lausevic, S, Ristic, M, Janackovic, P. Micro-morphology, anatomy and myxocarpy of nutlets of selected *Micromeria* species (Lamiaceae). In Tsekos I, Moustakas M, eds. Progress in botanical research: proceedings of the 1st Balkan Botanical Congress, pp. 85-88 (1998). Dordrecht: Kluwer.

MONOCHILUS

Cantino, PD. A new species of *Monochilus* (Lamiaceae) from Brazil. Novon 9(3): 323-324 (1999).

MOSLA

Hu, S, Fan, C. (The scanning electron microscope of pollen and fruit of *Mosla*). J. Wuhan Bot. Res. 16(4): 383-384 (1998).

Zhou, SL. (Genetic divergence and analysis of the relationships between species of *Mosla* (Labiatae)). Acta Phytotax. Sin. 37(1): 10-19 (1999).

Zhou, S, Pan, K, Hong, D. (Nutlet dispersal of *Mosla hangchouensis* Matsuda (Labiatae)). Guihaia 19(2): 176-179 (1999).

Zhou, SL, Pan, KY, Hong, DY. Pollen and nutlet morphology in *Mosla* (Labiatae) and their systematic value. Israel J. Pl. Sci. 45(4): 343-350 (1997).

NASHIA

Mendez Santos, IE. Study on the natural populations of *Nashia* (Verbenaceae) in Cuba. Lamiales Newsl. no. 5: 1-3 (1997).

NEORAPINIA

Mabberley, DJ. On *Neorapinia* (*Vitex* sensu lato, Labiatae-Viticoideae). Telopea 7(4): 313-317 (1998).

NEPETA

Jamzad, Z. A new species of *Nepeta* L. (Labiatae) from Iran. Iranian J. Bot. 7(2): 249-253 (1998).
Kolalite, MR. Comparative analysis of ultrastructure of glandular trichomes in two *Nepeta cataria* chemotypes (*N. cataria* and *N. cataria* var. *citriodora*). Nordic J. Bot. 18(5): 589-598 (1998).

Martin Mosquero, MA. *Nepeta cataria* L., una nueva especie para la flora de Andalucia occidental. Lagasalia 20(2): 315-316 (1998).

Tucker, AO, Tucker, SS. Catnip and the Catnip Response. Economic Botany 42(2): 214-231(1988).

Walter, E. Die Grossblutige Katzenminze (*Nepeta grandiflora* Bieb.) in Oberfranken. Flor. Rundbr. 32(1): 86-90 (1998).

NYCTANTHES

Bahadur, B, Venkateswarlu, T, Pratap Reddy, N. Heterostyly and pollen dimorphism in *Nyctanthes arbor-tristis* L. J. Palynol. 32(1-2): 51-58 (1996).

OBTEGOMERIA

Cantino, PD, Doroszenko, A. *Obtegomeria* (Lamiaceae), a new genus from South America. Novon 8(1): 1-3 (1998).

OCIMUM

Albuquerque, UP de, Andrade, L de HC. El genero *Ocimum* L. (Lamiaceae) en el nordeste del Brasil. (The genus *Ocimum* L. (Lamiaceae) in north-east Brazil). An. Jard. Bot. Madrid 56(1): 43-64 (1998).

Albuquerque, UP et al. Etnobotanica del genero *Ocimum* L. (Lamiaceae) en las comunidades Afrobrasilenas. (Ethnobotany of the genus *Ocimum* L. (Lamiaceae) by Afrobrasilian communities). An. Jard. Bot. Madrid 56(1): 107-118 (1998).

Dales, MJ. A review of plant materials used for controlling insect pests of stored products. Bulletin 65. Chatham, U.K.: Natural Resources Institute, 1996. 84p. ISBN: 0 85954 420 6.

Farooj, S et al. In vivo protective role of koflet (an Ayurvedic preparation) against cellular toxicity caused by CC14 and flyash. J. Ethnopharmacol. 58(2): 109-116 (1997).

Njoku, CJ et al. Oleanolic acid, a bioactive component of the leaves of *Ocimum gratissimum*. Int. J. Pharmacog. 35(2): 134-137 (1997).

Paton, A, Cafferty, S. The identity of *Ocimum tashiroi* Hayata (Labiatae). Kew Bull. 53(2): 466 (1998).

Paton, A, Harley, RM, Harley, MM. *Ocimum*: an overview of classification and relationships. In Hiltunen, R, Holm Y, eds. Basil: the genus *Ocimum*, pp. 1-38 (1999). Amsterdam, The Netherlands: Harwood Academic.

Smith, CA, Svoboda, KP, Noon, MM. Controlling the growth and quality of hydroponically-grown basil (*Ocimum basilicum* L.). Acta Horticulturae, growing media and plant nutrition, no. 405: 479-486 (1997).

Thoppil, JE et al. Antibacterial and antifungal activity of four varieties of *Ocimum basilicum*. Fitoterapia 69(2): 191-192 (1998).

ORIGANUM

Gonuz, A, Ozorguco, B. An investigation on the morphology, anatomy and ecology of *Origanum onites* L. Turk. J. Bot. 23(1): 19-32 (1999).

Karousou, R, Dardioti, A, Kokkini, S. *Origanum vulgare* L. in the Balkan peninsula and Anatolia: dis-

tribution and morphological variation. In Tsekos, I, Moustakas, M, eds. Progress in botanical research: proceedings of the 1st Balkan Botanical Congress, pp.73-76 (1998). Dordrecht: Kluwer.

Minter, S. The conservation of medicinal plants. Herbs 22(3): 4-5 (1997).

Socorro, O, Tarrega, I, Rivas, F. Essential oils from wild and micro-propagated plants of *Origanum bastetanum*. Phytochemistry 48(8): 1347-1349 (1998).

Tucker, AO. Will the Real Oregano Please Stand Up? The Herb Companion 4(3): 20-22 (1992).

Tucker, AO, Maciarello, MJ. Oregano: Botany, Chemistry and Cultivation. In Charalambous (Ed.). Spices. Herbs and Edible Fungi: 439-456 (1994).

Tucker, AO, Rollins, ED. The Species, Hybrids and Cultivars of *Origanum* (Lamiaceae) Cultivated in the United States. Bailey 23(1): 14-27 (1989).

ORTHOSIPHON

Vembu, B, Sampathkumar, R. Notes on karyomorphological studies on two species of *Orthosiphon* Benth. Geobios New Rep. 18(1): 39-42 (1999).

OXERA

Grayer, RJ, de Kok, RPJ. Flavonoids and verbascoside as chemotaxonomic characters in the genera *Oxera* and *Faradaya* (Labiatae). Biochem. Syst. Ecol. 26(7): 729-741 (1998).

de Kok, RPJ. The biology and systematics of *Oxera*, *Faradaya* and *Hosea* (Labiatae). Oxford: Rogier PJ de Kok, 1997 (PhD thesis).

de Kok, RPJ. *Oxera*, *Faradaya* and *Hosea*, systematics and conservation. Lamiales Newsl. no. 6: 1-3 (1998).

de Kok, RPJ, Mabberley, DJ. Generic and intra-generic delimitation of *Oxera* Labill. (Labiatae). Kew Bull. 54(2): 257-264 (1999).

de Kok, RPJ, Mabberley, DJ. A synopsis of *Oxera* Labill. (Labiatae). Kew Bull. 54(2): 265-300 (1999).

PANZERINA

Zhao, YZ, Li, SY, Cao, R, Liu, YB. (The analysis of morphological characters and a taxonomic revision on *Panzerina lanata* (L.) Sojak complex (Labiatae)). Acta Phytotax. Sin. 36(3): 193-205 (1998).

PERILLA

Ito, M, Toyoda, M, Honda, G. Essential oil composition of hybrids and amphidiploids of Japanese wild *Perilla*. Nat. Medicines 53(3): 118-122 (1999).

Maruyama, Y et al. Identification of magnolol and honokiol as anxiolytic agents in extracts of Saiboku-to, an oriental herbal medicine. J. Nat. Prod. 61(1): 135-138 (1998).

PHLOMIS

Alziar, G, Cafferty, S. Typification of the names of several species of *Phlomis* of Linnaeus (Lamiaceae). Biocosme Mesogeen 14(4): 119-127 (1997, publ. 1998).

Bucar, F et al. Flavonoids from *Phlomis nissolii*. Phytochemistry 48(3): 573-575 (1998).

Mann Taylor, J. *Phlomis*: the neglected genus. A guide for gardeners and horticulturists, 88 p. (1998). Westbury-on-Severn, Gloucester: J. Mann Taylor.

PHRYMA

Lee, NS. (Allozyme divergence in *Phryma leptostachya* (Phrymaceae)). Korean J. Pl. Taxon. 20(3): 147-156 (1990).

PHYLLOSTEGIA

Wagner, WL. Nomenclator and review of *Phyllostegia* (Lamiaceae). Novon 9(2): 265-279 (1999).

Wagner, WL. A new species of Hawaiian *Phyllostegia* (Lamiaceae) from Kaua'i and recognition

of a Wai'anae Mountain, O'ahu, endangered variety of *Phyllostegia parviflora*. Novon 9(2): 280-283 (1999).

PHYSOSTEGIA

Lersten, NR, Curtis, JD. Foliar idioblasts in *Physostegia virginiana* (Lamiaceae). J. Torrey Bot. Soc. 125(2): 133-137 (1998).

PITYRODIA

Rye, BL, Trudgen, ME. Two new synonyms in the genus *Pityrodia* (Lamiaceae) subfamily *Chloanthoideae*. Nuytsia 12(2): 297-300 (1998).

PLECTRANTHUS

Ascensao, L, et al. *Plectranthus madagascariensis*: morphology of the glandular trichomes, essential oil composition, and its biological activity. Int. J. Pl. Sci. 159(1): 31-38 (1998).

Morton, JK. New names in *Plectranthus* (Lamiaceae) and allied genera from the Ethiopian region. Novon 8(3): 265-266 (1998).

Morton, JK. Two new species of *Plectranthus* from northeast Africa. Kew Bull. 53(4): 997-999 (1998).

Perez G, RM et al. Antidiabetic effect of compounds isolated from plants. Phytomedicine 5(1): 55-75 (1998).

Rabe, T et al. Screening of *Plectranthus* species for antibacterial activity. S. Afr. J. Bot. 64(1): 62-65 (1998).

Ryding, O. A new species of *Plectranthus* (Lamiaceae) from Zaire. Bull. Jard. Bot. Nation. Belg. 66(1-2): 101-105 (1997).

Ryding, O. Notes on *Plectranthus* (Lamiaceae) in Somalia. Kew Bull. 54(1): 117-127 (1999).

Ryding, O. *Plectranthus alpinus* (Vatke) Ryding, new combination and correct name for *P. assurgens* (Baker) J.K. Morton (Lamiaceae). Bot. Jahrb. 121(2): 145-148 (1999).

Shu, Y-Z. Reviews. Recent natural products based drug develop-

ment: A pharmaceutical industry perspective. J. Nat. Prod. 61(8): 1053-1071 (1998).

POGOSTEMON

Ingrouille, M, Bhatti, GR. Intra-generic relationships within *Pogostemon* Desf. (Labiatae). Bot. J. Linn. Soc. 128(2): 159-183 (1998).

Pradeep, AK. *Pogostemon peethapushpum* (Lamiaceae), a new species from India. Candollea 53(2): 419-422 (1998).

Venturella, F. The essential oil of *Pogostemon heyneanus* Benth. var. *patchouli* Pellet (Lamiaceae) cultivated in the Palermo Botanical Garden. Quad. Bot. Ambient. Appl. no. 6: 81-82 (1995, publ. 1998).

PREMNA

Rajendran, A, Daniel, P. A new species of *Premna* L. (Verbenaceae) from southern India. Bull. Bot. Surv. India 34(1-4): 174-176 (1992, publ. 1997).

Rajendran, A, Daniel, P. *Premna debiana* Rajendran et Daniel (Verbenaceae): a new species from northeastern India. Bull. Bot. Surv. India 34(1-4): 177-179 (1992, publ. 1997).

PRIVA

Rzedowski, J, Calderon de Rzedowski, G. Dos especies nuevas de fanerogamas calcifilas del centro de Mexico. Bol. Inst. Bot. (Guadalajara) 5(1-3): 61-68 (1998).

PROSTANTHERA

Conn, BJ. Contributions to the systematics of *Prostanthera* (Labiatae) in south-eastern Australia. Telopea 7(4): 319-332 (1998).

Conn, BJ. The *Prostanthera cryptandroides*-*P. euphrasioides*-*P. odoratissima* complex (Labiatae). Telopea 8(2): 265-272 (1999).

PRUNELLA

Abramova, LI. Chernogolovka obyknovennaya. (*Prunella vulgaris*).

In Pavlov, VN, Tikhomirov, VN, eds. Biologicheskaya flora Moskovskoi oblasti, pp. 113-123 (1996). Vyp. 12. Moscow: Argus.

Hogstrom, S. Identifying av hybridder mellan praktbrunrot *Prunella grandiflora* och brunrot *P. vulgaris*. (The identification of hybrids between *Prunella grandiflora* and *P. vulgaris*). Svensk Bot. Tidskr. 93(2): 95-102 (1999).

PULEGIUM

Stepanek, J. Maty (*Pulegium* a *Mentha*) v Ceske republice: 1. Puvodni a zplanujici druhly. (*Pulegium* and *Mentha* in the Czech Republic: 1. Autochthonous and introduced species). Zpravy Ceske Bot. Spol. (Prague) 33(1): 1-28 (1998).

PYCNOSTACHYS

Ryding, O. *Pycnostachys recurvata* (Lamiaceae), a new species from Ethiopia. Novon 9(1): 101-103 (1999).

RABDOSIA

Li, WW, Li, BG, Ding, LS, Chen, YZ. (The chemical constituents of *Rabdosia coetsa*). Acta Bot. Sin. 40(5): 461-465 (1998).

ROSMARINUS

Hidalgo Fernandez, PJ et al. Mitochondrial DNA polymorphism and gynodioecy in a natural population of *Rosmarinus officinalis* L. Israel J. Pl. Sci. 47(2): 77-83 (1999).

Tucker, AO, Maciarello, MJ. The Essential Oils of Some Rosemary Cultivars. Flavour and Fragrance Journal 1: 137-142 (1986).

Williamson, EM (Ed). Patents alert. Phytother. Res. 12(2): 149-150 (1998).

ROTHECA

Steane, DA, Mabberley, DJ. *Rothecca* (Lamiaceae) revived. Novon 8(2): 204-206 (1998).

SALVIA

Baikova, EV. Morfologiya tsvetka nekotorykh shalfeev kak otrazhenie ego adaptatsii kopylityelam i osnova sistemy roda. (Floral morphology of some *Salvia* species as a reflection of its adaptation to pollinators and as a basis for a generic system). Byull. Mosk. Obshch. Ispyt. Prir., Biol. 103(4): 52-58 (1998).

Bisio, A et al. Glandular hairs and secreted material in *Salvia blepharophylla* Brandegees ex Epling grown in Italy. Ann. Bot. (UK) 83(4): 441-452 (1999).

Blanco, P, Espejo Serna, A, Lopez Ferrari, AR. *Salvia purpurea* y *S. viscosa* (Labiatae) en Cuba. An. Jard. Bot. Madrid 57(1): 169-170 (1999).

Corsi, G. I peli ghiandolari in *Salvia officinalis* L.: difesa, attrazione o altre strategie? Informatore Botanico Italiano 28: 399-403 (1996).

Cuellar, MJ et al. Screening of antiinflammatory medical plants used in traditional medicine against skin diseases. Phytother. Res. 12(1): 18-23 (1998).

Del Carratore, F, Garbari, F. Indagini biosistematiche sul genere *Salvia* L. sect. *Plethiosphace* Benth. (Labiatae). Inform. Bot. Ital. 29(2-3): 297-299 (1997, publ. 1998).

Del Carratore, F, Garbari, F, Jarvis, C. The application of the Linnaean names *Salvia pratensis*, *S. agrestis*, *S. haematodes*, *S. verbenaca* and *S. clandestina* (Lamiaceae). Pl. Biosystems 132(2): 169-176 (1998).

Del Carratore, F, Garbari, F, Jarvis, C. *Salvia saccardiana* (Lamiaceae), an endemic species of NE Italy. Pl. Biosystems 133(2): 157-162 (1999).

Hanlidou, E, Karousou, R, Kokkini, S. The sage plants in Greece: morphological variation and its taxonomic implications. In Tsekos, I, Moustakas, M, eds. Progress in botanical research: proceedings of the 1st Balkan Botanical Congress, pp. 65-68 (1998). Dordrecht: Kluwer.

Karousou, R, Vokou, D, Kokkini, S. Distribution and essential oils of *Salvia pomifera* subsp. *pomifera* (Labiatae) on the island of Crete (S. Greece). Biochem. Syst. Ecol. 26(8): 889-897 (1998).

Medina, JH et al. Neuroactive flavanoids: new lignans for the benzodiazepine receptors. Phytomedicine 5(2): 235-243 (1998).

Nagy, G, Gunther, G, Mathe, I, Blunden, G, Yang, MH, Crabb, TA. Danshenol-A and 15-epi-danshenol-A from the roots of *Salvia glutinosa*. Biochem. Syst. Ecol. 26(7): 797-799 (1998).

Navarro, L. Effect of pollen limitation, additional nutrients, flower position and flowering phenology on fruit and seed production in *Salvia verbenaca* (Lamiaceae). Nordic J. Bot. 18(4): 441-446 (1998).

Oran, SA. Nutlet anatomy of the genus *Salvia* L. in Jordan. Flora Medit. 7: 27-40 (1997).

Ozdemir, C, Senel, G. The morphological, anatomical and karyological properties of *Salvia sclarea* L. Turk. J. Bot. 23(1): 7-18 (1999).

Peshevski, N, Todorova, M, Evstatieva, L, Apostolova, B. Research into the essential oil of *Salvia officinalis* L., Dalmatica origin. Phytologia Balcanica 3(2-3): 173-176 (1997).

Rich, TCG, Lambrick, CR, McNab, C. Conservation of Britain's biodiversity: *Salvia pratensis* L. (Lamiaceae), meadow clary. Watsonia 22(4): 405-411 (1999).

Skoula, M, El Hilali, I, Makris, AM. Evaluation of the genetic diversity of *Salvia fruticosa* Mill. clones using RAPD markers and comparison with the essential oil profiles. Biochem. Syst. Ecol. 27(6): 559-568 (1999).

Tucker, AO, Maciarello, MJ. Volatile Leaf Oil of *Salvia clevelandii* (Gray) Greene "Winifred Gilman". J. Essent. Oil Res. 8: 669-670 (1996).

Tucker, AO, Maciarello, MJ, Clebsch, BB. Volatile Leaf Oils of Cultivars of *Salvia clevelandii* (Gray) Greene × *S. leucophylla* Greene. J. Essent. Oil Res. 7: 101-104 (1995).

Turner, BL. Synopsis of section *Axillaris* of *Salvia* (Lamiaceae). Phytologia 81(1): 16-21 (1996, publ. 1997).

Turner, BL. A new species of *Salvia* (sect. *Caducae*) from Guerrero, Mexico. Phytologia 81(5): 329-332 (1996).

Turner, BL. A new red-flowered *Salvia* (Lamiaceae) from Baja Verapaz, Guatemala. Phytologia 81(5): 340-342 (1996).

van Jaarsveld, EJ. *Salvia thermara*, a new species from the Western Cape, South Africa. Bothalia 29(1): 100-102 (1999).

Wu, ZJ, Ouyang, MA, Yang, CR. Polyphenolic constituents of *Salvia sonchifolia*. Acta Bot. Yunnanica 21(3): 393-398 (1999).

SATUREJA

Cantino, PD, Wagstaff, SJ. A reexamination of North American *Satureja* s.l. (Lamiaceae) in light of molecular evidence. Brittonia 50(1): 63-70 (1998).

Danin, A, Hedge, IC. Contributions to the flora of Jordan: 2. A new species of *Satureja* (Labiatae) and some new records. Wildenowia 28(1-2): 135-142 (1998).

Lagarde, F. Les hybridations dans le genre *Satureja* et ses allies. Pl. Montagne Rocaille 12(190): 556-558 (1999).

Tumen, G, Kirimer, N, Ermin, N, Baser, KHC. The essential oils of two new *Satureja* species from Turkey: *Satureja pilosa* and *S. icarica*. J. Essent. Oil Res. 10(5): 524-526 (1998).

SCUTELLARIA

Amagaya, S et al. General pharmacological properties of TJ-9 extract. Phytomedicine 5(3): 165-175 (1998).

Harley, R, Paton, A. Notes on New World *Scutellaria*. Kew Bull. 54(1): 221-225 (1999).

Hsieh, TH, Huang, TC. (The taxonomy and distribution of *Scutellaria* L. (Lamiaceae) in Taiwan). In Chiu, ST, Peng, CI, eds. Proceedings of the cross-strait symposium on floristic diversity and conservation, pp. 99-106 (1998). Taichung, Taiwan: National Museum of Natural Science.

Kim, S, Lee, S. (Taxonomy of the genus *Scutellaria* (Lamiaceae) in Korea). Korean J. Pl. Taxon. 25(2): 71-102 (1995).

Ohta, Y et al. Contribution of the antilipid peroxidative action of daisaiko-to extract to its preventive effect on carbon tetrachloride-induced acute liver injury in rats. Phytother. Res. 12(1): 5-8 (1998).

Pool, A. Notes on Central American *Scutellaria* (Lamiaceae). Novon 8(1): 62-66 (1998).

Shiuchi, T, Kanemoto, T. (New locality and chromosome number of *Scutellaria guilielmii* A. Gray (Lamiaceae), an endangered plant). Bull. Bot. Gard. Toyama, no. 4: 33-35 (1999).

Toma, C, Toniuc, A, Verdes, C. Morpho-anatomical researches on the pericarp of some Labiatae species. An. Sti. Univ. "Al. I. Cuza" Iasi, Biol. Veg. 44: 1-12 (1998).

Velazquez, D, Orsini, G. Aportes al conocimiento de la familia Lamiaceae en Venezuela: 1. *Ajuga, Teucrium* y *Scutellaria*. Acta Bot. Venezuel. 20(1): 93-115 (1997).

Zhao, Y, Qiao, J. (On *Scutellaria alaschanica* Tschern). Acta Bot. Bor. Occid. Sin. 19(1): 166-168 (1999).

SIDERITIS

Apostolos, G. Genetic studies on Greek mountain tea (*Sideritis* L.). Lamiales Newsl. no. 5: 8-9 (1997).

Borja, J. Notes breves sur certaines centuries. No.11591. *Sideritis hyssopifolia* L. subsp. *javallambrensis* (Pau) Borja, comb. et stat. nov. = *S. javallambrensis* Pau, Not. Bot. Bot. Fl. Esp., 1: 26 (1887). Soc. Ech. Pl.

Vasc. Eur. Bassin Medit. Bull. 20(1982-1983): 54-55 (1985).

Las Heras Vazquez, J et al. Genetic relationships and population structure within taxa of the endemic *Sideritis pusilla* (Lamiaceae) assessed using RAPDs. Bot. J. Linn. Soc. 129(4): 345-358 (1999).

Rivera, D, Obon, C, Alcaraz, F, Llorach, R. Systematics of the high mountain taxa of the genus *Sideritis* L. section *Sideritis*, subsection *Fruiculosae* Obon et D. Rivera (Lamiaceae). Bot. J. Linn. Soc. 129(3): 249-265 (1999).

Rosello, R, Peris, JB, Stubing, G, Romo, A. Sobre *Sideritis grandiflora* Salzm. ex Benth. (Lamiaceae). (On *Sideritis grandiflora* Salzm. ex Benth. (Lamiaceae)). An. Jard. Bot. Madrid 56(2): 387-388 (1998).

Rosello, R, Stubing, G, Peris, JB, Romo, AM. *Sideritis sierrarafolsiana*, nuevo endemismo de las montañas Rifenias. (*Sideritis sierrarafolsiana*, a new endemic species to the Rif mountains). Acta Bot. Barcin. 45: 207-212 (1998).

SIPHOCRANION

Paton, A, Ryding, O. *Hanceola, Siphocranion* and *Isodon* and their position in the *Ocimeae* (Labiatae). Kew Bull. 53(3): 723-731 (1998).

SOLENOSTEMON

Morton, JK. New names in *Plectranthus* (Lamiaceae) and allied genera from the Ethiopian region. Novon 8(3): 265-266 (1998).

STACHYS

Krestovskaya, TV, Vasileva, IM. Palinologicheskoe izuchenie vidov rodov *Stachys* i *Betonica* (Lamiaceae). (Palynological study in the genera *Stachys* and *Betonica* (Lamiaceae)). Bot. Zhurn. 82(11): 30-41 (1997).

Krestovskaya, TV, Vasileva, IM. Chisla khromosom nekotorykh vidov roda *Stachys* (Lamiaceae). (Chro-

mosome numbers in some species of the genus *Stachys* (Lamiaceae). Bot. Zhurn. 83(4): 142 (1998).

STACHYTARPHETA

Rajendran, A, Daniel, P. The identity of *Stachytarpheta indica* auct. non. (L.) Vahl (Verbenaceae). Bull. Bot. Surv. India 34(1-4): 165-173 (1992, publ. 1997).

White, I. The useful plants of coconut Island. Newsl. Hawaiian Bot. Soc. 36(3 & 4): 69-72 (1997).

STENOGYNE

Wagner, WL, Weller, SG. Rediscovery and assessment of *Stenogyne sherffii* Degener (Lamiaceae). Novon 9(3): 448-449 (1999).

SYNCOLOSTEMON

Paton, A. New records and new combinations in *Hemizygia* and *Syncolostemon* (Labiatae). Kew Bull. 53(2): 483-485 (1998).

TECTONA

Gupta, VC et al. Important folk medicinal plants and traditional knowledge of tribals of Aurangabad and Nasik Forest Divisions of Maharashtra (India). Hamdard Med. EB(2): 59-61 (1997).

Leakey, RB et al. Domestication of tropical trees for timber and non-timber products. MAB Digest 17. Paris: United Nations Educational, Scientific and Cultural Organization, 1994. 94p.

Rawat, MS, Uniyal, DP, Sharma, SL. Identification of provenances based on leaf morphology in *Tectona grandis*. Indian Forester 124(4): 248-251 (1998).

TEIJSMANNIODENDRON

Srivastava, SK. A note on the rare *Teijsmanniodendron pteropodium* (Miq.) Bakh. (Verbenaceae) from the Great Nicobar Biosphere Reserve, India. Bull. Bot. Surv. India 34(1-4): 224-227 (1992, publ. 1997).

TEUCRIUM

Al Yousuf, MH, Bashir, AK, Crabb, TA, Blunden, G, Yang, MH. Shiromool 1, 10-epoxides from *Teucrium stocksianum*. *Biochem. Syst. Ecol.* 27(1): 107-109 (1999, publ. 1998).

Bello, R et al. Evaluation of the analgesic and CNS actions of different fractions from the methanol extract of *Teucrium flavum* L. *Phytother. Res.* 12(1): 65-67 (1998).

Catalayud, S et al. Cardiovascular effects of the methanol and dichloromethanol extracts from *Teucrium cartaginensis* L. *Phytother. Res.* 12(1): 44-45 (1998).

Calatayud, S et al. Cardiovascular effects of the methanol and dichloromethanol extracts from *Teucrium flavum* L. *Phytother. Res.* 12(1): 68-69 (1998).

Carrillo, AF et al. *Teucrium* × *carvalhoi* (Lamiaceae) nuevo híbrido para el sudeste Iberico. (*Teucrium* × *carvalhoi* (Lamiaceae) a new hybrid for the southeastern Spain). *Acta Bot. Malacitana* 22: 221-223 (1997).

Deil, U. Distribution and ecology of some rare plant species in northern Morocco: 1. *Teucrium afrum* ssp. *rubriflorum* and *Euphorbia transtagana*. *Acta Bot. Malacitana* 22: 250-254 (1997).

Duman, H. A new species of *Teucrium* L. (Labiatae) from south west Anatolia. *Karaca Arbor. Mag.* 4(3): 125-130 (1998).

El Oualidi, J, Mathez, J, Navarro, T. Contribution a la connaissance des *Teucrium* sect. *Polium* (Labiatae) du Maroc: le complexe de *T. chlorostachyum*. *Flora Medit.* 7: 21-26 (1997).

El Oualidi, J, Verneau, O, Puech, S, Dubuisson, JY. Utility of rDNA ITS sequences in the systematics of *Teucrium* section *Polium* (Lamiaceae). *Pl. Syst. Evol.* 215(1-4): 49-70 (1999).

Kawashty, SA, El Din, EMG, Saleh, NAM. The flavonoid chemosystematics of two *Teu-*

crium species from southern Sinai, Egypt. *Biochem. Syst. Ecol.* 27(6): 657-660 (1999).

Navarro, T, Cabezudo, B. Dos novedades del genero *Teucrium* seccion *Stachyobotrys* Benth. y seccion *Scorodonia* (Hill) Schreb. subseccion *Scorodonia* Kastner (Lamiaceae) para la Flora Europea. (Two new records of the *Teucrium* genus section *Stachyobotrys* Benth. and section *Scorodonia* (Hill) Schreb. subseccion *Scorodonia* Kastner (Lamiaceae) for the Flora Europaea). *Acta Bot. Malacitana* 22: 249-250 (1997).

Navarro, T, El Oualidi, J. Notas taxonomicas y corologicas para la flora vascular de Andalucia y del Rif. *Notas* 46-48. 48. *Teucrium brevifolium* Schreb., novedad florística para Marruecos. *Lagascalia* 20(1): 185-187 (1997).

Navarro, T, El Oualidi, J. Synopsis of the genus *Teucrium* L. (Lamiaceae) in Morocco. *Acta Bot. Malacitana* 22: 187-203 (1997).

Rosello, R, Peris, JB, Stubing, G. Sobre *Teucrium pugionifolium* (Labiatae). *An. Jard. Bot. Madrid* 57(1): 164-167 (1999).

Ryding, O. *Teucrium* (Lamiaceae) in N.E. tropical Africa. *Edinburgh J. Bot.* 55(2): 209-220 (1998).

Sanchez Gomez, P, Navarro, T. Un nuevo híbrido de *Teucrium* (Labiatae). *An. Jard. Bot. Madrid* 57(1): 167-169 (1999).

Solanas, JL, Crespo, MB, De la Torre, A. Un nuevo nototaxon en el genero *Teucrium* (Lamiaceae). (A new nothotaxon in the genus *Teucrium* (Lamiaceae) from southeastern Spain). *An. Biol. (Univ. Murcia)* 19: 79-82 (1993, publ. 1994).

Velazquez, D, Orsini, G. Aportes al conocimiento de la familia Lamiaceae en Venezuela: 1. *Ajuga, Teucrium* y *Scutellaria*. *Acta Bot. Venezuel.* 20(1): 93-115 (1997).

THYMUS

Bini Maleci, L, Gentili, L, Pinetti, A, Bellesia, F, Servettaz, O. Morphological and phytochemical characters of *Thymus striatus* Vahl growing in Italy. *Pl. Biosystems* 133(2): 137-144 (1999).

Blanquer, A, Boira, H, Soler, V, Perez, I. Variability of the essential oil of *Thymus piperella*. *Phytochemistry* 47(7): 1271-1276 (1998).

Crespo, MB, Solanas, JL. Alguns timonets interessants del migjorn valencia (*Thymus* L., Lamiaceae). (Some interesting thyme species from southeastern Spain (*Thymus* L., Lamiaceae)). *Acta Bot. Barcin.* 45: 199-205 (1998).

De la Torre, A, Vicedo, M, Alonso, MA, Paya, J. Un nuevo híbrido del genero *Thymus* L. (Lamiaceae). (A new hybrid of the genus *Thymus* L. (Lamiaceae)). *Acta Bot. Malacitana* 22: 224-226 (1997).

Gorovoi, PG, Dudkin, RV. Novy vid roda *Thymus* (Lamiaceae) iz Primorskogo kraya. (A new species of the genus *Thymus* (Lamiaceae) from Primorsky territory). *Bot. Zhurn.* 83(6): 107-110 (1998).

Kulevanova, S, Ristic, M, Stafilov, T, Matevski, V. Composition of the essential oil of *Thymus rohlena* Velen. from Macedonia. *J. Essent. Oil Res.* 10(5): 537-538 (1998).

Manicacci, D, Atlan, A, Rossello, JAE, Couvet, D. Gynodioecy and reproductive trait variation in three *Thymus species* (Lamiaceae). *Int. J. Pl. Sci.* 159(6): 948-957 (1998).

Marhold, K, Martonfi, P. Typification of the name *Thymus serpyllum* L. (Lamiaceae). *Bot. J. Linn. Soc.* 128(3): 271-276 (1998).

Martin Mosquero, MA. *Thymus vulgaris* L., novedad para la flora de Andalucia occidental. (*Thymus vulgaris*, a new species in west Andalusia flora). *Acta Bot. Malacitana* 23: 259-260 (1998).

Martonfi, P. Pollen morphology of *Thymus* sect. *Serpyllum* (Labiatae: *Menthaeae*) in the Carpathians and Pannonia. *Grana* 36(5): 261-270 (1997).

Martonfi, P, Marhold, K. To the legitimacy of the name *Thymus pulcherrimus* subsp. *sudeticus* (Lyka) P.A. Schmidt. *Thaiszia* 8(1): 17-18 (1998).

Mateo Sanz, G, Mercadal Ferreruela, NE, Pisco Garcia, JM. Sobre un híbrido nuevo del genero *Thymus* L. detectado en Aragon. (A new hybrid taxon of genus *Thymus* L. collected in Aragon (Spain)). *Bot. Complutensis* no. 20: 69-73 (1995).

Penas, J, Cabello, J, Mota, JF, Sanchez Gomez, P. *Thymus* × *brachychaetus* (Willk.) countinho nothosubespecie sierranus nova. *Lagascalia* 20(2): 291-293 (1998).

Shin, H, Choi, HK. (A taxonomic study on *Thymus* in Korea: numerical analyses of morphological characters). *Korean J. Pl. Taxon.* 27(2): 117-135 (1997).

Tahiri, B, Rejdali, M, Atbib, M. Contribution a l'etude caryologique

de certaines especes marocaines du genre *Thymus* L. (Labiatae). *Flora Medit.* 8: 41-47 (1998).

Tan, K, Iatrou, G. Two rare taxa in the southern Peloponnese. In Tsekos, I, Moustakas M, eds. *Progress in botanical research: proceedings of the 1st Balkan Botanical Congress.* Dordrecht: Kluwer, pp. 153-156 (1998).

VERBENA

Guil, JL et al. Nutritional and toxic factors in selected wild edible plants. *Pl. for Human Nutrition* 51: 99-107 (1997).

Park, SH. (Unrecorded naturalized plants in Korea: 13). *Korean J. Pl. Taxon.* 28(4): 415-425 (1998).

Singh, B et al. Hepatoprotective activity of verbenalin on experimental liver damage in rodents. *Fitoterapia* 69(2): 135-140 (1998).

VITEX

Anon. *Octacosanol.* *Rev. Nat. Prod.* June: 3p (1997).

Anon. 100 plant facts for campaigning conservationists. *Plant Talk* 13: 44 (1998).

Fandialan, VC. Wealth of resources could be in your backyard. *PROSEA News* 1. (20): 5 (1998).

Jong de, W. Producing charcoal on Imperata grasslands. *CIFOR News* 17: 3 (1997).

Mabberley, DJ. On *Neorapinia* (*Vitex* sensu lato, Labiatae-Viticoideae). *Telopea* 7(4): 313-317 (1998).

Rajendran, A, Daniel, P. A note on the species of *Vitex* L. (Verbenaceae) endemic to the Andamans. *Bull. Bot. Surv. India* 35(1-4): 11-15 (1993, publ. 1997).