LAMIALES

LAMIALES NEWSLETTER

Issue number 1 **December 1992**

ROYAL BOTANIC GARDENS KEW

CONTENTS

EDITORIAL

Ray Harley & Alan Paton
Royal Botanic Gardens, Kew, Richmond, Surrey, U.K.

The Lamiales newsletter aims to provide a forum for discussion for scientists of all disciplines working on the Labiatae and Verbenaceae. It has been produced as a result of the desire expressed during the Advances in Labiate Science Conference, held at Kew, April 1991, to have a mechanism by which to continue the fruitful discussions began at the conference and informally to explore research topics.

This first edition includes abstracts of posters presented during the Advances of Labiate Science conference and articles on the relationships of Labiate genera in Europe and W. Asia, the work and role of the USDA Mentha collection, Malagasy Labiatae, and a general purpose database for the Labiatae of the former USSR. Articles for future editions of the Newsletter are now required. Please send your contribution to the editors at the address below. We do not intend to publish formal scientific papers, but only to convey news, views and criticisms of current research in the Labiatae and Verbenaceae. We welcome any thoughts or views that you may have regarding any aspect of the Lamiales. The success of this newsletter depends on you!

We hope to produce a Newsletter every six months, but this will obviously depend on the number of articles submitted. It is often difficult for scientists working without the resources of a large library to become aware of recent, relevant publications. Thus we propose to list recent papers on the Lamiales. If authors of such papers would like to submit to the editors the title, reference and if possible a reprint of any relevant work, published during or after 1991, these will be compiled and listed in the next newsletter. We will only list publications if you send us the details. We also wish to provide space for researchers to request living material or seed of members of the Lamiales.

A directory is currently being compiled in order that Newsletter subscribers can keep in contact with one another and know who is working on what. Many of you have received forms asking about your research interests for this purpose. If you have not received a form you can still send details of your address and research interests to the editors for inclusion in the directory which will hopefully be circulated in Spring 1993.

The Advances in Labiate Science conference proceedings is now almost ready for publication. It will contain articles on the chemistry, taxonomy and economic uses of the Labiatae. A new classification of the family has been produced by Philip Cantino, Ray Harley and Steve Wagstaff in which several genera, formerly in the Verbenaceae, have been moved into the Labiatae. An order form with details is enclosed in this Newsletter.

□

A PLAIN MAN'S GUIDE TO GENERIC GROUPINGS

I.C. Hedge,
Royal Botanic Garden, Inverleith Row, Edinburgh, U.K

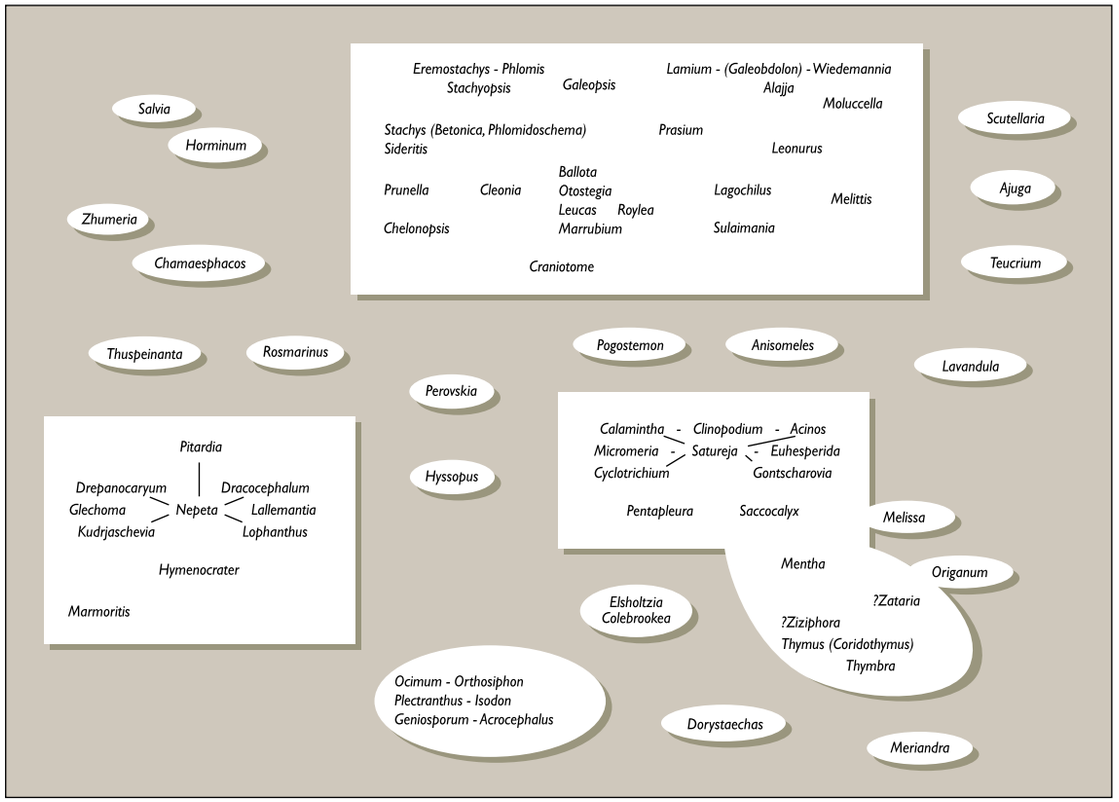
Most taxa above genus level are unsatisfactory or controversial - or both - and those of the Labiates are no exception. Often hierarchical groupings do not reflect true relationships and often are defined by their possessing a feature which is useful to the taxonomist but which may have arisen independently in different parts of the family: 2 stamens, ➢

fleshy nutlets, 15-nerved calyx, calyx inflated after anthesis. This is not to decry these characters, rather to stress that they should be viewed with caution in supra-generic taxonomy.

In recent years the cladistic approach together with the utilisation of a wide range of characters has given new insights into the family and its internal and external relationships. Yet "Every day brings further proof of the impossibility of reducing Nature to anything like mathematical accuracy" was what Bentham had to say about the Labiatae in 1834 and maybe today he would still have had the same thoughts! In attempting to put taxonomy onto a more objective clinical footing there is always the pitfall that the plant gets lost in the process. An informal Newsletter is a good outlet for iconoclastic (old and new 'icons') thoughts, and the following diagram with elliptic and rectangular balloons is a provisional attempt to indicate some generic relationships among the c. 80 genera in Europe, Mediterranean and South-west Asia.

The basic thinking behind it is that there are natural groups of genera and that they should be used as the building bricks for a better classification. Two of the balloons each contain 10-11 genera which, from my long-term experience of the family, are very intimately related: those with *Nepeta* and *Satureja*. The discontinuities between their constituent genera are so small that if an average standard level of discontinuity were applied throughout the family to recognize a taxon at generic level, they would only be regarded as two genera, *Nepeta* and *Satureja*.

The largest balloon, with 26 genera, contains knots of related genera indicated by their proximity e.g. *Stachys* and *Sideritis*, other genera stand rather apart e.g. *Sulaimania;* and some others scarcely merit independent generic status e.g. the knot with *Lamium (including Galeobdolon), Wiedemannia, Alajja,* or *Phlomis/ Eremostachys*. One of the most striking features of the overall diagram is the large number of monotypic balloons: no fewer than 16: genera which at least for the grey-haired herbarium/ field botanist are very isolated and seem to be isolated relicts. Although the balloon with *Ocimum* in it is small-sized in the area under review, its contents would swell considerably if all the many tropical genera ➢



came into the picture. Probably it would be a very clearly delimited balloon.

Whether such a simplistic brain-computerized approach can significantly improve our understanding of generic inter-relationships is a moot point, but I think it can form a basic framework to build on. If the exercise were widened to cover the whole world I would expect that the basic pattern would not be greatly different: a smallish number of middle-sized to large balloons which would account for the majority of the c. 200 genera, a small number of small balloons and an increase in monotypic balloons.

Editorial Note

Ray Harley & Alan Paton,
Royal Botanic Gardens, Kew, Richmond, Surrey, U.K.

In the spirit of discussion, we would like to point out three areas where we disagree with Ian Hedge.

First, we consider that as *Prunella* has 6-colpate pollen, typical of the Nepetoideae, it could be placed close to the 'Saturejoid' complex of genera, rather than near *Lamium* and related genera in the Lamioideae.

Second, we would place the *Lavandula* balloon near the balloon representing the Ocimeae as suggested by Bentham in Labiatarum Genera and Species (1832). *Lavandula* has somewhat declinate stamens and in some species the calyx upper tooth is large and membranous similar to some members of the Ocimeae.

Thirdly, a major change in family boundaries, to be published in the conference volume, requires some traditionally Verbenaceae genera to be included in this diagram! □

MENTHA - Genetic Resources and the Collection at USDA-ARS NCGR-Corvallis

by Henrietta L. Chambers
National Clonal Germplasm Repository 33447 Peoria Road Corvallis, or 97333 USA

The genus *Mentha* has a wide distribution on all continents except South America and Antarctica. Its centers of diversity are Europe, Australia and Central Asia, although the European diversity is at the species level and much of the variation in Central Asia is within *M. longifolia.* The current taxonomy recognizes 18 species and 13 hybrid species. There are nine primarily European species, five species endemic to Australia, and one species each in North America, North Africa, Japan and New Zealand. All of the hybrid species involve two or more of the European species of the Section *Mentha.* These species cross freely, with the hybrids between species of the same ploidy level being quite fertile but those between species with different ploidy levels being sterile. All propagate vegetatively and become established near their parents and fertile ones can form backcross clones (Harley 1972,1975, Harley and Brighton, 1977). This results in clones which vary in their morphology from parents and other hybrids and accounts for much of the proliferation of Latin names in the genus. The natural range of some of the European species extends into Asia and, in addition, many European species have been introduced into other continents where they have become garden escapes and pasture weeds. ➢

TABLE 1. NCGR *Mentha* COLLECTION

Species	clones	seed	varieties	hybrids
aquatica	13	l	2	33
arvensis	8	0	l	5
australis	1	0	1	0
canadensis	37	3	4	ll
cervina	3	2	l	0
cunninghamii	1	0	1	0
diemenica	1	0	1	0
gattefossei	3	2	1	0
grandiflora	0	0	0	0
japonica	1	1	1	0
laxiflora	0	0	0	0
longifolia	13	8	6	17
micrantha	0	0	0	0
pulegium	11	4	2	0
requienii	1	1	1	0
satureioides	0	0	0	0
*spicata**	87	2	4	23
suaveolens	19	2	3	20

* includes a rugose leaf form which can be called *M. cordifolia* or cv Kentucky Colonel

TABLE ll. NCGR *Mentha* Collection

Hybrid species**	NCGR clones	cv's
x dalmatica (longifolia x arvensis)	2	1
x dumetorum (longifolia x aquatica)	2	1
*x gracilis***(arvensis x spicata)*	18	3
x maximilianea (suaveolens x aquatica)	1	1
x muellerana (arvensis x suaveolens)	0	0
x piperita (spicata x aquatica)	39	10
x piperita subsp. citrata	14	1
x pyramidalis (aquatica x longifolia)	0	0
x rotundifolia (suaveolens x longifolia)	3	1
x smithiana (arv. x aquat. x spicata)	3	1
x tutinii (aquatica or piperita x suaveoens)	0	0
x verticillata (arvensis x aquatica)	3	1
x villosa (spicata x suaveolens)	13	1
x villosa subsp. alopecuroides ****	15	1
x villosa-nervata (longifolia x spicata)	0	0

** Established in nature although some may have arisen in cultivation (Harley 1972). Many of these hybrids are sterile but back-cross individuals may be fertile.

*** Includes *M.x gentilis* and *M. cardiaca* (Tucker 1990, Tucker et al. 1991)

****Old name is *M. niliaca*

The USDA-ARS National Clonal Germplasm Repository (NCGR) in Corvallis, Oregon, houses a collection of *Mentha* germplasm of approximately 500 accessions of 42 taxa and 130 interspecific hybrids. (Tables I and ll.)

The core of the collection was that of Merritt J. "Bill" Murray, a mint breeder with the A. M. Todd Company, Kalamazoo, Michigan. Dr. Murray collected in North America, Europe and the USSR and obtained germplasm from researchers throughout the world, including many accessions from R. M. Harley and A. O. Tucker.

When Dr. Murray retired in 1972, the collection, which consisted of over 600 accessions, was given to Oregon State University (OSU) under the care of C. E. Horner. Dr. Horner, a USDA plant pathologist, was a specialist on the diseases of mint, particularly *Verticillium* wilt. The collection was moved to the newly completed Repository in 1983 after duplicate germplasm was removed. Dr. Murray's notes describe the morphology, disease resistance, vigor, odor, fertility, some genetic data and the oil composition of many of the clones as well as the pedigrees of the hybrids.

Additional oil analyses were performed on many clones by Dr. Don Roberts, USDA plant breeder, in 1979-80 and these data are entered in the repository data base and the Germplasm Resources Information Network (GRIN) for the US National Plant Germplasm System.

In 1988 the Repository staff, with the help of Dr. Tucker, began to evaluate the *Mentha* collection for correct identification and nomenclature, and further reduce the duplicate germplasm and open-pollinated clones. The studies of Tucker and Fairbrothers (1990) and Tucker et al. (l991) showed the hyhrid origin of *M. gracilis* Sole, the correct name for several taxa. An acquisition program was initiated to obtain taxa that the collection lacked. Since that time approximately 100 new accessions of taxa from all over the world have been obtained. We have recently obtained three of the six species endemic to Australia and New Zealand. A tissue culture accession of *Mentha australis* was received from Victoria, Australia in early 1992. We are interested in other live *Mentha* collections and would be pleased to hear from the curators.

Mentha germplasm is available to researchers as tissue culture, rhizomes or cuttings. A few of the accessions are available as seed. For further information, contact Dr. Henrietta L. Chambers, National Clonal Germplasm Repository, 33447 Peoria Road, Corvallis, OR 97333 USA. (503) 750-8712 □

Literature Cited

Harley, R. M. 1972. *Mentha* in *Flora Europaea* (T. G. Tutin et al.) 3: 183-186.

Harley, R. M. 1975. *Mentha* in *Hybrids and the Flora of the British Isles*. C. A. Stace (ed.).p. 383-390. Academic Press. London.

Harley, R. M. and C.A. Brighton. 1977. Chromosome Numbers in the Genus *Mentha* L. Bot. J. Linn. Soc. 74: 71-96).

Tucker, A. O. and D. E. Fairbrothers. 1990. The origin of *Mentha x gracilis* (Lamiaceae) I. Chromosome numbers, fertility and three morphological characters. Econ. Bot. 44: 183-213.

Tucker, A. O., H. Hendriks, R. Bos, and D. E. Fairbrothers. 1991. The origin of *Mentha x gracilis (*Lamiaceae) Il. Essential oils. Econ. Bot. 45: 200-215.

MADAGASCAR - STOP THE CAR FOR ANOTHER NEW SPECIES!

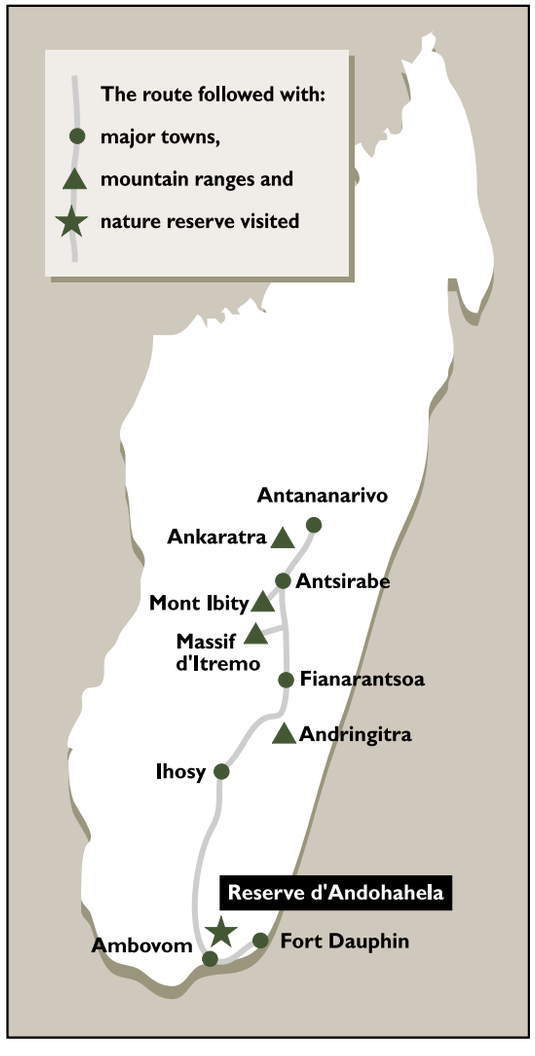
Peter Phillipson, Rose Clement and Guy Rafamantanantsoa*

It is by no means certain that you will find all that you are looking for in Madagascar but it is likely that you will come across some surprises and many of the plants you find will be extremely interesting. This certainly proved to be the case on a collecting expedition in March/April this year, the primary objective of which was to collect, photograph and make field observations of the family Labiatae.

The Labiatae are generally not well collected in Madagascar, especially outside the forest habitats where most of the recent collecting efforts have concentrated. Much of the early herbarium material is very poorly annotated and the urgent need for additional herbarium material and better information has recently become apparent now that revisionary work on the family for the *Flore de Madagascar et des Comores* has started.

The literature on the family is even more scanty than the herbarium holdings. Apart from the publication of numerous new taxa some hundred (or more) years ago, notably by Baker (1881, 1882, 1882-3, 1884-5, 1886) and Briquet (1894), the Malagasy Labiates have received very little attention. Few genera have been the subject of recent revisionary treatments, although the following are exceptions: *Salvia* (Hedge, l972), and *Tetradenia* (Codd, 1984).

Our trip was organised under the auspices of the Madagascar Research and Conservation Program of the Missouri Botanical Garden, and we were also encouraged by Ian Hedge (Royal Botanic Garden, Edinburgh) who is co-ordinating the treatments for the *Flore*.The itinerary was chosen to include numerous prime areas for labiates, many of which were known to be particularly poorly collected, and to include as broad a spectrum of habitats as possible within the time available, in the hope of collecting a good selection of taxa (see map). The localities visited included the exposed granite mountains of the central plateau, namely the *Massif d'Itremo* and *Mont Ibity* at 1600 - 2000m altitude with their varied vegetation types, remnant patches of evergreen Tapia (*Uapaca bojeri*) woodland, south-eastern and central plateau rainforest, and, in the arid south, spiny woodland with Didieriaceae on sandy soils, and deciduous woodland on calcareous hills.



To date, 27 genera of Labiatae have been recorded in Madagascar, three of which, *Mentha, Origanum* and *Thymus*, are known only in cultivation and two, *Leonotis* and *Leucas*, are widespread introduced weeds. Three, *Capitanopsis, Dauphinea* and *Perrierastrum*, are endemic and the last two also monotypic. The presence of the genera *Becium* and *Endostemon* has recently been confirmed, although the record of *Leonurus* still awaits clarification.

Approximately 115 species are currently recognised, including ➢

around 25 undescribed species that have been identified by Hedge and co-workers on the *Flore*. This indicates just how little the Malagasy labiates have been studied. The rate of endemism is high, at a similar level to that found in other families on the island, with species endemism now over 90%. In contrast, at generic level and excluding introductions, endemism is low with many genera such as *Salvia*, *Stachys* and *Ajuga* being relatively widespread elsewhere in the world.

The extraordinary facies of many Malagasy taxa such as the endemic genera already mentioned, *Orthosiphon humbertii* Danguy with its upwardly curved corolla tube and frilly lower lip and *Ocimum tenellum* Benth. with its unusual creeping habit has caused some difficulty in determining relationships with taxa elsewhere in the world. This problem is compounded by the inadequate delimitation of some labiate genera, notably within the tribe Ocimeae, such as *Orthosiphon*, *Solenostemon* and *Plectranthus*. Relationships between the Malagasy representatives of these genera and their African counterparts are far from clear at present, and generic concepts that have been applied in the past in Madagascar and in mainland Africa do not appear to be equivalent. It may well be that quite major changes will become necessary as monographic work on these awkward genera proceeds. It would, however, be sad to lose any of the three endemic genera!

During our trip we collected representatives of about l7 genera of labiates. *Tetradenia* proved to be of particular interest, and we were able to collect a large amount of useful material, including both herbarium and living. The affinities of this small African/Malagasy genus are uncertain, and it has a number of rather unusual features (Codd, 1983). We were aware before the trip of an undescribed species of this genus, which one of us (PP) had collected previously, and a few rather odd-looking sheets had also been noticed in herbaria.

The genus consists predominantly of dioecious species, which tend to flower in late summer through to winter, often after the leaves have been shed. Consequently herbarium material is often very difficult to interpret: the two sexes are rarely collected together, and the leaves, flowers and fruits are rarely present together. In addition the plants are mostly somewhat fleshy, and many of the useful characters are microscopic details of the tiny flowers, therefore herbarium material and annotations are often extremely poor. In the field, however, it soon became apparent that the genus is very common in suitable rocky habitats in Madagascar, particularly in the mountains on the central plateau, and that it is much more diverse than had originally been thought. To cries of "Another *Tetradenia*!", the Landcruiser would screech to a halt, sometimes at intervals of little more than 50 metres, and we eventually found not just one new species on our trip, but at least four! We were also able to confirm that one Malagasy species produces hermaphrodite as well as unisexual individuals, whereas previously hermaphroditism was only known in *T. barbaerae* (N. E. Br.) Codd from the E. Cape Province of South Africa.

The long isolation of Madagascar, the stability of the climate and the diversity of habitats has resulted in a wealth of taxa and high levels of species endemism. As studies of the labiates of the island proceed, it is certain that the results will be of considerable value in helping us to understand the evolution of the family both in Africa and worldwide.

Our expedition provided a fascinating first encounter with Madagascar for one of us (RC), and an opportunity to visit some new localities for PP and GR. In addition to the labiates, many other plants were collected, including several other taxa that are of particular interest to us or to our colleagues. The herbarium material from the trip will be lodged at E, K, MO, P, PRE, TAN and other institutions. Cuttings and seed collections have been taken to E, RUH, and TAN to enable further studies of many species.

We wish to thank the various organisations and individuals that helped to facilitate the expedition, including the National Council of State Garden Club of U. S. A. who partly funded one of us (PP).

* Rose Clement is on the staff at the Royal Botanic Garden, Edinburgh, Peter Phillipson is at Rhodes University, Grahamstown, South Africa and is a Research Associate of the Missouri Botanical Garden and Guy Rafamantanantsoan is at the Parc Botanique et Zoologique de Tsimazaza, Antananarivo, Madagascar.

Literature Cited

Baker, J. G., 1881. Notes on a collection of flowering plants made by L. Kitching, Esq., in Madagascar in 1879. *J. Linn. Soc., Bot. 18: 264-281.*

Baker, J. G., 1882. Contributions to the flora of central Madagascar. *J. Bot. 20 (n. s. , vol 11): 17-20, 45-51, 67-70, 109-114, 137-140. 169-173, 218-222, 243-245, 266-271.*

Baker, J.G., 1882-1883. Contributions to the flora of Madagascar. *J. Linn. Soc., Bot. 20: 87-304.*

Baker, J. G., 1884-1885. Further contributions to the flora of central Madagascar. *J. Linn. Soc., Bot. 21: 317-353, 407-455.*

Baker, J. G., 1886. Further contributions to the flora of Madagascar. *J. Linn. Soc., Bot. 22: 441-537.*

Briquet, J., 1894. Fragmenta monographiae Labiatarum. *Bull. Herb. Boissier 2: 118-142, 689-724.*

Codd, L. E., 1983. The genus *Tetradenia* Benth. (Lamiaceae), I. Malagasy Republic. *Bothalia 15: 177-183.*

Hedge, I. C , 1972. *Salvia* in Madagascar. *Notes Roy. Bot. Gard. Edinburgh 32: 1-11.*

Inflorescence of *Orthosiphon humbertii* Danguy, Madagascar 1992.
Photograph: Rose Clement

REQUESTS

The following requests for living material or seed have been received.

Requests for material of several genera

Verbenaceae from Southern S. America,
M.E. Mulgura de Romero, Instituto de Botanica Darwinion, Labarden 200, C.C. 22- 1642 San Isidro, Argentina

Cymaria, Holocheila, Renschia, Tinnea (not *aethiopica*), *Trichostema* (not *dichotomum*), *Schnabelia, Anisomeles, Glossocarya, Hymenopyramus, Peronema, Petraeovitex, Teijsmanniodendron, Chloanthoideae* and *Viticoideae* except *Clerodendrum, Callicarpa, Vitex*
P. Cantino, Dept. of Environmental & Plant Biology, Ohio University, Athens, Ohio 45701, USA (dry or pickled material also wanted)

Amasonia, Aegiphila, Tetraclea, Kalaharia, Glossocarya
H.Rimpler, Institut für Pharmazeutische Biologie, Schänzlestr. 1, 7800 Freiburg, Germany

Amethystea, Glossocarya, Hosea, Huxleya, Kalaharia, Karomia, Oncinocalyx, Tetraclea, Teucridium
D. Steane, Dept. of Plant Science, South Parks Rd., Oxford, OX1 3RA, UK

Chloanthoideae
M. Cole, Forensic Science Unit, Dept. of Pure and Applied Chemistry, Univ. of Strathclyde, 204 George St., Glasgow, G1 1XW, UK

Ocimeae (non-weedy species)
A. Paton, Herbarium, Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3AE, UK

Hyptidinae (non-weedy species)
R.M. Harley, Herbarium, Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3AE, UK

Dauphinea, Puntia, Symphostemon, Skapanthus, Hanceola
O. Ryding, Dept. of Systematic Botany, P.O. Box 541, S 751 21 Uppsala, Sweden

Meriandra, Salvia, Dysophylla, Elsholtzia, Mosla, Perillula, Rostrinucula, Pogostemon, Comanthos-phace, Colebrookia, Perilomia, Gomphostemma, Phyllostegia, Taitonia
S. Wagstaff, Dept, E.P.O. Biology, Univ of Colorado, Boulder, CO 80309, USA

Rosmarinus, Lavandula, Melissa
P.H. Fernandez, Dept. of Plant Biology, Univ. Cordoba, Avda. S. Alberto Maguo, 14004 Cordoba, Spain

Particular Genera

Anisomeles (Australian and New World)
R.J.S. Aluri c/o Albert, Door No 20-361\18, Ramamurthy Nagar, Yellamanchili 531 055 Andhra Pradesh, India

Clerodendrum
D. Mabberley, Dept. of Plant Science, South Parks Rd., Oxford, OX1 3RA, UK

Lantana (*L. camara* from Uganda, provenanced or vouchered material)
C.H. Stirton, RBG, Kew, Richmond, Surrey, TW9 3AE, UK

Leonotis (African and Mexican)
R.J.S. Aluri c/o Albert, Door No 20-361\18, Ramamurthy Nagar, Yellamanchili 531 055 Andhra Pradesh, India

Mentha (Australasian, E. European & S.W. Asian)
H. Chambers, National Clonal Germplasm Repository, 33447 Peoria Rd., Corvallis, Oregon 97333, USA

Melissa
S. Hose, Julius von Sachs Institut für Biowissenshaften, Dept. of Parmaceutical Biology, Mittlerer Dallenbergweg 64, D-8700 Warzburg, Germany

Nepeta (African and Asian species)
A.L. Budantsev, Herbarium, Komarov Botanical Institute, Prof. Popov St. 2, St. Petersburg, Russia

Nepeta
P. Goetghebeur, Lab. of Plant Systematics. State Univ. Ghent, Leganekstraat 35, 9000 Ghent, Belgium

Petrea (not *P. volubilis* or *P. racemosa*)
R.M. Rueda, Missouri Botanical Garden, P.O. Box 299, St. Louis, Missouri, USA

Plectranthus or related genera,
T.T. Aye Dept. of Biology, Univ. Botswana, Private Bag 0022, Gaberone, Botswana

Pogostemon
R.Bhatti, Biology Dept. Birkbeck College, Univ. London, Malet St., London WC1E 7HX, UK

Salvia (New World species)
G. Alziar, Jardin Botanique, 20 Traverse des Arboras F 06200 Nice, France

Sideritis (S. hirsuta and *S. hyssopifolia* from Italy)
M.C. Obón de Castro, Dept. Biologia Vegetal, Facultad de Biologia (Campus de Espinardo), Universidad de Murcia, 30071 Murcia, Spain

Scutellaria
A. Paton, Herbarium, Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3AE, UK

Scutellaria
M. Medvedeva, Department of Plant Resources, Komarov Botanical Institute, Prof. Popov St. 2, St. Petersburg, Russia

Stachys
T.Krestovskaya Herbarium, Komarov Botanical Institute, Prof. Popov St. 2, St. Petersburg, Russia

Stachys
J.B. Nelson, A.C. Moore Herbarium, Dept. Biological Science, Univ. of S. Carolina, Columbia, SC 29208, USA

Stachytarpheta
S.Atkins, Herbarium, Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3AE, UK

Tetradenia (wild collections)
P. Phillipson, Botany Dept., Rhodes University, Grahamstown, 6140, South Africa

Teucrium (from outside Europe), R. Clement, Royal Botanic Garden, Edinburgh, Inverleith Row, Edinburgh, U.K.

Teucrium (Sect. *Polium*)
J.L. Rosua Campos, Dept. de Biologia Vegetal, Facultad de Ciencias, Univ. de Granada, Granada, 18001, Spain

Thymus (African species)
R.Morales, Real Jardin Botanico, Pl. de Murillo 2, 28014 Madrid, Spain

Thymus (*T. herba-barona* from Mallorca)
B. Voirin, Bât. 741, Lab. Biologie mircromoleculaire et Phytochemie, Univ. Lyon 1, 43 Boul. du 11 Nov 1918, 69622 Villeurbanne, France

Oxera
D. Mabberley, Dept. of Plant Science, South Parks Rd., Oxford, OX1 3RA, UK

LABIDAT - A GENERAL PURPOSE DATABASE FOR THE LABIATAE

Dr Alexis Shavarda,
Komarov Botanical Institute, St. Petersburg 197376, Russia.

A general purpose database for the Labiatae is being compiled at the Komarov Botanical Institute. It is intended to begin by including all available data, chemical and taxonomic, on the Labiatae occurring in the territory of the former USSR. In future the database will be extended to include the whole family worldwide. The database is built along modular lines to allow further facilities to be added in the future.

The taxonomic unit of the database contains information on nomenclature, synonymy and types, and also on systematic relationships within the family and each genus. This unit is designed according to the preliminary recommendations for the Canberra meeting of the Species Plantarum Project.

Great attention is paid to geographical information. The database contains three types of data.

1. The general distribution of the species, similar to that in the Flora of the USSR, which may be used for preparing similar publications.

2. A detailed, three-levelled list of the geographic names which characterise the actual places of plant growth, which may be useful in floristic investigations.

3. A list of herbarium specimens with detailed descriptions of exact collection localities.

There is also a special unit carrying information on species habitats and vegetation types.

Numerous programme modules have been written allowing data processing to be automated and it is possible to use several languages simultaneously. A special programme module has been written to create a systematic tree, based on the information stored on the database, and to allow movement along it. It is planned to design a display on the tree-like structure of the family, which will give information about the characteristics (biochemical etc.) present in each taxonomic group.

Recently special attention has been paid to increasing the efficiency of data storage. This will result in a reduction of disk space needed for the database.

Despite the great number of ideas, work has progressed slowly due to lack of funding. Offers of support will be greatly welcomed. Hopefully the database can be completed and the wealth of information it contains made available to all those interested in the Labiatae. □

POSTER ABSTRACTS

The following posters were presented at *Advances in Labiate Science conference*, held at the Royal Botanic Gardens, Kew, UK, 2nd - 5th April 1991. The text of the abstracts has not been changed since this presentation.

POSTER ABSTRACTS – CONTENTS

Abstracts marked with an asterix (*) have been enlarged and modified into papers included in the Advances in Labiate Science conference volume.

POSTER ABSTRACTS – INDEX

Subject followed by relevant abstract number

2. *

CLADISTIC ANALYSIS OF THE SUB-FAMILY CARYOPTERIDOIDEAE BRIQ. AND RELATED TAXA OF VERBENACEAE AND LAMIACEAE USING MORPHOLOGICAL AND CHEMICAL CHARACTERS.

Ursula Falk, Claudia Winterhalter and Horst Rimpler
Institut für Pharmazeutische Biologie, Schänzlestr. 1, D-78 Freiburg, Germany

1.

COMPARATIVE ANATOMY OF LAMIACEAE AND VERBENACEAE AS A TOOL FOR RE-EXAMINATION OF DELIMITATION OF THESE TWO FAMILIES

K. Unnikrishnan and A.B. Remashree
Department of Botany, University of Calicut - 673 635, Kerala, India

Tectona grandis, Duranta repens, Petrea volubilis and *Clerodendrum* spp. of the Verbenaceae; and *Mentha spicata, Leucas aspera, Anisomeles ovata* and *Ocimum americanum* of the Lamiaceae were studied. The three plastochronic phases, pre-leaf-, leaf- and post-leaf-initiation are common to both families. Revelation of cytohistological zonations in different plastochrons have remarkable parallelism between the families. Procambial strands differentiate in the shoot apex in acropetal order in both. The foundation of opposite phyllotaxis or leaf initiation in either family can be identified either in T2 or T3 cells on the expected loci of next pair of leaves in the shoot apex. Precocious development of procambial strands has been found in each of the families. The origin of axillary bud meristems in Lamiaceae and Verbenaceae is as the detached meristem. The accessory bud meristems, whenever present, are again formed as detached meristems of the respective axillary bud meristems. Three types of vascular trace connections of axillary buds exist in these families: *Petrea, Leucas* and *Ocimum* represent these three. Unilacunar node with varying number of strands is a common feature of either family. Likewise the tracheary elements, fibres, stomata, venation of leaf and trichomes of the two families have been compared. Anatomical comparison based on vegetative features of the two families bring to focus the similarities between the two, rather than the dissimilarities. This also points to their evolutionary proximity and justifies their close systematic position.

3. *

MICROMORPHOLOGICAL AND PHYTOCHEMICAL RESEARCHES ON *TEUCRIUM MASSILIENSE* L.

A. Pinetti, Dipartimento di Chimica, Università di Modena, Italy
L. Bini Maleci, Dipartimento di Biologia Vegetale, Università di Firenze, Italy
O. Servettaz, Dipartimento di Biologia, Università di Milano, Italy

Pursuing our studies on the genus *Teucrium*, in this paper the micromorphological and phytochemical characters (volatile compounds) of *Teucrium massiliense* L. (Sect. Scorodonia) are reported. ➢

The Caryopteridoideae, which are traditionally placed in Verbenaceae, seem - at least in part - to be closely allied with certain Labiatae and therefore may be important for understanding phylogenetic relationships both within the Verbenaceae and between Verbenaceae and Labiatae. To cover a broader range of taxa a representative sample of the probably polyphyletic genus *Clerodendrum*, most genera of the rest of Clerodendreae, of Viticeae, and of Ajugeae, as well as a few genera from Verbenoideae and Lamiaceae were included in the cladistic analysis. Several morphological characters including floral and inflorescence structure, hair types, foliar nectaries and staminal characters, as well as occurrence and structural types of iridoid glucosides were scored and analysed under the parsimony criterion (PAUP). The strict consensus tree from 100 of the more than hundred equally parsimonious solutions, not unexpectedly showed that "Caryopteridoideae" is a highly polyphyletic assembly of genera from different lamiaceous and verbenaceous groups: *Caryopteris* and *Glossocarya* emerge as members of a large clade, characterised by fruits dehiscing into four dry mericarps, which includes all the Labiatae of our study as well as *Teucridium* and *Oncinocalyx* (Verbenaceae - Clerodendreae). The sister group of this clade is section *Cyclonema* (*Clerodendrum*). Within the Labiatae clade, four smaller clades can be recognised, one of which includes *Caryopteris, Glossocarya, Amethystea,* and *Trichostema* in agreement with the results of Abu-Asab & Cantino (1989). Verbenoideae, Viticeae plus *Peronema,* and the bulk of *Clerodendrum* plus *Aegiphila, Amasonia, Faradaya, Oxera, Tetraclea* emerge as three well-defined clades. *Hymenopyramis, Callicarpa, Petitia* and *Tectona* form a basal clade, which is less well corroborated.

The types of trichomes observed are the same as previously described in *Teucrium* sect. *Chamaedrys:* peltate, short capitate with a 2-cellular head, long capitate and non-secreting unbranched trichomes. The calyx is campanulate, 2-lipped; the upper tooth is much wider than the 4 others; the peculiar distribution of trichomes on the calyx is described.

The essential oil analysis in leaves, calyces and corollas has evidenced 34 compounds: monoterpenes, aliphatic acid esters and sesquiterpenes. Some compounds are chiefly detected in the corollas, and are perhaps secreted in the long capitate trichomes, present only in this part of the plant. A comparison between the essential oil composition of *T. massiliense* and the volatile compounds present in other species belonging to the same section is also reported.

4.

DISTRIBUTION OF FLAVONOID 7-(2”-ALLOSYL)-GLUCOSIDES IN MEMBERS OF THE SUBFAMILY LAMIOIDEAE

M.I. Gil, F.A. Tomás-Barberán, F. Ferreres and F. Tomás-Lorente
Laboratorio de Fitoquimica, C.E.B.A.S., P.O. Box 4195, Murcia 30080, Spain

In a previous review paper we reported that 8-hydroxyflavone glycosides were confined to subfamily Lamioideae in the Labiatae. In the last ten years several 6”’-monoacetylated 8-hydroxyflavone 7-(2”-allosyl)-glucosides have been reported from *Stachys* and *Veronica* species. Recently the 6”, 6”’-diacetylated derivatives have been reported from *Stachys anisochila*. In the present work we have analysed the distribution of these substances in different members of this subfamily by reversed-phase HPLC. The occurrence of deacetylated, 6”-monoacetylated and 6”-6”’-diacetylated 8-hydroxyflavone 7-(2”-allosyl)-glucosides has been demonstrated in *Sideritis, Galeopsis* and *Stachys* species as well as in *Teucrium webbianum* and *T. chamaedrys*. The 8-hydroxy-flavonoids present in *Ajuga* species are different in structure. The occurrence of these substances shows a very close relationship between the genera *Sideritis, Stachys* and *Galeopsis*.

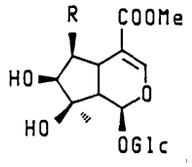
The distribution of flavonoid p-coumaroyl glucosides within the Labiatae is also studied. These compounds are confined to *Anisomeles, Ballota, Galeopsis, Leonurus, Marrubium, Phlomis, Sideritis* and *Stachys* species, which belong to Bentham’s Stachydeae, and to subtribes Lamieae and Marrubieae.

5.

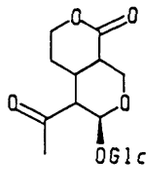
IRIDOIDS IN *LAMIUM ALBUM*

S. Damtoft, S.R. Jensen and B.J. Nielsen
Department of Organic Chemistry, The Technical University of Denmark, DK-2800 Lyngby, Denmark

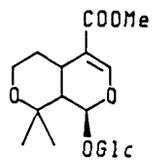
The main iridoid in *Lamium album* L. is Lamalbid. In a study of the minor iridoid components, we have isolated caryoptoside and two new secoiridoids alboside A and B.



R=H caryoptoside R=OH lamalbid



alboside A



alboside B

The occurrence of secoiridoids in *Lamium* is unexpected and is, to our knowledge, the first example of occurrence of secoiridoids in Lamiaceae. Preliminary results, however, indicate that the biosynthesis of the albosides is different from that of secologanin and the derived complex indole alkaloids. This will be discussed as well as the taxonomic consequences of the results.

---

6. *

HOST SPECIFICITY AND SEASONALITY IN TWO SPECIES OF *MELIGETHES* (COLEOPTERA: NITIDULIDAE), ASSOCIATED WITH *LAMIUM ALBUM*

A.H. Kirk-Spriggs
National Museum of Wales, Cathays Park, Cardiff, CF1 3NP, UK

The taxonomically difficult genus *Meligethes* is represented by 36 British species, which have been divided into species-groups based on taxonomic similarities and larval host-plant associations. 20 of these species are associated with Labiatae, the largest number being included within the *M. difficilis* species-group. ➢

The two commonest representatives of the *M. difficilis* species-group in Britain are *M. morosus* Erichson and *M. difficilis* (Heer). Both these species have larvae which develop in flowers of *Lamium album* L. Collecting data amassed over almost 30 years have shown that other flowering plants are fed upon by adults both before and after the flowering period of *Lamium album*. Fluctuations in seasonal activity result from variations in flowering periods. Whilst both species become active in late March, *M. morosus* has a longer period of peak activity than *M. difficilis*, and continues to be active until later in the year.

A range of alternative food-plants are utilised by adults of both species, but *M. morosus* appears to utilise a wider range of flowering plants than *M. difficilis*. Other species of Labiatae are important alternative food-plants for both beetle species.

7.

DISTRIBUTIONAL HISTORY OF *STACHYS FLORIDANA* IN THE UNITED STATES

J.B. Nelson
Department of Biological Studies, University of South Carolina, Columbia, SC 29208, USA

Described from a collection made in present-day Duval County, Florida, *Stachys floridana* Shuttlew. ex Bentham is typical of perennial species of the genus in North America in its bearing elongated, fragrant rhizomes. These rhizomes and the tubers which develop from them (prior to flowering) have enabled this species to quickly colonise a wide area of the southeastern United States.

The movement of this species within and outside the state of Florida is easily documented. Presently, it occurs in ten states of the southeast (within six of which it probably occurs throughout), as well as in Texas. Its rapid migration is due, probably in large part, to human-related activities, especially those involving movement of horticultural exports, originally from Florida, and secondarily from other states. At this time, *Stachys floridana* is one of the most noxious lawn and garden pests in the southeastern US; efforts to control populations generally encourage its success, as mechanical disturbance of the soil almost invariably spreads tubers or rhizomes. Despite its ferocity as a weed, this species has potential economic value as a food plant.

It may be that this plant has already reached a more or less northern limit, due to climate. An unsettled question concerns the absence of this plant from other presumably suitable “target” areas.

8.

THE SIGNIFICANCE OF THE ADAPTABILITY OF DIFFERENT MORPHOLOGICAL TYPES OF TRICHOMES OF SOME ENDEMIC SPECIES OF GENUS *STACHYS* OF THE BALKAN PENINSULA

B. Todorovic
Department for Botanical Research, Faculty of Pharmacy, University of Belgrade

The adaptive significance of various types of trichomes found on the following endemic species of the Balkan peninsula was investigated: 1. *S. scardica* (Gris.) Hayek, 2. *S. decumbens* Pers., 3. *S. canescens* Bory & Chaub., 4. *S. anisochila* Vis. & Panc., 5. *S. menthifolia* Vis., 6. *S. plumosa* Griseb., 7. *S. spruneri* Boiss., 8. *S. swainsonii* Bentham subsp. *scyronica* (Boiss.) Phytos & Damb., 9. *S. swainsonii* Bentham subsp. *argolica* (Boiss.) Phytos & Damb., 10. *S. iva* Griseb., 11. *S. chrysantha* Boiss. & Heldr., 12. *S. candida* Bory & Chaub., 13. *S. milanii* Petrovic, 14. *S. serbica* Pančič.

Among the studied species, a relatively large number of different types of glandular and non-glandular trichomes were noticed. On the basis of their ecological and morphological characteristics in the broadest sense, all the investigated species can be considered as xerophytes. Regarding the presence of the trichomes on the surface of the leaves we recognise the species with well developed hair cover whose leaves are completely white, the species with rare and scarce hairs, and the species that stand somewhere in between the previous two groups. Unequally developed hair cover on the leaves points to the specific adaptive significance of trichomes as external morphological structures of the endemic species of the genus *Stachys*.

9.

DITERPENES FROM *STACHYS ROSEA*

C. Fazio, S. Passannanti, M.P. Paternostro and F. Piozzi
Dept. of Organic Chemistry, University of Palermo, Palermo, Italy

Continuing our phytochemical investigation of some genera of Labiatae, we have examined the acetone extract of the aerial parts of *Stachys rosea* Boiss., collected in Cyrenaica (Lybia). Two new diterpenoids were extracted, namely roseo-stachenone and roseostachone.

Both products have a neoclerodane skeleton, and their structures were determined mainly be spectroscopic means.

10.

IRIDOID AND PHENYLPROPANOID GLYCOSIDES FROM *STACHYS MACRANTHA*

I. Çaliş, A.A. Başaran, I. Saracoğlu
Hacettepe University, Faculty of Pharmacy, Department of Pharmacognosy, TR-06100 Ankara, Turkey

O. Sticher
Eidgenössische Technische Hochschule Zürich, Pharmazeutisches Institut, Departement Pharmazie, CH-8092 Zürich, Switzerland

In previous communications we reported on the isolation and structure elucidation of phenylpropanoid glycosides, verbascoside and lavandulifolioside from the methanolic extract of *Stachys lavandulifolia* Vahl. Since this plant is used as herbal tea in Turkey, it has also been investigated for its essential oil.

In continuation of our studies on the chemical constituents such as iridoids and phenylpropanoid glycosides from *Stachys* species, we present the results of the investigation on *Stachys macrantha* C. Koch (syn. *Betonica grandiflora* Willd.).

Fractionation of the methanolic extract of the aerial parts of *S. macrantha* by a combination of CC on polyamide and silica gel followed by RP-18 MPLC allowed the isolation of seven iridoid glycosides, harpagide, 8-*O*-acetylharpagide, 8-*O*-(3,4-dimethoxy-cinnamoyl)-harpagide, ajugol, ajugoside, reptoside and allobetonicoside besides four phenylpropanoid glycosides, lavandulifolioside, verbascoside, leucosceptoside A and martynoside.

The results obtained from the point of iridoid glycosides show remarkable correlations with the findings reported for *Betonica officinalis* and other *Stachys* species. This is the second report of isolation of allobetonicoside and the first report for 8-*O*-(3,4-dimethoxy-cinnamoyl)-harpagide from nature.

11.

TWO NEW PHENYLPROPANOID GLYCOSIDES FROM *LEONURUS GLAUCESCENS*

I Çaliş, T. Ersöz, D. Taşdemir
Hacettepe University, Faculty of Pharmacy, Department of Pharmacognosy, TR-06100 Ankara, Turkey

P. Rüedl
Organisch-Chemisches Institut, Universität Zürich, Winterthurestr. 190, CH 8057 Zürich, Switzerland

Some *Leonurus* species are medicinally important plants and produce mainly sedative, antihypertensive and uterotonic activities. Although different types of chemical constituents such as alkaloids, iridoids, saponins, flavonoids, cardenolide-like glycosides, tannins and essential oils have been reported from these species, there is no report on the presence of phenylpropanoid glycosides which have great chemotaxonomic value. They may also be responsible for sedative and antihypertensive activities.

Herein we report a chemical investigation of the aerial parts of *Leonurus glaucescens* Bunge which is one of the five species found in Turkish flora. Separation of the methanol extract with a combination of polyamide CC and RP-18 MPLC afforded two new phenylpropanoid glycosides named as leonosides A and B in addition to verbascoside and lavandulifolioside.

On the basis of chemical and spectral data the structures of leonosides A and B have been elucidated as β-(3,4-dihydroxyphenyl) ethyl - O - α - L-arabinopyranosyl - (1->2) - α - L-rhamnopyranosyl - (1->3) - 4 - O feruloyl - β - D - glucopyranoside and β (3-hydroxy, 4-methoxyphenyl) ethyl - O - α - L - arabinopyranosyl - (1->2) - α - L - rhamnopyranosyl - (1->3) - 4 - O - feruloyl - β - D - glucopyranoside, respectively.

---

12. *

CHROMOSOMAL EVOLUTIONARY TRENDS IN THE GENUS *SIDERITIS* SUBGENUS *MARRUBIASTRUM*

A. Marrero
Jardin Botanico "Viera y Clavijo", Cabildo Insular de Gran Canaria, Canary Islands, Spain

The genus *Sideritis* consists of six sections distributed throughout the Mediterranean Region, North Africa and Macaronesia: sections *Sideritis, Empedoclea, Hesiodia, Burgsdorffia, Marrubiastrum* and *Empedocleopsis.*

The last two sections are exclusively Macaronesian and make up the subgenus *Marrubiastrum*.

Recent chromosome number studies have shown that the Macaronesian sections have higher levels of polyploidy than those of the Mediterranean/N. African sections. Whilst in the latter a dysploid series from 2n=16 to 2n=34 has been found, in section *Marrubiastrum* a continuous series from 2n=34 to 2n=44 is present and in section *Empedocleopsis* (exclusively of the Canary Island of La Gomera) 2n=44 and 2n=46. ➢

Chromosome numbers are of interest in the interpretation of the chorological history of the Macaronesian species, as well as of the evolutionary trends, showing a good approximation to morphologically delimited sections and subsections.

The study of karyotypes, though somewhat difficult, allows the possible chromosome evolution of the Macaronesian sections to be interpreted.

The increase in the number of chromosomes is accompanied by an increase in the coefficient of asymmetry of Stebbins, and the appearance of telocentric chromosomes at the expense of metacentrics can be observed.

This leads us to suggest that at least in the Macaronesian sections, Robertsonian changes or mutations have played an important role in evolution of the karyotype.

13.

HAIR COVERING AS TAXONOMIC MARKER FOR SECTIONS OF GENUS *SIDERITIS*

D. Rivera-Núñez and C. Obón-de-Castro
Dep. Biologia Vegetal, Fac. Biologia, University of Murcia, Spain

The presence of complex dendritic trichomes is, within the genus *Sideritis*, typical and exclusive to the two Macaronesian Sections (*Empedocleopsis* and *Marrubiastrum*), pointing towards a common ancestry. The branched hair-type has been detected also on some South African Labiatae formerly described as *Sideritis* by Thunberg and later included in *Stachys*. No one species belonging to the Mediterranean and Asiatic sections (*Burgsdorfia, Hesiodia, Sideritis* and *Empedoclea*) show complex dendritic trichomes.

Through the whole genus simple uniseriate multicellular trichomes and single-celled head glandular trichomes are found, even in the Macaronesian taxa.

14.

HAIR COVERING AS TAXONOMIC MARKER FOR SUBSECTIONS OF SECTION SIDERITIS (*GENUS SIDERITIS*)

D. Rivera-Núñez and C. Obón-de-Castro
Dep. Biologia Vegetal, Fac. Biologia, University of Murcia, Spain

The SEM study of hair covering is used as a tool to build subsections within section *Sideritis.* Types of hair covering detected were ciliate, glabrate, sericeous, tomentose, villous, etc. Hair covering is quite similar within genetically uniform populations when studied at the level of the stem base. The type of stem base hair covering of one species remains relatively unchanged under different environmental conditions, while on leaves and inflorescences, changes can be detected. Major features used to discriminate are the length of hairs, main direction (antrorse or retrorsely curved) and shape of apical cell (conical, collapsed, riband, glandular). Some taxa display a continuous hair cover but many others are neatly goniotrichous. Density of hairy cover sometimes depends on variations of environmental factors.

Many taxa have a monotypic hair covering, in which only statistical variations of hair length can be detected. Some taxa as *Sideritis hirsuta* and related species have a composite hair covering with hairs differing in length and main direction of curvature. The presence of glandular hairs has only been detected on few primitive taxa.

15.

ECOLOGY OF POLLINATION IN TWO MINT SPECIES

Raju R.S. Aluri
c/o V. Albert, Door No. 20-361/18 Ramamurthyu Nagar, Yellamanchili 531 055, Visakhapatnam Distr. Andhra Pradesh, India.

Species of *Anisomeles* have bilabiate and gullet-shaped flowers. *Anisomeles malabarica* and *A. indica* are herbaceous perennials and grow from perennating root stock or seed. *A. malabarica* grows in disturbed and undisturbed places with soils saturated or unsaturated, while *A. indica* is confined to undisturbed areas with water saturated soils. Flowering in *A. indica* is associated with moisture content of the soil. The two *Anisomeles* species are mainly outcrossers and are principally pollinated by carpenter bees (*Xylocopa* sp.) and sunbirds (*Nectarinia* sp.). These pollinators exploit the flowers for nectar nototribically - a floral mechanism credited for precision and economy in pollen transfer. The floral nectars of the two *Anisomeles* species have three common sugars (glucose, sucrose, fructose), aminoacids and proteins. The total sugar concentration is 32-43% as sucrose equivalents in *A. indica* and 30-48% in *A. malabarica.*

Competition for such pollinators has been avoided by the natural distribution of these two plant species in different habitats. Furthermore, the plants have ➢

synchronous seasonal flowering but have different diurnal anthesis times. In times of non-availability of pollinators the flowers do self-pollinate by reflexing the receptive bilobed stigma against the dehisced anthers with viable pollen situated just below. Although the two plant species are separated by habitats, there is a possibility for natural hybridisation between these two plant species as their pollinators are long-distance fliers and could transfer pollen between the flowers of the two species. Hand-pollination experiments for such a hybridisation between *A. malabarica* and *A. indica* indicate that the pollen is compatible with each other as is realised by fruit and seed production.

16.

A MICROMORPHOLOGICAL STUDY IN SOME REPRESENTATIVE GENERA OF THE TRIBE STACHYDEAE AND SATUREJEAE

S.Z. Husain

Department of Botany, University of Reading, Berkshire, UK

M. Qaiser
Department of Botany, University of Karachi, Pakistan

P. Marin
Botanical Institute and Garden, Faculty of Science, University of Belgrade

The old world genera in tribes Stachydeae and Saturejeae are usually distributed either in Europe and North Africa or in the temperate parts of Asia. The centres of distribution of investigated genera are mainly in the Mediterranean region and South West Asia. In taxonomic revisions very little reference is usually made to micromorphological characters, in particular, to nutlets and leaf indumentum, in spite of the stability of these characters. SEM of nutlet surface and patterns of leaf indumentum show a wide range of variation, not only among genera, but also at lower levels of classification. In view of this, nutlet surface and leaf indumentum, as seen in the SEM, provide useful additional character combinations in delimiting 18 closely related genera studied within the Stachydeae and Saturejeae.

17.

CHEMOTAXONOMIC STUDIES IN THE LABIATAE FAMILY

I. Máthé jr. and V.V. Miklóssy
Res. Inst. Ecol. Bot. Hung. Acad. Sci., Vácrátót, Hungary

A. Máthé
Univ. Hort. and Food Ind., Budapest, Hungary

G. Blunden
School Pharm. and Biomed. Sci., Portsmouth, UK

A. Borhidi and I. Máthé
Res. Inst. Ecol. Bot. Hung. Acad. Sci., Vácrátót

Chemical features, like volatile oils, iridoids, rosmarinic acid, etc. as chemotaxonomic markers, are characteristic of Labiatae. The different occurrence supports Erdtman's distinction of Lamioideae and Nepetoideae subfamilies. Mineral elements and triterpenoid acids are also evaluated as potential markers.

The accumulation of 28 elements is also evaluated. Leaf samples of more than 140 species from 30 genera were assayed by ICP-technics. The quantity of elements ubiquitous in these plants, eg. Al, B, Ca, Cu, Fe, K, N, Si, Sr, Ti, V, Zn, does not reveal unequivocal differences between the species of the two subfamilies. Two elements, ie As, Se are not present in traceable amounts, while others such as Cd, Co, Dr, Ga, Hg, Li, Mo, Pb can be detected in various proportions. The differences are presumably more characteristic at the generic than subfamily level.

The oleanolic and ursolic triterpenoid acids, similarly to other organic markers, show valuable differences at subfamily level. They are common in Subfam. Nepetoideae, while in Subfam. Lamioideae their presence is questionable.

---

18. *

A PHYLOGENETIC INTERPRETATION OF POLLEN MORPHOLOGY IN TRIBE MENTHEAE

Steven J. Wagstaff
Department of E.P.O. Botany, University of Colorado, Boulder, CO 80309, USA.

An SEM study of pollen morphology in tribe Mentheae *sensu* Bentham revealed variation in exine structure and sculpture. All pollen studied has simple columellae with a tectate-perforate to semitectate exine structure. Most examined representatives of subtribes Origaninae and Pogostemoninae have suprareticulate grains with polygonal lumina containing numerous small perforations. This pollen type is also characteristic of tribes Salvieae, Nepeteae and most Ocimeae. Exceptions, which are probably derived, include: *Tetradenia*, with parallel supratectal ➢

ridges giving it an unusual striate sculpture; *Mosla*, with patchy, discontinuous supratectal ridges; and *Collinsonia*, with a psilate tectum. The pollen in the examined representatives of subtribes Melissinae and Horminae is characterised by a reduction in the number of perforations per lumen and an increase in perforation size, culminating in an almost complete disintegration of the lumina and a semitectate structure. Semitectate exine structure occurs in *Gardoquia*, *Glechon*, *Hedeoma*, *Lepechinia*, *Minthostachys*, *Rhabdocaulon* and *Xenopoma* as well as three genera of Ocimeae (*Catoferia*, *Orthosiphon* and *Syncolostemon*) where it has presumably evolved independently.

19.

BIOCHEMICAL AND MORPHOLOGICAL STUDIES OF EFFECTS OF DAYLENGTH ON MONOTERPENE COMPOSITION OF YOUNG LEAVES OF *MENTHA* X *PIPERITA*

B. Voirin, C. Bayet
Laboratoire de Biologie Micromoleculaire et Phytochimie, Université Lyon I, Villeurbanne, France

M. Colson, A. Perrin
Laboratoire de Biologie Vegetale, Université Jean Monnet, Saint-Etienne, France

The effects of ontogenetical ageing on monoterpene composition in *Mentha* x *piperita* have been studied by analyses of micro-samples realised by coupling a Desorption-Concentration-Introduction technique with a gas chromatograph from plants subjected to long or short photoperiod. Whatever the length of day, the apparition and development of the two types of glands of shoot meristem studied by scanning electron microscopy shows that the capitate glands appear before the peltate glands. Thus, there is a level of leaves which only possesses capitate glands. The chromatographic analyses of meristem and different primordial leaf pairs show that the monoterpenes are only detected if the leaf bears peltate glands and that the first cyclic compound accumulated is limonene. So, the question with regard to monoterpene biosynthesis is whether the capitate glands elaborate, or do not elaborate, essential oil at an ulterior stage.

Moreover, limonene is present in young leaves of plants growing in short or long day treatment. Therefore, the photoperiod as such is not responsible for the biosynthesis of this compound.

20.

CONTRIBUTION TO THE KNOWLEDGE OF SECTION *PSEUDOTHYMBRA* OF THE GENUS *THYMUS* IN THE IBERIAN SOUTHEAST

P. Sánchez-Gomez
C.R.I.A., Murcia, Spain

Alcaraz Ariza, F. Sáez Soto
Departamento de Biologia Vegetal, Botanica, Universidad de Murcia, Spain

Within genus *Thymus* L., Section *Pseudothymbra* Benth. is widely spread in the southeastern Iberian peninsula, with the following species present:

Thymus funkii Cosson, *Thymus moroderi* Pau ex Martinez, *Thymus longiflorus* Boiss., *Thymus membranaceus* Boiss. and *Thymus antoninae* (Rouy) Cosson.

All of them are endemics with a small dispersion area, and with closely related morphological characteristics and chemical composition.

21.

A NEW SUBSTITUTION PATTERN AT C-8 OF FLAVONOIDS FROM *THYMUS HIRTUS*

R. Merghem, M. Jay and B. Voirin
Laboratoire de Biologie micromoleculaire et Phytochimie, Université Lyon 1, 69622 Villeurbanne, France

As part of our biochemical research on the flavonoids of Algerian plants, we have studied *Thymus hirtus* which has a large distribution area in the east of Algeria. This species contains more than twenty flavonoids (flavones and flavonols) from which three new compounds were identified: 8-C-*p*-OH-benzylapigenin, 8-C-*p*-OH-benzylluteolin and 8-C-*p*-OH-benzylkaempferol.

These native compounds, isolated from leaf material extracted with a neutral alcoholic mixture, were separated on polyamide column.

These different new natural products were characterised from UV, MS and H^1 NMR data.

22.

"IN VITRO" CULTURE OF SOME SPANISH *THYMUS* SPECIES ENDEMICS

F. Sáez Soto
Departamento de Biologia Vegetal, Botanica, Universidad de Murcia, Spain

A. Piqueras Castillo
C.E.B.A.S., Murcia, Spain

P. Sánchez-Gómez
C.R.I.A., Murcia, Spain

In vitro culture techniques have been proved in the last decades to be specially useful for crop managing.

At Murcia University (Spain), they are being applied to select and improve southeastern Spanish endemics of thyme.

Thymus zygis ssp. *gracilis*, *Thymus moroderi* and *Thymus piperella* have been chosen from three different sections of *Thymus*. Their *in vitro* nutrition requirements are to be studied as a first step to making easier and faster selection of this plant's elite-lines.

The number of new axillary shoots and root biomass of *Thymus piperella* obtained after exposing acclimatised plantlets to different hormonal situations are to be shown in this poster.

Experiments for *Thymus zygis* and *Thymus moroderi* are still in early stages of development, but variations in characteristics such as branching ability have already been observed.

23.

CONTRIBUTION TO THE STUDY OF ESSENTIAL OIL OF *THYMUS ARUNDANUS*

M. C. Soriano Cano
Consejeria de Agricultura Ganaderia y Pesca, C.R.I.A., Dpto, Zonas Aridas. 30150 La Alberca (Murcia), Spain

M. C. Garcia Vallejo
I.N.I.A.-C.I.T. Dpto. de Industrias Forestales, carretera de la Coruna, Km 7, 28040 Madrid, Spain

P. Sánchez-Gómez, E. Correal Castellanos
Consejeria de Agricultura Ganaderia y Pesca, C.R.I.A., Dpto, Zonas Aridas, 30150 La Alberca (Murcia), Spain

F. Sáez Soto
Dpto. Biologia vegetal, Universidad de Murcia, Espinardo (Murcia), Spain

An interspecific hybrid between *Thymus mastichina* (L.) L. and *Thymus baeticus* Boiss. ex Lacaita has been obtained under experimental cultivation at the C.R.I.A. Exp. Station in La Alberca (Murcia).

The objective of this work is to confirm the hybridogenous origin of *Thymus arundanus* Willk. by comparing the chemical composition of its essential oil with that of its parents: *Thymus mastichina* (L.) L. and *Thymus baeticus* Boiss. ex Lacaita

The essential oil content of the hybrid was intermediate between the parental values and the same was found for its essential oil components limonene, 1,8-cineole, trans-sabinenehidrate, linalol, a-terpineol and borneol, except for verbenone which, as in *Thymus mastichina*, is not present .

24.

SYNOPSIS OF THE GENUS *MICROMERIA*

R. Morales

Real Jardin Botanico, Plaza de Murillo 2, 28014 Madrid, Spain

Micromeria Benth. is a large genus with about 90 species, inhabiting the temperate regions of Eurasia, Africa and North and South America. The genus displays its maximum diversity in the Mediterranean and Macaronesian regions. Section *Micromeria* is well represented in southern Europe and northern Africa, with nearly 30 species occurring in this area. There is an example of adaptive radiation in the Canary Islands, where 15 endemic species are found. Section *Pseudomelissa*, with 14 species, extends from India to the east of the Iberian peninsula. Section *Cymularia* contains a single annual species, *Micromeria cymuligera*, restricted to Turkey. Section *Pineolentia* (two species) is endemic to the Gran Canaria island. Section *Xenopoma* (15 species) and *Hesperothymus* (4 species) are included in this genus with some doubts. Further studies are necessary.

The most commonly recorded chromosome number within section *Micromeria* is 2n=30 (36 counts from 14 species). Other less frequent numbers are 2n=20 (one population) and 2n=60 (5 populations) in *M. graeca*, n=25 (3 populations) in *M. capitellata*, and 2n=26 and 2n=48 in *M. inodora*. Within section *Pseudomelissa*, the following counts have been reported: 2n=20 for *M. dalmatica* and *M. thymifolia*, and 2n=22 for *M. fruticosa*.

25. *

VOLATILES IN FLOWERS OF BALM (*MELISSA OFFICINALIS*

W. Schultze
Department of Pharmaceutical Biology, University of Hamburg, Germany

A. Zänglein, S. Hose, I. Koch-Heitzmann
Department of Pharmaceutical Biology, University of Wurzburg, Germany

K.-H. Kubeczka
Department of Pharmaceutical Biology, University of Hamburg, Germany

F.-C. Czygan
Department of Pharmaceutical Biology, University of Wurzburg, Germany

Balm (*Melissa officinalis* L.) is an old medicinal plant. Several studies deal with the essential oils of the herb and leaves, but still nothing is known about volatile compounds of balm flowers.

We found that the corolla produces very small amounts (ca. 0.002% of f.w.) of a rather complex mixture of volatiles: more than 150 constituents, some of which, e.g. alkalenes, probably derive from cuticular wax. 95 compounds, representing 83.7% of the sample, were identified by capillary GC and GC/MS: 1.6% monoterpenes, 63.0% sesquiterpenes and 19.1% others. The main compounds are ß-caryophyllene (57.2%), humulene (3.2%), 6.10.14-trimethyl-pentadecan-2-one (3.0%), tridecane (2.6% and ß-ocimene (2.0%).

In contrast, the volatiles of the calyx are similar to those of the leaves, with citral 46.1% (leaf: 12.0%), ß-caryophyllene 15.2% (10.9%), germacrene D 13.2% (13.5%) and citronellal 4.1% (36.2%) as main constituents.

A detailed study by light and scanning electron microscopy revealed hairs and secretory glands on the calyx resembling those on leaves, whereas the corolla is characterised by various non-glandular hairs, a papillose adaxial epidermis on the lower lip (the osmophore?) but no visible essential oil accumulation site.

However, a direct mass spectrometric micro-analysis of parts of a few corollas proved that the main volatile compounds are located only in the region of the bilabiate mouth and not in the lower tubular parts of the corolla.

26.

AN APPROACH TO THE TAXONOMY OF *CUNILA*

M.R. Garcia-Peña

Herbario Nacional, Instituto de Biologia, U.N.A.M., Mexico

Cunila includes around 14 to 16 species. Seven of them are restricted to North America and almost equal number to South America. The study only deals with the North American ones. Geographically *Cunila* has a disjunct distribution, one centre of diversity extends from the eastern United States (one species) and six more mainly on the western cordilleras of Mexico, with only one species ranging south to Panama and a group of species surprisingly located in south eastern Brazil, in northern Argentina and parts of Uruguay. The genus *Cunila* is a member of tribe Satureineae *sensu* Bentham (1876) and is distinguished from the other genera by having five-teeth calyx and two exserted stamens. Growth habits, inflorescences, pedicel length, calyx teeth and indumentum are examples of more useful features for classification in the genus than pollen morphology, which is similar among species and is, therefore, of limited systematic value.

The North American species are described with regard to distribution, flowering season, reproductive biology (for some species), habitat and presumed interspecific relationships. For some species taxonomic and nomenclatural history has been confused and this has also been discussed. Economic (medicinal and ornamental) importance and vernacular names are included for some species when known.

27.

THE VOLATILE CONSTITUENTS OF *ZIZIPHORA* SPECIES GROWING IN TURKEY

K.H.C. Başer

Anadolu University, Medicinal Plants Research Centre, 26470 Eskisehir, Turkey

G. Tümen

Uludag University, Faculty of Education, Department of Biology, 10100 Balikesir, Turkey

E. Sezik

Gazi University, Faculty of Pharmacy, Department of Pharmacognosy, 06330, Ankara, Turkey

M. Kürkçuoğlü, T. Özek

Anadolu University, Medicinal Plants Research Centre, 26470 Eskisehir, Turkey

Ziziphora in Turkey is represented by 5 species and 2 subspecies. These are *Z. capitata*, *Z. clinopodioides*, *Z. persica*, *Z. tenuior*, *Z. taurica* subsp. *taurica* and *Z. taurica* subsp. *cleonioides*. Except for *Z. capitata*, all the other species yield essential oils. The essential oils from aerial parts of essential oil yielding species have been studied in our laboratory.

We report on a comparative study of the volatile constituents of *Ziziphora* species. *Z. tenuior*, *Z. taurica* ssp. *cleonioides* and *Z. taurica* ssp. *taurica* oils were marked with high pulegone content (87%, 77%, 65% resp.). Pulegone content in *Z. clinopodioides* oil was considerably lower (21%) and 1,8 Cineole was the second major component (14%). *Z. persica* oil, on the other hand, showed a distinctly different pattern with *thymol* (30%) and no pulegone.

Sensory evaluation of the oils has also been conducted.

28.

TRICHOMES ON FOUR *SALVIA* SPECIES

J. Szujkó-Lacza

Botanical Department of the Natural History Museum, Budapest, Hungary

The indumentum of all organs were studied in *Salvia officinalis*, *S. nemorosa*, *S. pratensis* and *S. sclarea* (Labiatae) by light microscope and SEM.

All trichomes are epidermal outgrowths but they differ in the number of trichome initials, accompanying cells around the hair base cell(s).

There are more than ten types of glandular hairs and more than twenty types of the non-glandular trichomes. Two types of sessile gland hairs are found in *S. officinalis* and *S. sclarea* and twelve stipitate glandular trichomes. These differ in form, number of stalk cells, or in the form of naked cells under the one- or four-celled gland head.

The non-glandular trichomes can be divided according to the number of cells/hair, simple or branched, smooth or tuberculate surface; and also according to the function, **a.** cover of hairs (by length and density or localisation on the given organ surface), **b.** protective (light, temperature and air humidity regulators), **c.** (a+b), **d.** in connection with pollination.

There are further differences in the consistency and distribution of different trichomes either between organs or between species.

29.

SESTERTERPENES FROM IRANIAN *SALVIA* SPECIES, ANTI-INFLAMMATORY ACTIVITY OF *S. HYPOLEUCA*.

A. Rustaiyan, K. Zare, A. Habibi and M. Saberi
Department of Chemistry, Shahid Beheshty University, Eveen, Tehran. Iran.

The aerial parts of *Salvia hypoleuca* afforded as main components two sesterterpenes (salvileucolide methyl ester and salvileucolide-6-23-lactone with a previously unknown carbon skeleton.

The more polar fractions afforded several further sesterterpenes, eg. salvileucolide methyl ester derivatives and isomeric epoxides and a hydroperoxide derived from salvileucolide-6-23 lactone and a sesterterpene with a further new carbon skeleton, which is a ketone . The extract of the aerial parts of *Salvia syriaca* afforded a polar sesterterpene lactone with four hydroxy groups. The structures were elucidated by high field NMR techniques and some chemical transformations. Possibilities for the development of potential anti-inflammatory agents from these compounds are to be expected, and the projects are under way.

30.

THE EVALUATION OF *SALVIA OFFICINALIS* OILS BY ^{13}C NMR SPECTROSCOPY

A.V. Patel, G. Blunden, T.A. Crabb, Z.-X. Yuan
Portsmouth Polytechnic, Portsmouth, UK

I. Máthé
Institute of Ecology and Botany of the Hungarian Academy of Sciences, Vácrátót, Hungary

Oils prepared by steam distillation of *Salvia officinalis* leaves have been shown to differ significantly, even when obtained from the same plant at different times of the year. For the evaluation of these differences the oils have been examined by thin-layer chromatography, gas-liquid chromatography combined with mass spectrometry and ^{13}C nuclear magnetic resonance spectroscopy. Using the last of these techniques, with the spectra expanded to one metre in length, the differences between the oils can be clearly observed. Whereas the carbon signals arising from certain components, for example α-pinene, camphor, cineol and linalool, were observed, not all the signals have been attributed to individual compounds. The pattern of peaks observed is, however, very useful as a "fingerprint" of the individual oil.

31. *

TEMPORAL GYNODIOECY *IN ROSMARINUS OFFICINALIS*

J.L. Ubera and P.J. Hidalgo
Department of Plant Biology and Ecology, Division of Botany, Faculty of Sciences, University of Córdoba, Avda San Alberto Magno s/n, 14004 Córdoba, Spain

Several wild populations of *Rosmarinus officinalis* L. from Sierra Morena (Cordoba prov., south Spain) were studied. Field observations were carried out during three years (1988-90) throughout the flowering season (October to May). We found the two classical floral forms described for a gynodioecious population: hermaphrodite or male functional flowers (MF) and female or male sterile flowers (MS), consistent with previous reports by other authors (Dulberger, 1988 in *Rosmarinus officinalis* L.; Garcia-Montoya & Munoz-Alvarez, 1988 in *Teucrium fruticans* L.).

Punctual observation reveals a set of forms intermediate (INT) between the typical MF and MS flowers distributed unevenly in the plants. These INT flowers present a gradient in characters such as: style length, stigmatic receptivity, number of pollen grains, pollen viability, pollen morphology, corolla size and corolla colour. According to these characters, we have classified the wide range of floral variation encountered into five types: MF, INTL (long stamens), INTM (median stamens), INTS (short stamens) and MS.

We monitored the proportion of each floral type weekly and correlated it with plant size (as an age estimation).

Most plants (small and medium plants) started flowering with MF or MF and INT. Only very large plants started flowering with MS. The proportion of MS and the type of INT changed gradually, from MS or INTS to INTM, INTL, and finally MF. Thus, we refer to this sexual behaviour as "temporal gynodioecy". It is of a high ecological value as it results in increased cross-pollination and avoids the geitonogamy so frequently found in Labiatae with hermaphrodite flowers.

32.

ESSENTIAL OIL CONTENT AND COMPOSITION OF THE *ROSMARINUS ERIOCALYX-TOMENTOSUS* COMPLEX IN SOUTH-EAST SPAIN

M. C. Sorio Cano
Consejeria de Agricultura Ganaderia y Pesca, CRIA, Dpto Zonas Aridas, 30150 La Alberca (Murcia), Spain

M. C. Garcia Vallejo
INIA-CIT Dpto de Industrias Forestales, carretera de la Coruna Km 7, 28040 Madrid, Spain

P. Sánchez Gómez, Enrique Correal Castellanos
Consejeria de Agricultura Ganaderia y Pesca, CRIA, Dpto Zonas Aridas, 30150 La Alberca (Murcia), Spain

The species of *Rosmarinus eriocalyx-tomentosus* complex are natively present in certain areas of Almeria and Granada, Spanish provinces.

A wide range of hybrids and retrocrossing could be found in localities where they grow together with *Rosmarinus officinalis*.

The chemical composition of the essential oils of these taxa has been studied, and the more significant compounds are: a-pinene, 1,8-cineole, camphor, borneol and verbenone.

33.

EFFECT OF WATER AVAILABILITY ON ESSENTIAL OIL YIELD IN *ROSMARINUS OFFICINALIS*

Carlos Sombrero* and James D. Ross
Department of Botany, University of Reading
[*present address: Hadlow College, Tonbridge]

The effect(s) of water availability on the essential oil yield of a clone of *Rosmarinus officinalis* L. grown under glasshouse conditions was investigated. Data from four separate experiments indicated that a decrease in the water supply had a negative effect on the total amount of essential oil yielded. This decrease was not only due to a reduction in the amount produced as a proportion of leaf weight, or leaf area. It was also shown that the decrease of oil yielded was not evident when expressed as a proportion of overall growth. The analysis of the oil revealed that those plants grown under water-stressed conditions produced oil of different composition.

---

34. *

CHROMOSOME NUMBERS IN TROPICAL AMERICAN LABIATAE

Christine Heywood
Wokingham, Berks, UK

Raymond M. Harley
Royal Botanic Gardens, Kew, UK

➢

Collections of Labiatae from the Neotropics were made as part of a systematic study of the family, especially of the subtribe Hyptidinae (Nepetoideae: Ocimeae) which includes the large genus *Hyptis* and its allies. These formed the basis of the present cytological study, together with other material donated to us.

Although the small chromosome size found in most taxa makes meaningful karyotypic analysis impracticable, chromosome number has in many groups of Labiatae proved to be of important systematic value.

Within the Hyptidinae, chromosome number has confirmed a number of taxonomic decisions based originally on other characters. Base number differences and presence or absence of polyploidy and dysploidy appear to have played an important role in species diversification.

35.

THE GREASY POLE SYNDROME

Raymond M. Harley
Royal Botanic Gardens, Kew, UK

Two South American genera of Labiatae: *Eriope* and *Hypenia* have an unusual explosive pollination mechanism, usually adapted to visits by solitary bees. Ants, in their role as nectar thieves, would interfere with pollination and might reduce seed production. Both field observations and experiments with plants in cultivation indicate, however, that they are unable to reach these flowers due to a suite of characters here designated as the "Greasy Pole Syndrome". These characters include a slender wand-like habit with the stems often densely strigose below and with glabrous waxy often fistulose internodes above. The wax is composed of microscopic platelets that are loosely applied to the stem surface. Field observations suggest that ants of all sizes are unable to scale the stems and thus rob the flowers of nectar. Experiments tend to confirm this, the ants either becoming hopelessly entangled in the hairs near the base of the stem, or being unable to climb the waxy surface of the stem.

36.

PHYLOGENY OF *ERIOPE* AND RELATED GENERA

Raymond M. Harley and Paula J. Rudall
Royal Botanic Gardens, Kew, UK

The genus *Eriope* (Labiatae) contains about 30 species distributed throughout tropical South America, the majority restricted to the cerrado and campo rupestre vegetations of Brazil. It is assigned to the New World subtribe Hyptidinae (Nepetoideae-Ocimeae). Generic limits are established largely on floral and inflorescence characters since vegetative characters are very diverse, ranging from herbs to shrubs and trees, and mesomorphic to xeromorphic forms. Its close relatives include the groups with similarly large flowers and racemose (or cymose) inflorescences, particularly the newly circumscribed genera *Hyptidendron* (16 species in 2 sections) and *Hypenia* (24 species).

This preliminary analysis of *Eriope* and its closest relatives combines data from various sources (morphology, anatomy and cytology), in the context of biogeography, towards a better understanding of evolutionary relationships in the group.

37.

BIOLOGICAL ACTIVITY IN THE LABIATAE

S.G. Deans and K.P. Svoboda
Scottish Agricultural College, Auchincruive, Ayr KA6 5HW, Scotland

Plants of *Melissa* officinalis from a number of seed sources were subjected to heat stress during cultivation. The objective of such stress was to increase the volatile oil yield in what is a notoriously poor oil producer. Little improvement was, however, realised and no qualitative changes in the oil profiles were detected.

Dried leaves of *Ocimum basilicum* were extracted by supercritical carbon dioxide at the Institute of Food Research at Norwich. Pressures of up to 300 bar were used at temperatures ranging from 10°C to 60°C. Extraction at lower pressures yielded a yellow oil totally soluble in hexane plus some water; the higher pressure extracts produced a green-coloured oil which was cloudy in appearance due to the presence of some water, while the 300 bar 60°C extract was a green-coloured semi-solid substance. All four extracts exhibited strong antioxidant activity. GC and GC-MS highlight the differences in these extracts.

Hyssopus officinalis was grown at Auchincruive over two years and qualitative/quantitative analyses undertaken. The antibacterial activity of the volatile oils was evaluated against 25 genera of test bacteria. From these studies, significant activity was recorded against one third of the bacteria.

38.

PRELIMINARY STUDIES ON THE CHEMOTAXONOMIC SIGNIFICANCE OF FATTY ACIDS IN THE LABIATAE FAMILY

Maffei Massimo
Department of Morphophysiology, University of Turin, Italy

Scannerini Silvano
Department of Plant Biology, University of Turin, Italy

Leaves and flowers of 10 taxa (*Agastache scrophulariifolia, Agastache foeniculum, Ballota nigra, Calamintha sylvatica, Hyssopus officinalis, Lavandula spica, Leonurus turkistanicus, Lycopus exaltatus, Marrubium vulgare* and *Mentha asiatica*) belonging to the Labiatae family were used for the extraction of non-polar lipids.

Fatty acids (FA) hydrolysed from triglycerides (T), diglycerides (D) and also free fatty acids (FFA) were separated, esterified and analysed by GC/MS. The data were statistically processed by means of principal component (PCA) and cluster analyses in order to evaluate the chemotaxonomic significance of fatty acids. FA from leaf T were characterised in all taxa by a high content of linolenic (C18:3) acid, followed by palmitic (C16), linoleic (C18:2) and stearic (C18) acids, with the exception of *M. vulgare* which had a higher content of C16. Leaf FFA also scored high C18:3 values but *A. scrophulariifolia, B. nigra* and *L. turkistanicus* had a higher content of C16, while *M. vulgare* was particularly abundant in C18:2. Most of the taxa showed for leaf FA from D a high content of C16; only *L. spica* and *H. officinalis* had a high C18:3 content, while *Agastache foeniculum* scored high oleic acid (C18:1) values. FA from flower T were dominated in all taxa by C18:3 except for *C. sylvatica* which had a high C18:2 content. FFA from flowers scored for all taxa, with the exception of *L. exaltatus* (C18:3) and *M. vulgare* (C18:1). A high C16 content FA from flower D were characterised in *L. spica, M. asiatica* and *C. sylvatica*, by high C16, in *M. vulgare* by high C18 and in the other taxa by high C18:3 levels.

The results obtained from this preliminary study give evidence that C18:3 can be considered a chemotaxonomic character for the species considered only when FA are separated from T. On the other hand C16, C18:2, C18:1 and C18 may act as chemotaxonomic discriminators if FFA and/or FA from D are considered.

39.

LIPIDS AS TAXONOMIC MARKERS IN THE SELECTED TAXA OF LAMIACEAE

Petar D. Marin
Botanical Institute and Garden, Faculty of Science, Belgrade, Yugoslavia

Fatty acid composition of nutlet lipids in 62 species from the Saturejoideae, 7 species from the Ajugoideae and 4 species from the Scutellarioideae have been analysed. The classification follows Wunderlich (1967).

Linolenate is the predominant acid in all species of the Saturejoideae. Its content ranged from 40.7-73.7%. Linoleate was less present (10.7-37.5%). In the Ajugoideae linoleate and linolenate were the major fatty acids. In all *Scutellaria* species (Scutellarioideae) the dominant fatty acid was lineoleate. Its content ranged from 60.2-69.0%. The ratio of linolenate/linoleate (18:3/18:2) is very interesting. Species from the Saturejoideae show higher values of this index (1.4-5.2) if compared with the Ajugoideae (0.5-0.98) and Scutellarioideae (0.02).

Based on these results it may be concluded that fatty acid composition of nutlet lipids and the ratio of 18:3/18:2 can serve as taxonomic markers. They distinguish subfamilies Saturejoideae, Ajugoideae and Scutellarioideae within the Lamiaceae.

---

40. *

SECONDARY METABOLISM IN TISSUE CULTURE OF THE LABIATAE

G.D. Brown and D.V. Banthorpe
Chemistry Department, University College, London, UK

Plant tissue cultures have recently received much attention as a possible means for the production of natural products under controllable and reproducible conditions.

Our investigations with two members of the Labiatae family, *Mentha spicata* and *Mentha longifolia*, revealed that both species failed to accumulate the essential oils characteristic of the parent plants, but did produce two unusual enol-ester pigments believed to be derived from rosmarinic acid.

Screening of other species showed that these novel pigments were also present as the major components ➢

in tissue cultures of four other Labiates, *Lavandula angustifolia*, *Plectranthus caninus*, *Rosmarinus officinalis* and *Salvia officinalis*, but that they were entirely absent from callus of other families (Compositae, Umbelliferae and Geraniaceae). Given the extreme simplicity of secondary metabolism in those cultures of the Labiatae examined to date, we suggest that these pigments may be useful as chemotaxonomic markers within the family.

41.

ESSENTIAL OILS OF THE TURKISH LABIATAE

K.H.C. Başer

Anadolu University Medicinal Plants Research Centre, 26470 Eskisehir, Turkey

The Labiatae is represented by 45 genera, 546 species and 730 taxa in the Flora of Turkey. Important essential oil-bearing genera include *Acinos*, *Calamintha*, *Clinopodium*, *Coridothymus*, *Cyclotrichium*, *Dorystaechas*, *Lamium*, *Lavandula*, *Melissa*, *Mentha*, , *Micromeria*, *Nepeta*, *Ocimum*, *Origanum*, *Rosmarinus*, *Salvia*, *Satureja*, *Sideritis*, *Stachys*, *Teucrium*, *Thymbra*, *Thymus*, *Ziziphora*.

This presentation covers a review of research work hitherto done on the essential oil bearing Labiatae growing in Turkey including unpublished results of our ongoing work involving capillary gas chromatography and gas chromatography/mass spectrometry analysis.

---

42. *

DISPERSAL IN LABIATAE

F. Bouman and A.D.J. Meeuse

H. de Vries-Laboratorium, University of Amsterdam

Although on the whole the diaspores (nearly always mericarps) of the Labiatae seem to be rather uniform in size, shape and weight, there is a surprisingly large number of dispersal strategies ranging from autochory and unspecialised barochory to anemophily, hydrochory, various forms of endo- and epizoochory and myrmecochory.

Diplochory is not at all rare, especially with myrmecochory as the second phase. Adaptations to a certain form of dispersal are found in the morphology and consistency of the (almost always persistent) calyx (and sometimes also the pedicel), the structure of the seed coat (eg. myxospermy), and in the presence of an elaisome (in myrmecochorous taxa especially).

A few examples are shown - a more elaborate survey is given in the hand-out to be distributed during the conference.

43.

SINTESIS BIOGEOGRAFICA Y BIOCLIMATICA DE LAS LABIADAS EN SIERRA NEVADA (GRANADA, ESPANA)

F. Perez Raya

Dpto de Biologia Vegetal, Facultad de Farmacia, Universidad de Granada, Espana

Sierra Nevada es el nombre con que se designa el macizo montañoso más importante, por superficie y altura de sus cumbres, de las Cordilleras Béticas. Se extiende entre las provincias de Almeria y Granada, si bien es en esta ultima donde se dan los contrastes más acusados (altura, sustrato, diferencia de temperaturas, ombroclima, etc) que han provocado la riqueza floristica y los originales ecosistemas vegetales que otorgan justa fama botanica al territorio.

Desde el punto de vista biogeografico, Sierra Nevada forma parte de al provincia Bética, incluyendo, en la provincia de Granada, territorios pertenecientes a tres sectores: Malacitano-Almijarense, Nevadense y Alpujarreñdo-Gadorense.

Bioclimáticamente, el macizo nevadense es el único de la Peninsula Ibérica en el que se encuentran representados cinco de los seis pisos bioclimaticos descritos para la Region Mediterranea: termo, meso, supra, oro y crioromediterráneo.

En el trabajo que presentamos se realiza una sintesis del papel que ejecen como bioindicadores biográficos y bioclimáticos más de 80 taxones de labiadas presentes en el macizo montanoso de Sierra Nevada, los cuales se distribuyen en los siguientes géneros: *Acinos*, *Ajuga*, *Ballota*, *Calamintha*, *Cleonia*, *Clinopodium*, *Lamium*, *Lavandula*, *Lycopus*, *Marrubium*, *Melissa*, *Mentha*, *Micromeria*, *Nepeta*, *Origanum*, *Phlomis*, *Prunella*, *Rosmarinus*, *Salvia*, *Satureja*, *Scutellaria*, *Sideritis*, *Stachys*, *Teucrium*, *Thymbra*, *Thymus* y *Ziziphora*.

Por último, se acompañan dos mapas representativos de la posición biográfica y bioclimática de los taxones estudiados.

44. *

ARCHAEOBOTANY OF LABIATAE IN EUROPE AND NEAR EAST

D. Rivera-Nuñéz and C. Obón-de-Castro

Dep. Biologia Vegetal, Fac. Biologia, University of Murcia, Spain

Palaeobotanical finds of Labiatae are relatively scarce in western archaeology. The Labiatae remains discovered in archaeological sites represent commonly wild plants whose diaspores were gathered by accident by men and cattle or intruded into the sites as items of the local seed rain. Only a few cases belong to directly cultivated plants, eg. some finds of *Melissa officinalis* in European mediaeval sites.

The structures preserved in the archaeological layers are very often seeds and fruits but also rarely leaves and stems.

The major sources of identified Labiatae remains are Egyptian graves, different European lake-dwelling and medieval European foul pits and latrines.

In southern Spain we were able to identify some imprints of leaves from *Teucrium* and *Rosmarinus* species in chalolythic pottery, produced by leaves mixed by accident to the silt before baking.

---

45. *

THE LABIATAE FAMILY IN POPULAR MEDICINE IN EASTERN ANDALUCIA (SPAIN)

M.R. González-Tejero, J. Molero Mesa, M. Casares Porcel

Departamento de Biologia Vegetal, Facultad de Farmacia, Universidad de Granada, 18071 Granada, Espana

Species of Labiatae due to their distribution and diversity in the Mediterranean region, as well as their high content of essential oils, are a point of interest from the botanical-taxonomic and ecological point of view, as well as from the chemical and pharmacological point of view.

In the ethnobotanic study which we have been carrying out in Andalucia (Spain), we have been able to prove that it is the region which contributes by far the greatest number of species to popular medicine in our region, which is not strange given the ostentatious perfumes which have attracted man since ancient times.

The medicinal uses Labiatae by the population of eastern Andalucia is examined.

46. NATIONAL PLANT COLLECTIONS

G.A. Pattison, M.J. Andrew

NCCPG, The Pines, c/o Wisley Garden, Woking, Surrey, England

K.P. Svoboda, S.G. Deans

The Scottish Agricultural College, Auchincruive, Ayr, Scotland

The National Council for the Conservation of Plants and Gardens (NCCPG) is a charity formed in 1978, based at The Royal Horticultural Society (RHS) Garden at Wisley. The aim of the NCCPG is to conserve the unsurpassed range of garden plants in Britain which form part of our horticultural heritage and are an invaluable genetic resource.

The National Collection Scheme is a unique practical method of conserving garden plants. Within the 560 Collections already established 50,000 garden plants are being maintained under safe cultivation. The participation of a steadily increasing membership, both national and international, will ensure the continuing expansion of this scheme and of NCCPG itself.

The poster shows some of the National Collections within the family Labiatae. It also demonstrates the application of GLC analysis of essential oils, carried out at the Scottish Agricultural College in clarifying the chemotaxonomy of plants in the *Origanum* Collection held by Iden Croft Herbs in Kent.