LAMIALES NEWSLETTER

Issue number 5 April 1997 ISSN 1358-2305

CONTENTS

EDITORIAL

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Welcome to the fifth edition of the Lamiales Newsletter. Since the last Newsletter, we have created a Lamiales web site on the Internet. It can be found at **http:/www.rbgkew.org.uk./science/lamiales**. The site includes some back editions of the Newsletter (currently only editon 3; 4 and 5 to be added shortly), a list of recognised genera within the Lamiales and a directory of research carried out in the Lamiales by the Royal Botanic Gardens, Kew. It also contains information about the planned Lamiales Conference organised by Baldomero Esquivel and T.P. Ramamoorthy. Currently, the organisers intend to hold the next Lamiales Conference just before the next Latin American Botanical Congress, to be held in Mexico City in late October 1998. Unfortunately no funding has yet been secured. The organisers are waiting until they know the exact dates of the congress, before approaching potential funders. The organisers would be interested to hear from anyone who is willing to help with funding or has ideas for the Conference. They can be contacted on E-mail: **baldo@servidor.unam.mx**. Or: Dr Baldomero Esquivel, Instituto de Quimica (UNAM, Mexico City), Circuito Exterior, Cd. Universitaria, Coyoacan 04510, Mexico DF, Mexico. Tel: +525 622 4448. Fax: +525 616 2217.

We would welcome articles for the next Newsletter. We can be contacted at the above address or by email: **a.paton@rbgkew.org.uk**. If anyone wishes to be added to the mailing list, please do not hesitate to contact us. ❑

STUDY ON THE NATURAL POPULATIONS OF *NASHIA* (VERBENACEAE) IN CUBA

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Nashia Millsp. is a West Indian genus of Verbenaceae. Some authors (Urban, 1912; Junell, 1934) consider it is closely related to *Lippia* L., bearing in mind the anatomical characteristic of the ovary and the floral morphology, but Moldenke (1980) regards them as independent, taking into account the characteristics of the calyx and the presence of the thorns found in *Nashia*. Furthermore, the fruit of *Nashia* is a semi-dry drupe, with a thin mesocarp which is very strongly attached to the endocarp; this drupe is made up of two 1-locular pyrenes which stick together when ripe. On the other hand, the fruit of *Lippia* is a dry schizocarp which, when ripe, splits into two 1-locular mericarps (Méndez 1993). *Nashia* has a greater phenetic and phylogenetic affinity with Sect. *Callioreas* (Cham.) Schauer of *Lantana* L. (Méndez. 1994).

The genus grows in abrupt limestone promontories in xerophytic coastal ecosystems. Generally it does not form large populations; on the contrary, it grows in isolation as a small plant, so it is rarely collected.

Moldenke (1980), only makes reference to thirteen herbarium specimens of the seven species described (five from Cuba, one from Bahamas and another from La Española). All of the Cuban specimens were collected before 1924. This illustrates why all the Cuban species are considered to ➣

be threatened or extinct, according to the studies made by Borhidi and Muñiz (1983 and IUCN (1989).

When we began studying this genus, we found that the last works mentioned above did not take into account the herbarium material collected in Cuba during the last twenty years, which was kept without any taxonomic identification in the herbarium of the National Botanical Gardens (HAJB). After we had identified this material, we visited each location where some of the specimens were collected and studied "*in situ*" the status of the populations. To this end the following aspects were taken into account: the number of individuals and the population structure, regeneration level, the actual or potential risk factors, and the natural enemies so far known.

The results of this analysis involved some critical revision about the conservation status of the species. In general, the history of the collected species, their actual distribution and conservation status could be summed up in the following way:

N. cayensis Britt. could only be found in Cayo Romano, in Camagûey province. It was described from *Shafer* 2450, collected in 1908. The only other specimens were collected in 1976 (*Provecto Flora de la República de Cuba)* between El Molino and Sabanita del Burro, in Cayo Romano (*PFC* 31701 in HAJB), and, in 1981, in La Silla de Cayo Romano (*PFC* 43756 in HAJB). Borhidi and Muñiz (1983) classified this species as a "rare plant" and the IUCN (1989) considered it as "undetermined". In my opinion, it should be considered as a “rare plant” because of its limited location and the few number of individuals in the populations, although there are no actual or potential risk factors menacing it.
The "*locus classicus*" of *N. variifolia* (Urb.) Mold. is at Punta de Pastelillo, in Nuevitas Bay, Camaguey; where the specimen *Ekman* 15542 was collected. For this species, Borhidi and Muñiz (1983) suggested the use of the category of "rare plant", while the IUCN (1989) suggested the category of "undetermined". It was unsuccessfully searched for in Pastelillo, between 1989 and 1990, but the new industries built up over these years have caused the disappearance of almost every form of natural vegetation. Finally, it was found in the coastal vegetation of Gibara, Holguin, in the late 90's (*Méndez*, 5888 in the Herbarium "Julián Acuña Galé", of the Pedagogical University of Camagûey "HIPC"). Some isolated specimens can be found in precipitous loctions. Therefore, I consider that this species could be considered as "threatened".

N. armata (Urb.) Mold. has not been collected since 1918 (when Ekman collected the type material in Aguadores, Santiago de Cuba). In 1968, it was found in two new locations: in Baitiquiri, Guantánamo, in 1968, (*PFC* 7891 in HAJB), 1971 (*PFC* 20041 in HAJB) and 1972 (*PFC* 21793 in HAJB), and in Maisi, between Cueva del Agua and El Canto (*PFC* 59281 in HAJB) in 1986. Borhidi and Muñiz (1983) classified this plant as "rare plant" and IUCN (1989) as "undetermined". In 1991, we very carefully explored the area of Baitiquiri and it was impossible to locate a specimen; the cause seems to be the nearness of a gypsum mine which has caused severe harm to the environment. In 1992, the zone of Maisi was also explored, this time with a greater success since isolated well-established specimens were found (*Méndez, Barbadillo & Ramirez*, 7076 in HIPC). I consider that it should be treated as "threatened".

N. nipensis (Urb.) Mold. was collected for the first time in Rio Piloto, Nipe, in 1922 (*Ekman*, 15044) and it was not collected again for 54 years. Then it was found (*Provecto Flora de Cuba)* in the hills of Macambo, Imias, Guantánamo (PFC 29838 in HAJB). In 1988, this region was explored, but the plant was not found, even though there was no alteration of the natural environment. Its present category should be of a "rare plant" suggested by Borhidi and Muñiz (1983) instead of that of "undetermined" suggested by IUCN (1989).

N. myrtifolia (Griseb.) Mold. is only known by the specimen *Wright* 3160, which was collected somewhere in Western Cuba. It should be considered as "extinct", until any evidence to the contrary appears.

The information gathered at the different locations visited was very important to define an integral strategy for the conservation of the genus *Nashia* in Cuba. Therefore the following measures are suggested:

– to go on exploring the areas where the genus is more likely to grow;
– to preserve and keep in good condition the natural environment where specimens have been found;
– to carry out an integral study on the ecology and the reproductive biology of the genus;
– to cultivate specimens "ex situ";
– to increase the numbers of natural populations using artificially reproduced plants.

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SEED OIL FATTY ACIDS IN THE LABIATAE

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Recently, we have found large differences between the seed oil fatty acid patterns of various genera in the *Ranunculaceae* (Aitzetmüller and Tsevegsüren, 1994; Aitzetmüller, 1995). These may be caused by the presence or absence of chain-elongating enzyme systems (elongases) and by the presence or absence of several types of desaturases operating at the carbon atoms number five and six (or six and seven) of the fatty acid chain, i.e. near the "front-end" of the fatty acid chain between the COOH group and the first "usual" double bond at the Δ9 position (as in oleic acid). Genes coding for these "front-end" desaturases are apparently rather labile and may have been the subject of several mutations during the course of evolution. A better understanding of the evolution of the enzymes operating in the biosynthesis of "unusual" fatty acids could have important consequences for the genetic engineering of seed oils and for renewable resources.

The presence or absence of certain types of Δ5 and Δ6 fatty acids in the seed oils may also be a valuable chemotaxonomic indicator. Similar or superimposable fatty acid "fingerprints" (Aitzetmüller, 1993) in different genera of one plant family could perhaps be considered as indicators of monophyly of these genera, when these fingerprints are identical and show the presence of an unusual non-methylene-interrupted polyenoic (NMIP-) fatty acid. Such information could therefore be valuable in supra-generic taxonomy, a subject that is very much in discussion both in the *Ranunculaceae* (Takhtajan, 1987; Tamura, 1993; Jensen et al., 1995) and in the Labiatae (Hedge, 1992; Cantino et al., 1992; Cantino, 1992).

American workers (Bagby et al., 1965; Hagemann et al., 1967) have shown that a particularly interesting case is the presence of laballenic acid, 18:2Δ5,6*allene*, in some representatives of the Labiatae. This is a very rare "unusual" fatty acid of certain *Labiatae*, that is not found anywhere else in the whole plant kingdom. According to Hagemann et al. (1967) it occurs in many, but not all, members of two subfamilies in the *Labiatae*. Other significant observations were the presence of trans fatty acids, the presence of Δ5-NMIP-fatty acids (Fig. 1), the presence of 2-hydroxy-fatty acids, and the reported presence of C_{17}-fatty acids in some other genera of the *Labiatae* (Fig. 2) (Smith and Wolff, 1969; Smith et al., 1969). We have recently confirmed the presence of the allenic fatty acid (laballenic acid) in a number of Labiatae seed oils (Fig. 2), and we have also confirmed the simultaneous presence of both 18:3Δ5*cis*,9*cis*,12*cis* and 18:3Δ5*trans*,9*cis*,12*cis* in the seed oils of two *Teucrium* species (in a ratio of about 3:1; cf. Fig. 3). The latter separation, however, is not shown by the simple "fingerprints" as used for Fig. 2, because it requires a different gas-liquid chromatographic (GLC) column selectivity (Fig. 3) (Aitzetmüller et al., 1993). Because of these preliminary results, it can be assumed that seed fatty acid fingerprints or fatty acid pattern analysis (Aitzetmüller, 1993), of *Labiatae* seed oils could eventually prove to be as valuable in systematic work in suprageneric taxonomy, as they apparently are in the case of the Ranunculaceae (Aitzetmüller and Tsevegsüren, 1994; Aitzetmüller, 1995).

For a number of reasons, we believe that the presence of Δ5*cis*-NMIP-fatty acids in some Ranunculaceae seed oils indicates a more archaic evolutionary status of the respective genera within this plant family. During the course of evolution, an archaic Δ5*cis*-desaturase that may have

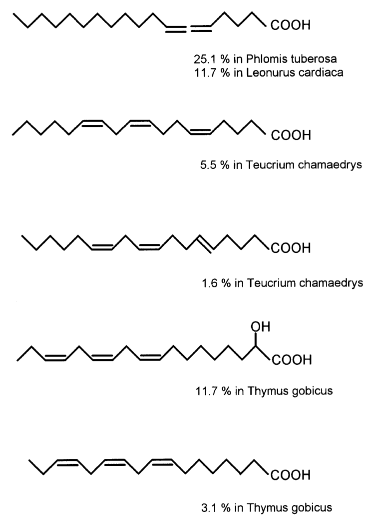

Fig. 1: Structural formulae (schematic) of some chemotaxonomically significant Labiatae fatty acids. Examples of occurrence are also given.

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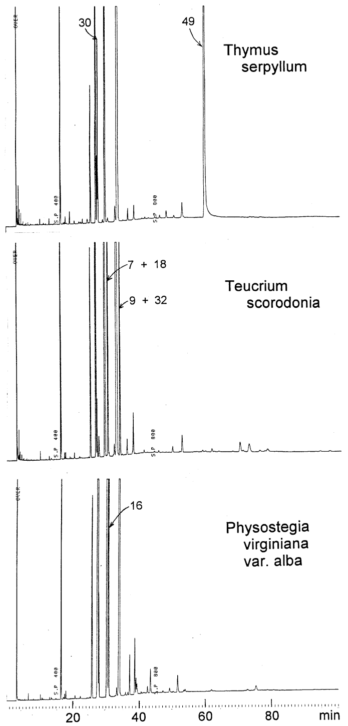

Fig. 2: Seed oil fatty acid "fingerprints" (Aitzetmüller, 1993) of some *Labiatae* species on a Silar 5 CP column. In the capillary gas liquid chromatograms of the fatty acid methyl esters shown here only the "unusual" fatty acid methyl ester peaks are numbered as follows:

Peak 7 = 18:3Δ5*trans*,9*cis*,12*cis* (columbinic acid)
Peak 9 = 18:4Δ5*cis*,9*cis*,12*cis*,15*cis*
Peak 16 = 18:2Δ5,6*allene* (laballenic acid)
Peak 18 = 18:3Δ5*cis*,9*cis*,12*cis* (pinolenic acid)
Peak 30 = 17:3Δ8*cis*,11*cis*,14*cis*
Peak 32 = 18:4Δ5*trans*,9*cis*,12*cis*, 15*cis*
Peak 49 = 2-OH-18:3Δ9*cis*,12*cis*, 15*cis*(2-hydroxy-linolenic acid)

been present originally, could have changed - by way of mutation of its amino acid sequence - to desaturases with a different substrate specificity (Aitzetmüller and Tsevegsüren, 1994) and to desaturases producing Δ5*trans*-NMIP- or Δ6*cis*-methylene-interrupted (MIP-) fatty acids such as columbinic acid and γ-linolenic acid, respectively. Furthermore, "front-end" -desaturation, and chain-elongation beyond C_{18}, may both have been lost at all eventually, in separate steps during later stages of evolution. In the *Labiatae*, a similar situation could have existed, which - during the course of evolution - starting from a Δ5*cis*-precursor may have led to the particularly interesting formation of the Δ5,6*allene* rather than to Δ5*trans* or Δ6*cis* structures. Even more interesting is the postulated presence of both Δ5*cis*-NMIP and Δ5*trans*-NMIP fatty acid structures simultaneously in certain *Labiatae* seed oils, notably in *Teucrium* (Smith et al., 1969), and of both *allenic* and *trans* unsaturation in *Lamium* (Hagemann et al., 1967; Mikolajczak et al., 1967), although in the latter case both these features seem to be located in one and the same fatty acid.

On the other hand, a shift from Δ5*cis*- or Δ5*trans*-NMIP unsaturation to Δ6*cis*-MIP has not been observed, because - to our knowledge - an occurrence of the pharmaceutically interesting Δ6*cis*-MIP-fatty acid, γ-linolenic acid (18:3Δ6*cis*,9*cis*,12*cis* or 18:3n-6), which is rather wide-spread in the plant kingdom, has not yet been documented in the *Labiatae*. [The presence of all three types of these fatty acids, Δ5*cis*-, Δ5*trans*- and Δ6*cis*-, has been documented in the *Ranunculaceae* (Smith, 1970; Aitzetmüller and Tsevegsüren, 1994)].

It would certainly be interesting to follow up on this and carry out an investigation of seed oil fatty acid patterns and their taxonomic and evolutionary significance in the *Labiatae*, and it is a pity that recent studies (Marin, 1991; Marin et al., 1991; Maffei and Scannerini, 1992) have not mentioned these facts at all. Considerable amounts of laballenic acid must have been present in the seed oils of many of the species investigated by Maffei and Scannerini (1993) and by Marin et al. (1992) - e.g. up to 25% in Phlomis (Aitzetmüller and Tsevegsüren, to be published) - but were not found in leaves and flowers or were overlooked in seeds because this fatty acid is often difficult to separate from linoleic acid (18:2n-6) by capillary GLC (Aitzetmüller et al., to be published). We believe that analyses of the normal fatty acids (16:0, 18:0, 18:1, 18:2, 18:3) as such, or of their ratios, are of little chemotaxonomic value (Aitzetmüller, 1993).

Even the latest subfamilial botanical classifications of the *Labiatae* (Cantino et al., 1992) are not fully consistent with the fatty acid chemical evidence as found by Hagemann et al. (1967) and in this laboratory. If a more detailed chemical investigation were carried out regarding the fatty acid composition of oils extracted from the seeds of *Lamium*, *Teucrium*, and closely related genera, and in particular of those genera that are considered to be the most archaic ones within the families *Labiatae* and *Verbenaceae*, some interesting results could be expected.

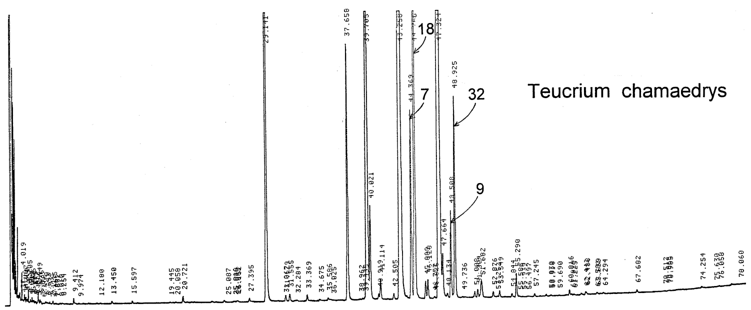

Fig. 3: Capillary gas-liquid chromatogram of the seed oil fatty acid methyl esters of *Teucrium chamaedrys* on a CP-SIL-88 column (Aitzetmüller et al., to be published), showing the simultaneous presence of both 18:3- and 18:4-Δ5cis and -Δ5trans fatty acids. For peak numbers of "unusual" fatty acid methyl ester peaks, cf. legend to Fig. 2.

Acknowledgement

The author is indebted to Mrs. G. Werner and Dr. L. Brühl for GLC data and to Prof. St. A. Ivanov (Plovdiv, Bulgaria) and Dr. N. Tsevegsüren (Ulan Bator, Mongolia) for seed samples.

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FATTY ACIDS OF SOME CENTRAL ASIAN LABIATAE

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Seed oils of 13 Labiatae species from Central Asia (Mongolia) were analysed for their fatty acid composition by capillary gas-liquid chromatography (GLC). Laballenic acid (18:2Δ5,6 allene) was found in high amounts in the total fatty acids of the seed oils of *Phlomis tuberosa* L., *Leonurus sibiricus* L. and *Panzerina canescens* (Bunge) *Soják* (subfamily *Lamioideae*) (1). Various species of *Dracocephalum*, *Lophanthus* and *Schizonepeta* (subfamily *Nepetoideae*) showed very similar fatty acid compositions in their seed oils. They contain predominantly α-linolenic, linoleic and oleic acid, whereas *Thymus gobicus* Tscherneva also contained heptadecatrienoic (norlinolenic) acid (17:3n-3) and α-hydroxylinolenic acid (α-OH-18:3n-3). *Amethystea caerulea* L. as one representative of the subfamily *Teucrioideae* contained a seed oil with common fatty acids only, like α-linolenic, linoleic and oleic acid. The Δ5-fatty acids which are so typical for *Teucrium* were absent in *Amethystea*.

In the flora of Mongolia the Labiatae are represented by 67 species in 23 genera (2). Some of these are used as spices or in traditional medicine and liqueur production (3). Little is known about their seed oils. However, a few Labiatae seed oils have also found local commercial use or are of potential interest as a renewable resource (4), and several plants of the family Labiatae are known to produce highly unsaturated seed oils which contain a range of unusual fatty acids (5-10). Most of these unusual fatty acids had been discovered during a screening program by a research group of the U. S. Department of Agriculture. Phylogenetic and chemotaxonomic relationships regarding the occurrence of unusual fatty acids in Labiatae, however, are not well understood. The present investigation has sought to supplement the literature with respect to species not previously studied, and it contributes capillary GLC data for some species where only conventional GLC data were available, for some of the species occurring in Mongolia.

Plant seeds investigated here were collected at maturity from wild plants in Mongolia in the summer of 1993 and 1994. Seeds of *Thymus gobicus* Tscherneva were collected from plants in Shar-Khudag, Dundgobi aimak, Delgercogt sum region, Mongolia in August 1993. Seeds of *Dracocephalum grandiflorum* L., D. *nutans* L., D. *ruyschiana* L. and *Phlomis tuberosa* were obtained from plants in Khandgait, Ulan-Bator region in July - August 1994. Seeds of *Schizonepeta multifida* (L.) Briq. and *Leonurus sibiricus* were collected from plants in the district of Ulan-Bator (Bogd uul - Boginyn am, Tavan tolgoi) in August 1994. Seeds of *Dracocephalum foetidum* Bunge and *Amethystea caerulea* were gathered from wild plants in Khurdangyn khec, Dundgobi aimak, Erdene Dalai sum region, Mongolia in August 1994. Seeds of *Panzerina canescens*, *Schizonepeta annua* (Pall.) Schischk., *Dracocephalum fruticulosum* Steph, and *Lophanthus chinensis* Benth. were collected from wild plants in Bayan zag and Gobi-Gurvansaikhan (Baruunsaikhan), Umnegobi aimak, Bulgan sum region, Mongolia in August 1994. Voucher herbarium specimens have been deposited in the Botanical Institute of the Mongolian Academy of Sciences, Ulan-Bator.

Oil extraction (11), fatty acid methyl ester formation (11,12) and capillary GLC analysis on a Silar 5 CP column were as previously described (12,13). A few samples were analyzed only on a BPX 70 column, which was programmed from 100 to 240°C at 2°C/min. (12). The oil content and fatty acid composition of seeds from 13 species of Labiatae belonging to three subfamilies (*Lamioideae*, *Nepetoideae* and *Teucrioideae*) are presented in Table 1. Our present capillary GLC study clearly shows the presence of laballenic acid in seed oils of both *Phlomis* and *Leonurus*, and also in *Panzerina*. High percentages of this unusual fatty acid have been found in the seed oil fatty acids of *Phlomis tuberosa* (25.0 %) and *Leonurus sibiricus* (18.0 %). Hagemann et al. (6) reported the presence of an allene as a seed oil component in *Phlomis armeniaca* Willd. (8.9 %), *Ph. crinita* Cav. (12 %), *Ph. fruticosa* L. (12 %), *Ph. herba-venti* L. (5.6 %), *Ph. lycia* D.Don (13 %), *Ph. purpurea* L. (15 %) and *Ph. rigida* Labill. (12 %). This was determined by IR analysis. On the other hand, Panekina et al. (14) and Novickaya et al. (15) did not find an allenic fatty acid in seed oils of *Phlomis fruticosa*, *Ph. alpina* Pallas, *Ph. tuberosa*, *Ph. maximoviczii* Regel. and *Ph. salicifolia* Regel. In the fatty acid methyl ester gas chromatograms of *Ph. tuberosa* seed oil, we found a number of unidentified minor peaks.

Hagemann et al. (6) also reported 14 % and 9.9 % of allenes in *Leonurus sibiricus* and *L. cardiaca* L. seed oils as determined by IR analysis. Although Novickaya et al. (15) also

Table 1. Fatty acid composition and content of seed oils from some Labiatae (*Lamioideae*, *Nepetoideae* and *Teucrioideae*) from Mongolia

	Lamioideae *Leonurus sibiricus* (a)	*Panzerina canescens* (a)	*Phlomis tuberosa* (a)	*Nepetoideae°* *D. grandiflorum* (a)	*D. foetidum* (b)	*D. fruticulosum* (b)	*D. nutans* (b)	*D. ruyschiana* (b)	*Lophanthus chinensis* (a)	*Sch. annua* (a)	*Sch. multifida* (a)	*Thymus gobicus* (a)	*Teucrioideae* *Amethystea caerulea* (a)
Oil contents weight - %	28.5	16.0	11.8	4.0	19.9	22.4	21.6	9.7	15.8	29.2	21.4	28.2	16.3
Fatty acid*													
14:0	tr.	0.1	tr.	0.1	-	-	-	-	0.1	0.1	tr.	0.5	0.1
15:0	tr.	tr.	tr.	0.1	-	-	-	-	tr.	-	-	0.2	tr.
16:0	4.0	4.5	1.3	6.1	3.3	3.4	3.7	4.3	3.9	2.8	3.1	5.5	4.8
16:1n-9	tr.	0.1	0.1	0.1	-	0.1	-	-	tr.	tr.	tr.	0.4	0.1
16:1n-7	0.1	0.2	0.2	0.1	-	-	tr.	tr.	0.1	0.1	tr.	0.3	0.1
18:0	1.5	2.5	0.3	1.4	1.8	2.1	1.7	1.7	2.1	1.8	1.5	3.3	2.3
unknown**	-	4.6	-	-	-	-	-	-	-	-	-	-	-
18:1n-9	16.8	22.1	21.4	6.7	6.5	7.0	7.5	11.0	6.4	8.4	6.9	9.9	15.0
18:1n-7	1.0	1.0	1.1	1.2	0.7	0.5	0.6	0.7	0.6	0.6	0.6	0.8	0.7
17:3n-3	-	-	-	-	-	-	-	-	-	-	-	3.3	-
18:2n-6	50.9	48.6	42.3	17.5	17.9	18.7	20.5	28.4	17.2	19.0	18.6	12.8	27.5
18:2Δ5,6	18.0	10.3	25.1	-	-	-	-	-	-	-	-	-	-
18:3n-3	3.0	1.3	1.3	61.1	66.3	64.4	62.9	47.1	64.5	63.8	65.8	44.9	46.4
20:0	0.4	0.7	0.1	0.2	0.2	0.4	0.1	0.2	0.3	0.3	0.3	0.3	0.6
20:1n-11	1.2	1.4	3.2	-	-	-	-	-	-	-	-	-	-
20:1n-9	0.2	0.2	0.2	0.7	0.4	0.7	0.4	0.4	0.3	0.3	0.3	0.4	0.2
20:2n-6	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-	0.2
22:0	0.4	0.6	0.1	0.2	0.1	0.2	tr.	0.4	0.2	0.2	0.2	0.2	0.4
22:1n-9	0.1	tr.	0.3	0.1	0.1	0.1	0.1	tr.	0.1	tr.	tr.	0.5	0.1
22:2n-6	-	-	-	-	tr.	0.1	tr.	-	-	-	-	0.1	-
α-OH-18:3n-3	-	-	-	-	-	-	-	-	-	-	-	11.9	-
24:0	0.5	0.3	0.4	0.2	0.1	0.1	tr.	0.2	0.1	tr.	0.1	0.3	0.2
24:1n-9	-	-	-	0.1	0.1	0.1	0.1	1.8	0.1	tr.	tr.	-	-
Others	1.8	1.4	2.5	4.0	2.4	2.0	2.3	3.7	3.9	2.5	2.5	4.4	1.3

∞D. = *Dracocephalum*; Sch. - *Schizonepeta*
(a) GLC with a Silar 5CP column; (b) GLC with a BPX 70 column
*Area-% (uncorrected) from capillary GLC
**GLC data indicate petroselinic acid, 18:1Δ6cis. This will be investigated in more detail later, if seeds become available
tr. - trace

studied the seed oils of *Leonurus cardiaca*, *L. quinquelobatus* Gilib. and *L. glaucescens* Bunge, they did not give any separate data on the presence of an allene. The seed oil of *Leonurus turkestanicus* Krecz & Kuprian did not contain any allene according to a study of Gusakova et al. (16). In contrast to some of these authors, however, we believe that laballenic acid is present in all *Phlomis* and *Leonurus* species. It may have been simply overlooked by these authors (14-16) because of analytical problems such as insufficient GLC separation of laballenic from linoleic acid (18).

The gas chromatograms which we obtained from the *Panzerina* seed oil fatty acid methyl esters also showed the presence of an additional unknown fatty acid (Table 1). According to our GLC data (retention characteristics on three different GLC columns of different polarity) this was tentatively identified as petroselinic acid. Further research is needed to confirm this.

As expected, *Thymus gobicus* contains 3.2 % of norlinolenic acid and 11.7 % of α-hydroxylinolenic acid in its seed oil fatty acids, two unusual components which had also been found previously at similar levels in seed oils of other *Thymus* spp. (6, 8). Marin et al. (17) did not find these acids in *T. serpyllum* L. Our own research (Aitzetmüller and Werner, unpublished), however, clearly showed that they are also present in *T. serpyllum*, as in all *Thymus* species investigated so far.

It has been found in the present study that the seed oil of *Amethystea caerulea* (belonging to the subfamily *Teucrioideae*) is composed of 47.0 % α-linolenic, 27.5 % linoleic and 15.0 % oleic acid. These data were in good agreement with early literature data (6). The Δ5-fatty acids which are so typical for *Teucrium*, however, were not present in *Amethystea caerulea* and this could be taken as an indication that the two genera are perhaps not quite so closely related, phylogenetically (18).

Acknowledgment

One of us (N.T.) is indebted to the Alexander von Humboldt Foundation, 53173 Bonn, for a two-year fellowship in Germany. The authors are indebted to Dr. S. Darimaa, Department of Biology, State Pedagogical University of Mongolia, Ulan-Bator, for the identification of plants and to Mr. Ch. Otgonbayar, Chemical Institute, Mongolian Academy of Sciences, Ulan-Bator, Mongolia for his assistance in the collection and preparation of the seeds.

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N.B.: If one of our readers could supply us with small samples (ca. 0.1 - 0.5 grams) of *Panzerina* seed, this would be highly appreciated. An independent confirmation of the presence of petroselinic acid, 18:1Δ6cis, would be highly important from a biosynthetic and phylogenetic point of view, cf. the preceding article by one of us

[K. Aitzetmüller, Seed Oil Fatty Acids in the Labiatae, Lamiales Newsletter ed. 5 (1996)]. ❑

GENETIC STUDIES ON GREEK MOUNTAIN TEA (SIDERITIS L.)

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Introduction: The Greek mountain tea (*Sideritis* L.) belongs in the Family Lamiaceae. *Sideritis* is derived from the Greek word sideros (iron). *Sideritis* is known in Greece from ancient times and it is mentioned by Dioskourides (First Century A.D.).

Nowadays it is widely used in Greece as specific traditional tea endowed with a number of beneficial properties. It has a pleasant aroma, a distinguished taste and yellow or brown yellow colour. The dried inflorescence with some leaves of *Sideritis* contains two flavonoids (Theodosiou, 1962) and a very high percentage of iron, 52.5 mg per 100 g (Floca & Iconomou, 1981). This plant could be considered as a rich natural source of iron for humans.

Because of its great importance, market needs could not be met from only the wild indigenous plants, so growers were forced to cultivate it. At present *Sideritis* is cultivated in Greece in low fertility hilly and mountainous areas of over 1000 m altitude. Its cultivation helps farmers increase their meagre incomes in these poor and problematic areas of Greece (Goliaris, 1984).

The main target of this work was to study the chromosome number of the indigenous Greek species of *Sideritis* and the breeding and use of interspecific hybrids for higher yield and better quality.

Chromosome numbers: This work was undertaken to study the chromosome number and morphology in six indigenous Greek *Sideritis* L. species (Goliaris, 1995)
The species used were :

1. *S. athoa* Papanik. & Kokkini (Athos)
2. *S. scardica* Griseb. (Olympus)
3. *S. raeseri* Boiss & Heldr. subsp. raeseri (Parnassos)
4. *S. clandestina* Chanb. & Bory (Taygetus)
5. *S. euboea* Heldr. (Evia)
6. *S. syriaca* L. (Kriti)

All the *Sideritis* L. species studied had 32 chromosomes. In addition the species *S. athoa* and *S. scardica*, carried up to 2 B-type chromosomes.

The individual chromosome length ranged from 0.8 µm up to 3.2 µm. It was observed that some species had generally smaller chromosomes than others. The smallest chromosomes (0.8 - 1.0 µm) were observed in *S. euboea* and the largest (2.2 - 3.2 µm) in *S. scardica*. The B-chromosomes observed were smaller than half the size of a regular chromosome. The centromere divided all A-chromosomes in all species into two chromosome arms, with more or less equal length.

In conclusion, the *Sideritis* L. species studied have the same chromosome number but they are different in respect to chromosome length.

Interspecific Hybridization: A number of interspecific hybrids between indigenous species of *Sideritis* L. and their potential for agricultural exploitation were studied in the years 1986-1993.

The work was carried out at the farm and the laboratory of the department of Medicinal and Aromatic Plants of the Agricultural Research Centre of Makedonia-Thraki (A.R.C.M.T.). The indigenous species studied were established in two regions. The first one was established at the farm of the A.R.C.M.T. and the second one in a regional farm located in the area of Zoodochos Pigi, 1500 meters above sea level, on the Mountain Vermion near Kozani. In Zoodochos Pigi the trial of the interspecific hybrids was established according to the R-7 Honeycomb design (Fasoulas & Fasoula, 1995). The species *Sideritis sardica* Griseb. subsp. *sardica*, indigenous and well adapted in this region (Vermion mountain) was used as control.

To simplify their study, the interspecific hybrids produced were arranged into 6 groups. Each group included all the hybrids with the same mother species.

1. group common mother *Sideritis syriaca* L. (Kriti)
2. group common mother *Sideritis raeseri* Boiss & Heldr. subsp. *raeseri* (Parnassos)
3. group common mother *Sideritis euboea* Heldr. (Evia)
4. group common mother *Sideritis clandestina* Chaub. & Bory (Taygetus)
5. group common mother *Sideritis scardica* Griseb. (Olympus)
6. group common mother *Sideritis raeseri* Boiss & Heldr (Orthris Magnesias)

From the 252 F1 interspecific hybrids developed, the 15 best were selected on the basis of their yields and the quality of essential oils. The selected hybrids significantly outyielded both the control (in yield and essential oil) and their respective parents (in yield). Regarding the quality assessment of certain main characteristics, it was found that most of the hybrids were better than the best parent (Goliaris, 1995).

Given that "mountain tea" is also asexually propagated (in addition to sexual propagation) it is concluded that the 15 superior interspecific hybrids could be utilised, to start with, in the mountainous marginal areas of the country to increase farmers' income.

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THE WORK OF THE CENTRE FOR ECONOMIC BOTANY with particular reference to the Lamiales

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Economic botany has always been a key aspect of Kew's science and the Centre for Economic Botany (CEB) provides a focal point for current research into useful and potentially useful plants. The building which houses the CEB is named after Kew's most famous economic botanist, Sir Joseph Banks. This building also houses more than 73,500 botanical samples and artefacts, a collection originally conceived by the first official Director of Kew, Sir William J. Hooker, in 1847 to *"render great service, not only to the scientific botanist, but to the merchant, the manufacturer, the physician, the chemist, the druggist, the dyer, the carpenter and the cabinet maker and artisans of every description, who might here find the raw materials employed in their several professions correctly named"*. Almost 150 years later the significance of this statement is more apparent than ever, given increasing awareness of the importance of plants as sources of useful raw materials, and the **Economic Botany Collections** form an important component of Kew's scientific collections. The Lamiales are represented in the Collections by over one thousand items and nearly 400 taxa.

CEB is currently involved in a wide range of research projects, particularly in the UK and tropical dryland regions. Current projects include:

• **Survey of Economic Plants for Arid and Semi-Arid Lands (SEPASAL)**. A major database focusing on the uses of over 6000 dryland species, mainly from the tropics and subtropics. It currently holds data on 95 taxa in the Lamiales. The use categories follow the Taxonomic Databases Working Group (TDWG) *Economic Botany Data Standard*, developed within the CEB. The main categories listed in SEPASAL for the Labiatae are medicines and food, whilst those for the Verbenaceae are materials and food. *email* sepasal@rbg kew.org.uk

• **Plantas Do Nordeste (PNE)**. A joint Kew/Brazilian initiative in dry north-east Brazil which is contributing to the identification, sustainable use and management of plant resources. This includes research, conducted within Brazil, on medicinal Labiatae. *email* k.pipe-wolferstan@rbg kew.org.uk

• **People & Plants Initiative**. A joint initiative with UNESCO and WWF to promote and support community-based ethnobotanical work in order to contribute to the sustainable and equitable use of plant resources. *email* a.hoare@ rbgkew. org.uk

• **Poisonous Plants and Fungi**. This joint project, with the Medical Toxicology Unit of Guy's & St Thomas' Hospital Trust, has designed an interactive, image based computer system to enable non-botanists to identify potentially harmful plants and fungi. The current commercially available system, with both medical and non-medical versions, focuses on plants in Britain and Ireland, but further versions are being developed for other geographic regions, as well as for fungi. *email* e.dauncey@rbgkew.org.uk

• **Traditional Remedies Surveillance**. CEB is collaborating with the Medical Toxicology Unit of Guy's & St Thomas' Hospital Trust to determine the frequency and severity of adverse reactions to herbal remedies in the UK. There is a particular interest in Chinese Traditional Medicine, a system in which the Labiatae is the third most important plant family after the Compositae and Leguminosae. *email* c.leon@rbgkew.org.uk

• **Medicinal Plant Trade**. A WWF contractor is currently working within CEB investigating the UK import trade in medicinal plants. Of particular interest is information on the impact of wild harvesting on medicinal Labiatae from the Mediterranean region. *email* f.dennis@rbgkew.org.uk

CEB also plays a major role in the collection and dissemination of information about useful plants throughout the world. Using the unique resources available at Kew, staff in the CEB are able to provide comprehensive, authoritative answers to many questions concerning economic plants. Around 700 enquiries are answered each year, and this number is growing rapidly. Enquiries are handled from the public, scientific and commercial bodies, and charges are made on a consultancy basis where appropriate. A prime source of information, which enables staff to answer such enquiries, is the **Economic Botany Bibliographic Database**. This contains over 156,000 literature references covering the uses of plants from around the world (excluding major crop species); for example there are over 500 references on the genus *Mentha* alone, and 90 on the genus *Vitex*. It provides instant and flexible access to detailed information; searches are possible by species, vernacular names, geographical area, uses and/or properties, or indeed any combination of these parameters. The depth and breadth of the database's focus on plant uses are unique.

From this issue of the *Lamiales Newsletter* onwards, recent literature on useful Lamiales will be extracted from the Economic Botany Bibliographic Database and added to the existing taxonomic bibliography. For the six months to October 1996 this amounts to some 120 extra references.

If you require further details on any aspect of the work of the CEB please contact:

James Morley tel. +44 (0)181 332 5719; fax +44 (0)181 332 5768; *email* J.Morley@rbgkew.org.uk World-Wide Web http://www.rbg kew.org.uk/ceb

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BIBLIOGRAPHY OF RECENT TAXONOMIC PUBLICATIONS ON THE LAMIALES

The following list of publications has been abstracted from the Kew Record of Taxonomic Literature (October 1995 - September 1996) and from the Kew Economic Botany Bibliographic Database (c. May - November 1996), and we are extremely grateful to the editors and compilers for their assistance in preparing this bibliography. In addition some authors have sent us notification of publications and these have also been included. Where possible, articles are listed under the applicable genus - genera are arranged alphabetically. Publications that cover many genera are listed at the beginning under the "general" heading. As opposed to the previous newsletter, no distinctions are made between different disciplines (eg. Economic botany, cytology, anatomy, floras), and entries are to be found under either "general" or the relevant genera. All diacritical marks have been removed to facilitate editing.

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