

## *Kunkeliella*, a New Genus of Santalaceæ in the Canary Islands

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### Abstract

**Kunkeliella**, a new genus of Santalaceae with two species endemic to the Canary Islands, is distinguished from **Thesium** by its isopolar pollen and drupaceous fruit, from **Osyris** by its scale-like leaves and hermaphrodite flowers. In habit it resembles the monotypic Australian genus **Omphacomeria**, the S. American genus **Austroamericium** and some African species of **Thesium**. The type-species, **K. canariensis** Stearn, inhabits Gran Canaria, the other, **K. psilotoclada** (Svent.) Stearn (syn. **Thesium psilotocladum** Svent. [1960]), Tenerife. Pollen characters in the Santalaceae provide taxonomic information meriting further study. A Latin diagnosis of the tribe **Amphorogyneae** Stauffer is included to validate the name, together with a biographical note on Hans Ulrich Stauffer (1929-1965) and a list of his publications on Santalaceae.

### Resumen

**Kunkeliella**, un nuevo género en la familia Santalaceae con 2 especies endémicas en las Islas Canarias, se distingue de **Thesium** por su polen isopolar y su fruto drupáceo, de **Osyris** por sus hojas tipo escamoso y sus flores hermafroditas. En su hábito se asemeja a **Omphacomeria**, un género australiano y monotípico, a **Austroamericium**, de Sudamérica y a algunas especies africanas de **Thesium**. La especie tipo, **K. canariensis** Stearn, habita en Gran Canaria, la otra, **K. psilotoclada** (Svent.) Stearn (sin. **Thesium psilotocladum** Svent. [1960]), en Tenerife. Los caracteres del polen en las Santalaceae proveen información taxonómica que requiere un estudio más profundo. Para validar el nombre de la tribu **Amphorogyneae** Stauffer, se incluye un diagnóstico en latín, con una nota biográfica sobre Hans Ulrich Stauffer (1929-1965) y una lista de sus publicaciones sobre la familia Santalaceae.

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### Discovery

In November 1971, when exploring botanically an almost inaccessible southern exposed slope, at 700 metres, in the Barranco de Guayadeque, eastern Gran Canaria, Mr. Günther Kunkel found between 80 and 100 bushes of an inconspicuous *Ephedra*-like plant (Fig. 1), up to 1 m high, with erect slender green shoots, sparse scale-like leaves and creamy or greenish stellate 5-parted hermaphrodite flowers only 3mm across, with an inferior ovary, which he was unable to identify despite his extensive and intimate knowledge of the Canarian flora. Examination of a specimen passed by him to the British Museum (Natural History) showed it to be a member of the Santalaceae, in habit and flower structure coming close to some South African species of *Thesium*, notably *Th. lineatum* L.f. This genus reaches its maximum development in South Africa, 128 species being distinguished by Arthur W. Hill in his account of Santalaceae in the *Flora Capensis* 5.ii:136-200 (1915). Hill divided the African genera of Santalaceae having the stamens equal in number to the perigon-segments into two tribes, the *Thesieae* with a dry fruit and the *Osyrideae* with a succulent fruit. Lacking fruit Kunkel's plant could not be allocated generically, though probably a *Thesium*. However, although it grew in a place difficult and dangerous to reach, he returned there in February 1972 and sent me by airmail some living material in both fruit and flower. The white globose fruits about 5mm long and broad had a succulent exterior as in the *Osyrideae*, but the plant did not fit satisfactorily into any of the accepted genera of this group as described by Hill, *Osyridocarpos* having a well-developed perigonal tube above the ovary, *Rhoiacarpos* a disc with prominent lobes, *Osyris* unisexual flowers etc. The taxonomic alternatives seemed then either to regard it as representing a new section of *Thesium*, distinguished by a succulent fruit and obscuring the carpological distinction between Hill's tribes *Thesieae* and *Osyrideae*, or else to regard it as a new genus of the tribe *Osyrideae*, distinguished *inter alia* from *Osyris* L. by its herma-

phrodite 5- (not 3-4) parted flowers with almost entire (not 3-4 fid) stigma and slightly twisted placenta.

### *Taxonomy and Palynology*

Pilger in Engler, *Die natürlichen Pflanzenfamilien*, 2nd ed. 16b pp. 52-91 (1935) retained the classification published by Hieronymus in the first edition of the *Pflanzenfamilien* (3.1: 198-227; 1889), where *Osyridocarpos* is placed in the *Thesieae*. Kunkel's plant here keys out to *Omphacomeria*, a monotypic Australian genus having unisexual flowers, now placed in the tribe *Anthoboleae* (cf. Stauffer in *Mitt. Bot. Mus. Univ. Zürich* 213-237; 1959). The only species, *O. acerba* (R.Br.) DC., indeed agrees vegetatively with Kunkel's Canarian plant but the shoots as noted by Bentham in Hooker's *Icones Plantarum* 12:64, t.1172 (1873) are entirely leafless, lacking even such minute scales as replace true leaves in the latter.

Since the pollen of Santalaceae manifests a diversity likely to be of taxonomic use, as indicated by Swamy in *Amer. J. Bot.* 36:661-673 (1949) and by Erdtman, *Pollen Morphology and Plant Taxonomy, Angiosperms* 392-394 (1952), the pollen of a few *Thesium* species, namely *Th. alpinum* L. (lectotype of *Thesium*) *Th. euphorbioides* L., *Th. foliosum* A.DC., *Th. humifusum* DC. and *Th. lineatum* L.f., *Cervantesia tomentosa* Ruiz & Pavon (type of *Cervantesia*), *Omphacomeria acerba* (R. Br.) A.DC. (type of *Omphacomeria*), *Osyridocarpos schimperanus* (A. Rich.) A.DC. (lectotype of *Osyridocarpos*), *Osyris alba* L. (type of *Osyris*), *O. lanceolata* Hochst. & Steudel ex A.DC., *Thesidium fruticulosum* A.W. Hill and Kunkel's plant, was examined using the Cambridge 'Stereoscan' scanning electron microscope.

The pollen in all the *Thesium* species examined was heteropolar (i.e. with one end much broader than the other) and tricolpate, in general shape rather like a pyramid with a roughly triangular and flattened base and three triangular sides, the colpi running along the angles (Figs. 3, 4). *Osyridocarpos* and *Thesidium* have similar heteropolar po-

llen. On the other hand, in *Osyris* (Fig. 4 a 5) and *Omphacomeria* the pollen is isopolar (i.e. with both ends equal) and prolate or subprolate, with three longitudinal colpi, the sides smooth. Kunkel's plant had smooth isopolar tricolpate pollen (Fig. 4, 5), about 21  $\mu$  long, 12  $\mu$  broad, quite unlike that of *Thesium* but approximating, to that of *Osyris*, particularly *O. lanceolata*. Since on the other characters it cannot be placed in these genera, it is accordingly here made the type of a new genus named *Kunkeliella* in honour of Günther Kunkel, the diminutive suffix *-ella*, certainly apt for a plant with such minute flowers, being used on account of the existence of *Kunkelia* Arthur applied to a rust fungus occurring on *Rubus*. Arthur's *Kunkelia*, published in *Bot. Gaz.* 63:504 (1917) commemorates the American mycologist Louis Otto Kunkel (1884-1960).

That rocky slopes and cliffs in the Canary Islands are still likely to yield remarkable plants new to science is shown not only by the discovery of *Kunkeliella* on Gran Canaria but also by the discovery of a new genus and species of Compositae on Tenerife, *Heywoodiella oligocephala* Svent. & Bramwell in *Acta Phyt. Barcin.* 7:5 (1971).

The tribe *Osyrideae* as defined by Pilger (loc. cit. 69) includes *Santalum* L., the type genus of the family Santalaceae, and should accordingly be called *Santaleae*, the name used by Alphonse de Candolle in 1857. Pilger's *Osyrideae* is a heterogeneous group, from which in 1969 Hans Ulrich Stauffer (1929-1965) in a posthumous publication removed *Choretum*, *Leptomeria* and *Phacellaria*, to form, together with *Spirogardnera*, *Dendrotrophe* (*Henslowia* Blume non Wall.), *Cladomyza*, *Dufrenoya*, *Dendromyza*, *Hylomyza*, *Amphorogyne* and *Daenikera*, a new tribe *Amphorogyneae*. Stauffer's untimely death of at the age of 36 cut short the preparation of his series of detailed monographic papers on the *Santalaceae*. As his manuscript on *Amphorogyneae* published in *Vierteljahrsschr. Naturf. Ges. Zürich* 114: 49-76 (1969) lacks the Latin diagnosis necessary for valid publication of the name, this is here provided:

### **Santalaceae** tribus **Amphorogyneae** Stauffer

Plantae lignosae, ramificatione sympodiali. Foliorum dispositio (phyllotaxis) 2/5. Inflorescentia plerumque racemosa. Flores parvi vel minuti. Perigonii lobi (tepala) cum receptaculo firmiter conjuncti non articulati; pili pone stamina plerumque praesentes. Stamina loculis antherae (thecis) 2 plerumque utroque loculamentis 2 superpositis separatim dehiscentibus. Ovarium omnino inferum; stylus brevis vel nullus, stigmatis lobi cum lobis perigonii isomeri; placenta superne rotundata, sessilis. Discus epigynus praesens. Fructus drupaceus, tepalis staminibus disco et stigmate persistentibus coronatus. (Descriptio e Germanico in Latinum botanicum converta).

Typus: **Amphorogyne** Stauffer et Hurlimann in Vierteljahrsschr. Naturforsch. Ges. Zürich 192: 337 (1957), genus Novae Caledoniae.

The removal of the above genera with peculiar anthers and the transfer of *Omphacomeria* to the *Anthoboleae* makes the *Santaleae* a more easily definable group, which could, however, be reasonably be further divided using palynological data. The affinities of *Kunkeliella* within this group appear to be with *Osyris*, *Colpoon* and *Rhoiacarpos*, three taxa maintained as separate genera by Stauffer in his 'Santalales-Studien V' (*Vierteljahrsschr. Naturf. Ges. Zürich* 106:388-389; 1961). *Colpoon* and *Rhoiacarpos* are monotypic genera of southern Africa. *Osyris* has two species, *O. alba* in northern Africa and southern Europe, *O. lanceolata* widespread in Africa and southern Asia. All possess normal well-developed foliage leaves. *Osyris* has axillary one- to several-flowered and then umbelliform inflorescences and unisexual flowers with 3 or 4 deciduous perigon lobes and a 3-lobed stigma. *Colpoon* and *Rhoiacarpos* have terminal racemose inflorescences and hermaphrodite flowers, with 4-6 perigon lobes, deciduous in *Colpoon*, persistent in *Rhoiacarpos*, the stigma 4-lobed in *Colpoon*, 5-lobed in *Rhoiacarpos*.

*Kunkeliella* with its entire stigma and its leaves reduced to scales is readily distinguishable from all three. Indeed by its virgate almost leafless habit and its perigon divided to the top of the ovary into 5 triangular lobes it approaches some South African species of *Thesium* belonging

to the subgenus *Frisea* (cf. Hendrych in *Nov. Bot. Hort. Univ. Prag.* 1962: 17-24 for a 'Divisio generis Thesii') but differs from them as from other species of *Thesium* in the drupaceous fruit with a succulent exocarp covering the crustaceous endocarp. The pollen also is different, as noted above. From the palynological observations of Swamy and Erdtman and my own preliminary examination of pollen of species of *Anthobolus*, *Arjona*, *Cervantesia*, *Comandra*, *Exocarpos*, *Omphacomeria*, *Osyridocarpos*, *Osyris*, *Quinchamalium*, *Santalum*, *Scleropyrum*, *Thesidium* and *Thesium* (of which 'Stereoscan' micrographs are filed in the Department of Botany, British Museum (Natural History), London), it is evident that pollen characters supply information of value for the classification of the genera into major groups, particularly in association with embryological characters, as indicated by B. M. Johri and S. P. Bhatnagar, 'Embryology and taxonomy of the Santalales', *Proc. Nat. Inst. Sci. India* 26B, Suppl.: 199-220 (1960), and floral anatomical characters, as detailed by F. H. Smith and E. C. Smith, 'Floral anatomy of the Santalaceae and some related forms' in *Oregon State Monogr., Studies in Botany* no 5 (1943); they merit investigation over a wider range of species. Thus the genera placed by Pilger in *Thesieae*, namely *Osyridocarpos*, *Thesidium*, *Thesium* (including *Austroamericium*), *Arjona* and *Quinchamalium* all have heteropolar pollen of the *Thesium* type, but his *Osyrideae*, morphologically a much less homogeneous group, displays a greater diversity in pollen, which although isopolar in many genera, e.g. *Scleropyrum*, *Cervantesia*, *Buckleya*, *Eucarya*, *Darbya* (*Nestronia*), *Oryris*, *Geocaulon* and *Santalum*, is heteropolar in some others, e.g. *Mida*, *Nanodea* and *Myoschilos*. The drastic reduction of foliage leaves to minute scales which occurs in species of diverse genera of Santalaceae, e.g. in *Exocarpos*, *Choretrum*, *Leptomeria*, *Phacellaria*, *Dendromyza*, *Daenikera*, *Spirogardnera*, *Kunkeliella*, *Thesidium*, *Thesium* and *Austroamericium*, evidently represents parallel evolution and is associated with a parasitic or hemiparasitic habit in a mostly dry habitat.

## *Description*

### **Kunkeliella** Stearn, *genus novum*.

Genus tribus **Santalacearum** (syn. **Osyridearum**) familiae **Santalacearum** ut videtur in Insulis Canariensibus endemicum, ab **Osyride** et **Rhoiacarpo** foliis squamiformibus, stigmatе integro, a **Thesio** (cujus speciebus aliquot Austro-Africanis rami virgatis quoad habitus sparteum congruit) fructu drupaceo, granis pollinis prolatis vel fere perprolatis haud pyramidalibus distinguibile. **Austroamericium** (seu **Thesium** sect. **Psilotherium**), quod cum **Kunkeliella** aspectu aphylo congruit, lobis perigonii anguste oblongis apice cucullatis, filamentis quam antheris multoties longioribus, granis pollinis heteropolaribus more **Thesii**, stylo elongato, fructu sicco praeclare recedit.

**Suffrutices** erecti, valde ramosi, habitu fere **Spartii** vel **Ephedrae**, glabri, ramulis gracilibus. **Folia** dissita, minuta, ad squamas triangulares reducta. **Inflorescentia** axillaris, brevissima, bracteata, floribus paucis breviter pedicellatis, bracteolis sub flore 2 oppositis. **Flores** hermaphroditi, minuti. **Perigonium** 5-partitum, deciduum, lobis per aestivationem valvatis tum patentibus triangularibus, intus pone stamina pilis paucis instructum. **Stamina** 5, basi perigonii loborum inserta iisque breviora; filamenta brevina, tenuia, nuda; antherae oblongae, biloculares, loculis parallelis longitudinaliter dehiscentibus; grana pollinis prolata, 3-colpata, laevis. **Discus** epigynus cum perigonio continuus margine haud prominente. **Ovarium** inferum, uniloculare; ovula 3, ex apice placentae centralis parum tortae pendula; stylus brevis apice truncatus, stigmatе integro. **Fructus** parvus, drupaceus, globosus, monospermus, perigonio persistente coronatus, exocarpio succulento, endocarpio crustaceo. **Semen** albumine copioso, embryone brevi recto, radícula cotyledonis aequilonga.

Erect much branched glabrous shrubs of *Spartium* - or *Ephedra* - like growth with slender branches. *Leaves* scattered, minute, reduced to triangular scales. *Inflorescence* axillary, very short, bracteate, with the flowers few and short-pedicelled and two opposite bracteoles below the flower. *Flowers* hermaphrodite, minute. *Perigon* 5-parted, stellate, with the lobes valvate in aestivation, later spreading, triangular and provided with a tuft of hairs behind the stamen. *Stamens* 5, opposite to the perigon lobes and inserted at their base; filaments short, thin, glabrous; anthers bilocular, with parallel locules dehiscing longitudinally; poll-

en grains prolate, tricolpate, smooth. *Disc* continuous with the perigon lobes, the margin not prominent. *Ovary* inferior, unilocular, ovules 3, pendulous from the apex of a slightly twisted central placenta; style short, truncate at the apex, with an entire stigma. *Fruit* small, drupaceous, globose, one-seeded, crowned by the persistent perigon, with the exocarp succulent and the endocarp crustaceous. *Seed* with copious endosperm and a short straight embryo with the radicle equalling the cotyledons.

Type-species, *K. canariensis* Stearn.

1. ***Kunkeliella canariensis* Stearn, sp. nova**

**Suffrutex** plerumque 50-80 cm. interdum 1 m. altus, ramis ramulisque ascendentibus, vetustioribus lignosis c. 3mm crassis, cortice tenui brunnea vestitis, junioribus flexibilibus 1-2 mm crassis laevibus viridibus sulcis angustis longitudinaliter percursis. **Folia** sparsa, appressa, squamiformia, triangularia, acuta, margine minutissime ciliata, 0.7-2.5mm longa, basi 0.3-1.0mm lata, primum viridia, demum brunnea. **Inflorescentia** uniflora sed usque ad alabastra 3 gerens, bracteis bracteolisque minutis acutis. **Flos** fere sessilis, stellatus, cremeus vel viridulus, c.3mm diametro. **Perigonii lobi** (tepala) triangulares, acuti, margine minutissime ciliati, c.1mm. longi, basi 0.8mm lata. **Stamina** lobis perigonii multo breviora; filamenta c.0.3mm longa; antherae flavae, c.0.3mm longae, pilis paucis ad lobi connexae, polline flavo. **Ovarium** obconicum; stylus crassiusculus. **Fructus** albus, c.5-6mm longus et latus, exocarpio succulento vix 0.5mm crasso, endocarpio brunneo, c.4mm longo, 3.5mm longo, longitudinaliter costato inter costas irregulariter porcato; embryo c.1.5mm longus.

Canary Islands: Gran Canaria, Riscos de Guayadeque, 700m., in shrubland community, 1 Nov. 1971, **Kunkel 14380** (BM); same locality, 2 Feb. 1972, **Kunkel 14776** (BM, holotypus). Isotypes in Herbarium kunkelianum. Mr. Kunkel has supplied the following additional note on its habitat and associates:

"Growing on steep cliffs (older basaltic rocks), southern exposed. Forming almost dense shrubby bushes up to 1 m tall, generally being only 60 to 70 cm tall. Found flowering (few) at beginning of November, and luxuriously flowering and fruiting end of March and beginning of April. By the end of April still flowering.

Found growing together with shrubs of *Parolinia*, probably also a new species. (Cruciferae.) Other accompanying species are



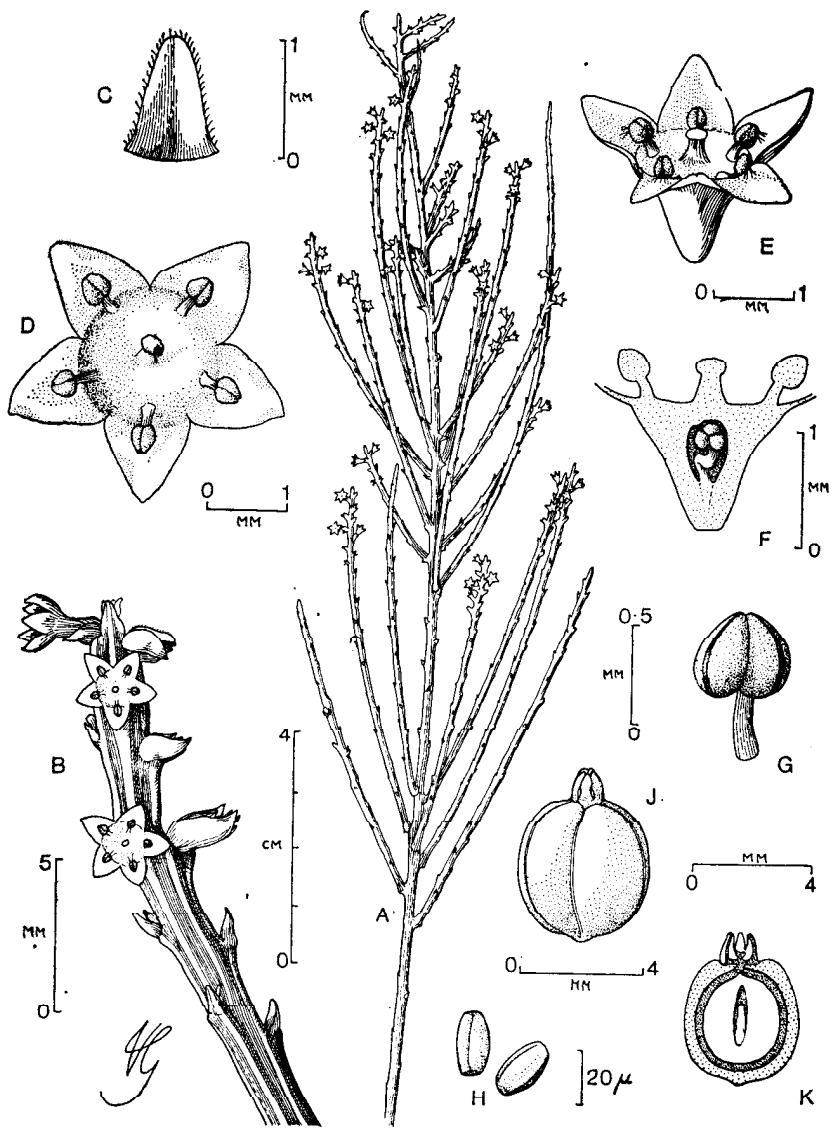


Fig. 1. *Kunkeliella canariensis* Stearn; A, habit of growth; B, flowering branch; C, bract; D, flower from above; E, flower in side view; F, longitudinal section of ovary; G, stamen; H, pollen grains; J, fruit; K, fruit in section (Gran Canaria, Kunkel 14776; drawing by Victoria Goaman).

*Cytisus (Teline) congestus*  
*Lavandula minutolii*  
*Taekholmia pinnata*  
*Aeonium percarneum*  
*Micromeria varia*  
*Descurainia preauxiana*  
*Rumex lunaria*

*Bupleurum salicifolium* ssp. *aciphyllum*  
*Euphorbia obtusifolia* ssp. *regis-jubae*  
*Artemista canariensis*  
*Campylanthus salsoloides*  
*Allagopappus dichotomus*  
*Carlina canariensis*  
*Echtum decatsnet*

*Psoralea bituminosa*

His notes further describe it: 'Broom-like shrub, densely branched, 50-80 cm tall (rarely exceeding 80 cm.), upright and only outer branches nodding: lower branches woody with bark thin, brownish, somewhat fissured; upper branches and branchlets herbaceous or (in older ones) apparently fleshy, flexible; new branches green, older ones greenish-glaucous, knotty at base, slightly ribbed or grooved as in *Equisetum*. Leaves minute, scale-like and very reduced on flowering branches, often brownish, up to 2.5mm long and 1mm wide on young growth. Flowers small, usually single, shortly stalked, 2-3mm in diameter, cream-coloured. Young fruits green and subglobose, with greenish-orange mucro; ripe fruits globose, clear white, fleshy, up to 6mm in diameter, containing one seed'.

2. ***Kunkeliella psilotoclada*** (Svent.) Stearn, *comb. nova.*

*Thesium psilotocladum* Sventenius, *Additam. Fl. Canar.* 5, t.3 (1960)

Canary Islands: Tenerife, Masca, 800m, 1 Mar. 1948, Sventenius (Herb. Jard. Acclim. Orotava; holotypus, fide Sventenius, l.c. iv).

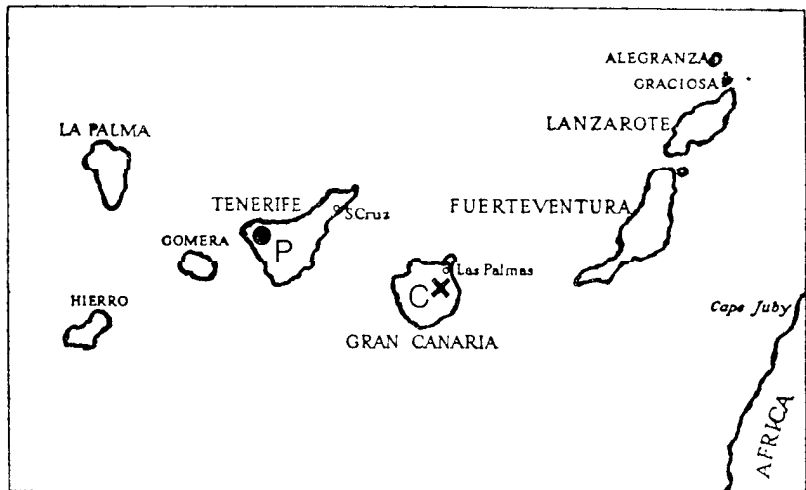


Fig. 2. Distribution of *Kunkeliella*; c, *canariensis*; p, *psilotoclada*.

The above two taxa are evidently very close and may not be specifically distinct, but *K. psilotoclada* appears to differ from *K. canariensis* in having setulose branchlets and

slightly larger flowers with obtuse perigon lobes and also possibly with an ovoid-cylindric ovary. The type locality is in north-western Tenerife (cf. Fig. 2).

The pollen grains of *K. psilotoclada* are isopolar, tricolpate and smooth like those of *K. canariensis* but are slightly shorter (about 19-20  $\mu$ ) and slightly broader (ab. 17  $\mu$ ): the difference in outline between the almost perprolate grains of *K. canariensis* and the prolate grains of *K. psilotoclada* corresponds approximately to that between the grains of *Osyris lanceolata* and *O. alba*.

### Stauffer's Work on Santalaceae

Hans Ulrich Stauffer, whose publications have been cited above, had become by the time of his death the unrivalled authority on the family Santalaceae through his broad-based detailed studies of its morphology and taxonomy which he began in 1953 with research on *Exocarpos*. He was born at Aarau, Switzerland on 8 August 1929, studied for a short time at the University of Basel, then moved to the University of Zürich from which he received his doctor's degree in 1959. He travelled in southern Africa in 1963 and in Australia, New Guinea, New Caledonia and Fiji in 1964, giving special attention to Santalaceae. His death on 21 August 1965, before he could synthesize his observations and study fully the collections then made, came as a great shock to his many friends not only in Switzerland but in England and elsewhere. Had he lived, Stauffer would almost certainly have provided a new classification of the family and the needed revisions of genera not included in his series of papers entitled 'Santalales-Studien'. These remain valuable sources of information and are listed below for the guidance of other workers on the family.

- I. Zur Stellung der Gattung *Okoubaka* Pellegrin et Normand. *Ber. Schweiz. Bot. Ges.* 67: 422-427 (1957).
- II. *Daenikera*, eine neue Santalaceen-Gattung. Von H. Hürlimann und H. U. Stauffer. *Vierteljahrsschr. Naturf. Ges. Zürich* 102: 332-336 (1957).
- III. *Amphorogyne*, eine weitere Santalaceen-Gattung aus Neukaledonien. Von H. U. Stauffer und H. Hürlimann. *Vierteljahrsschr. Naturf. Ges. Zürich* 102: 337-349 (1957).
- IV. Revisio Anthobolearum; eine morphologische Studie mit Einschluss der Geographie, Phylogenie und Taxonomie. *Mitt. Bot. Univ. Zürich* 213 (1959).
- V-VIII. *Osyris*, *Colpoon* und *Rhoiacarpos* (pp 388-400); *Osyridocarpus* (pp 400-406); *Acanthosyris*, *Cervantesia* und *Jodina* (pp 406-412). Zur Morphologie und Taxonomie der *Oleaceae* Tribus *Couleae* (pp 412-418). *Vierteljahrsschr. Naturf. Ges. Zürich* 106: 387-418 (1961).

- IX. *Spirogardnera*, eine neue Santalaceen-Gattung aus West-Australien. *Vierteljahrsschr. Naturf. Ges. Zürich*. 113: 305-309 (1968).
- X. *Amphorogyneae*, eine neue Tribus der *Santalaceae*. *Vierteljahrsschr. Naturf. Ges. Zürich*. 114: 49-76 (1969).

The following three papers by the Dutch botanist Benedictus Hubertus Danser (1891-1943) also amend and supplement the "Pflanzenfamilien" account of Santalaceae. Danser did not state the derivation of his new names for genera segregated from *Dendrotrophe* (*Henslowia* Blume, 1850, non Wall., 1832), but the names *Cladomyza*, *Dendromyza* and *Hylomyza* are evidently from the Greek *klados*, 'branch', *dendron*, 'tree', *hule* 'forest' and *muzao* 'to suck' and refer to parasitism upon trees by the plants concerned.

1. A revision of the genus *Phacellaria* (Santalaceae). *Blumea* 3:212-235 (1939).
2. On some genera of *Santalacea Osyrideae* from the Malay Archipelago, mainly from New Guinea. *Nova Guinea, New Ser.*, 4:133-149 (1939).
3. Supplementary notes on the Santalaceous genera *Dendromyza* and *Cladomyza*. *Nova Guinea, New Ser.*, 6:261-277 (1955).

I thank Miss Victoria Goaman for the care with which she has portrayed *Kunkeliella*, Miss Marilyn Jones for help in examining the pollen of this and other genera of 'Santalaceae', and Mr. Günther Kunkel for providing fresh material. The co-operation of Dr. David Bramwell in obtaining pollen of *K. psilotoclada*, is also gratefully acknowledged.

#### Illustrations

- Fig. 3. Pollen grain of *Thesium alpinum* L. (Sweden, *Asplund* 641), x 3,500.
- Fig. 4a. Pollen grains of *Thesium lineatum* L.f. (South Africa, *Schelpe* 235) x 2,000.
- Fig. 4b. Pollen grains of *Thesium euphorbioides* L. (South Africa, *MacOwan* 764) x 2,000.
- Fig. 5a. Pollen grains of *Osyris alba* L. (France, *Maude*) x 1,000
- Fig. 5b. Pollen grains of *Kunkeliella canariensis* Stearn (Gran Canaria, *Kunkel* 14776) x 1,000.
- Fig. 6a. Pollen grain of *Osyris lanceolata* (Rhodesia, *Pole-Evans* 3072) x 3,000.
- Fig. 6b. Pollen grain of *Kunkeliella canariensis* Stearn (Gran Canaria, *Kunkel* 14776) x 3,000.

