

ON AN UNDESCRIBED SPECIES OF LEPTOSPERMUM  
AND ITS ESSENTIAL OIL.

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[With Plate II.]

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THE LEMON SCENTED LEPTOSPERMUM.

*Leptospermum Liversidgei*, sp. nov.

A shrub 6 to 12 feet high, glabrous, with erect numerous branches and branchlets, the lower branchlets *being quite filiform* and having persistent leaves only on the upper part. Leaves flat, concave and slightly curved, 2 to 3 lines long, very numerous and imbricate, sessile or with a very short petiole, mostly lanceolate but also ovate, rather thin, 1 to 3 nerved but not always clearly shown. Oil glands numerous and distinctly marked. Flowers solitary, axillary on the branchlets, on a short pedicel, measuring about 6 to 8 lines in diameter when expanded. Calyx quite glabrous, broadly campanulate, lobes rounded, as long as the tube, thickened in the middle. Petals orbicular, spreading, much larger than the calyx lobes, about 2 lines in diameter, faintly veined. Ovary five-celled, flat on the top with a slight depression round the base of the pistil and a circular ridge near the free edge of the calyx. Capsule domed above the distinct flange of the calyx, 2 to 3 lines in diameter.

Habitat—Ballina (D. W. Munro), Byron Bay (J. H. Maiden and J. L. Boorman), Port Macquarie (all New South Wales localities).



*L. Liversidgei*, apart from its chemical constituents, has marked points of difference from cognate species. It was at first thought to be one of the many varieties of *L. flavescens* on account of its glabrous calyx, a common feature of all the species placed systematically with that "tea" tree, but the shape and disposition of the leaves, branchlets, size of the flower and chemical constituents of the oil are facts that we considered to be of sufficient importance to justify its differentiation from that species. Typical *L. flavescens* has an extensive range in the coast districts of all the eastern States of the continent, and exhibits a marked constancy of specific characters throughout its distribution especially in the shape of the leaves, which as stated by Smith in his original description,<sup>1</sup> "are linear, lanceolate, obtuse and nerveless,"—a description that does not apply to the leaves of this species, which apart from the other features quoted, may be said to be imbricate whilst those of Smith's plant are loose and spreading. Bentham (B.Fl. iii., p. 104-5) gives a number of species and varieties under *L. flavescens*, classifying them as:—

(a.) *commune*—This includes Smith's specimen (regarded as type) and one or two other species of different authorities.

(b.) *obovatum*—With this variety are synonymised Sweet's *L. obovatum* and Miquel's *L. micromyrtus*. This is a plant more nearly approaching var. *microphyllum*, having divaricate branches but distinct ovate leaves which are flat and not recurved, and are much larger than those of that var. or this new species.

(c.) *grandiflorum*—Under this are placed *L. grandiflorum*, Lodd., *L. virgatum*, Schau., *L. nobile*, F.v.M. The leaves, flowers and fruits of this var. are longer and finer than those of this new species and not so numerous and differently shaped.

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<sup>1</sup> *Trans. Linn. Soc.*, III., p. 262.



(d.) *microphyllum*—It was at first thought that *L. Liversidgei* might be this variety, and was so named by us at first, but a further investigation showed this determination to be wrong. This variety is a robust shrub with stout, divaricate or dichotomous branchlets with leaves drying a light grey colour and the whole plant resembling somewhat a small variety of *L. lævigatum* with scattered leaves, a marked contrast to the erect branches with very numerous very fine slender filiform branchlets of this new species which has also less numerous, more distant and differently shaped leaves.

(e) *minutifolium*, of F.v.M.—This is altogether a different form from this new one, having distinctly channelled recurved leaves, smaller and differently shaped to those of *L. Liversidgei*. It has also stouter branchlets and never the slender filiform ones of the latter species, and its leaves are distinctly 3-nerved, whilst the flowers show good characteristic differences, are much smaller, and the petals being more deciduous.

*L. scoparium*, Forst. and *L. arachnoideum*, Sm., have each a glabrous calyx, and that is their only resemblance to this species.

#### ESSENTIAL OIL.

The lemon odour which this plant gave when the leaves were crushed, was considered to be an indication of the possible presence of citral, and as the results promised to be of an interesting nature, a quantity of material was obtained for distillation. The material was collected several days before it reached the Museum, and the leaves had, by that time, become so loosely attached to the stem that they easily fell off when the twigs were shaken. The leaves of this plant are very small, and as they so readily fall off it would be desirable to distil the plant soon after collecting. The twigs and woody portion were present in larger amount



than would be necessary for commercial distillation, so that the yield of oil as here given, is perhaps a little less than would be obtained commercially, particularly if care were taken in the collection of the material.

The amount of oil obtained from 373 pounds of leaves and branchlets was  $13\frac{1}{2}$  ounces, equal to 0.227%. The crude oil was somewhat mobile and had a marked secondary odour of citral; it was reddish-brown in colour, but this, being due to the mode of distillation, was accidental. The red colour was entirely removed by agitating the oil with a very dilute solution of aqueous potash or soda; after this treatment the oil was of a light lemon tint.

The principal constituents in the oil were, (1) the aldehyde citral, (2) an alcohol considered to be geraniol, (3) an acetic acid ester considered to be geranyl-acetate, (4) the terpene pinene which was dextrorotatory, and (5) a sesquiterpene, which is probably the constituent which gives the lævotation to the higher boiling portion. Limonene could not be detected by any method, and was, therefore, absent; nor was phellandrene present. The whole of the aldehyde appears to be citral, as proof of the presence of any other aldehyde could not be obtained, and two determinations by Flatau and Labbe's method failed to give any indication for citronellal. The physical determinations seem also to indicate that citral is alone present. The secondary odour of the oil, from which the aldehydes had been removed, strongly resembled that of geraniol. The oils of the *Leptospermums* do not appear to have been chemically investigated, so that the occurrence of citral in the oil of *Leptospermum Liversidgei* is of some scientific interest.

#### EXPERIMENTAL.

The crude oil was insoluble in 10 volumes 70% alcohol (by weight) but was soluble in 1 volume 80% alcohol. The rotation in 100 mm. tube was  $a_D + 9.2^\circ$ . The refractive



index at 16° C. was 1.4903. The specific gravity at 15° C. was 0.8895. On a first rectification three main divisions were detected, but owing to the presence of such a large proportion of high boiling constituents the lower boiling portion was not readily separated. Below 170° C. 20% distilled; the specific gravity at 15° C. of this fraction was 0.8624, the refractive index 1.4774 at 16° C., and the rotation in 100 mm. tube  $\alpha_D + 32.5^\circ$ . Between 195–225° C. 30% distilled; the rotation of this fraction was  $+ 5.7^\circ$ ; the specific gravity 0.8892, and the refractive index 1.4892. Between 225–235° C. 20% distilled, this fraction was lævorotatory, the rotation being  $-1.1^\circ$ ; the specific gravity was 0.9048, and the refractive index 1.4945. Between 235–273° C. 12% distilled, which consisted largely of a sesquiterpene, the refractive index of this fraction was 1.5052 and the specific gravity 0.9024; the rotation could not be well taken, but it was lævorotatory. The indications thus pointed to the presence of pinene, of a large proportion of alcohols or aldehydes, of a sesquiterpene and perhaps esters.

The first fraction was again distilled, and the portion boiling at 155–157° C. was collected apart. This was shown to be dextrorotatory pinene. The specific gravity when cooled to 15° C. was 0.8601; the refractive index at 20° C. was 1.4706, and the rotation  $\alpha_D + 35.5^\circ$ . The nitrosochloride was also prepared and this melted at near 103° C. When the oil distilling between 170–195° C. was rectified pinene was again obtained. It is thus assumed that about 25% of the oil was pinene. When the oil was treated with twice the volume of a 30% solution of sodium bisulphite a solid mass soon formed, the aldehydic portion readily dissolved when heated in the water bath. Two closely agreeing determinations by this method, in the ordinary way, gave a mean yield of 35% of aldehydes. The aldehydic



constituents were also removed from a larger quantity of oil prepared for the other determinations, and the separated oil carefully collected and weighed; 40 grams of oil gave 25.9 grams of non-aldehydic constituents, equal to 35.25% of aldehydes. The barium salt of the aldehydic bisulphite compound was prepared, and the aldehyde when separated from the filtrate by the addition of soda, extracted by ether and steam distilled, was shown to be citral. Its odour indicated that aldehyde, its specific gravity at 21° C. was 0.8929 and it had a refractive index 1.4913 at 20° C., it was also inactive to light, and the naphthocinchonic acid, prepared by Doebner's reaction, melted at 199° C. The very small amount of aldehyde (about one per cent.) obtained from the barium precipitate in the usual way, gave no indication for citronellal, but consisted apparently of partly polymerised citral as indicated by the odour and by the refractive index.

The citral prepared from the crystalline bisulphite compound by purifying the crystals with ether-alcohol, decomposing with sodium carbonate and steam distilling, gave at 20° C. a refractive index 1.4913 and specific gravity 0.8937, indicating that citral is the only aldehyde present.

The non-aldehydic portion of the oil had a specific gravity 0.8866 at 20° C.; rotation + 13.4°; refractive index 1.4855 at 22° C. The index of the original oil determined at the same time and under identical conditions was 1.4873, so that the index of the aldehyde was higher than that figure. The ester determination was made on the non-aldehydic portion of the oil, the saponification number was 23.5 equal, to 8.225% of ester as geranyl-acetate. The aldehyde being 35%, this gives 5.346% of ester in the original oil. A determination for ester in the crude oil gave 5.54%. A portion of the non-aldehydic oil was esterised in the usual way, and this gave a saponification number 73.63, which repre-



sented 14·98% of free alcohol, or 9·74% of geraniol in the original oil.

The oil of *Leptospermum Liversidgei* may be stated to have approximately the following composition :—

Citral	...	...	...	...	35·00 per cent.
Geranyl-acetate	...	...	...	...	5·35 „
Free Geraniol	...	...	...	...	9·74 „
Dextro-pinene	...	...	...	...	25·00 „
Sesquiterpene and undetermined					24·91 „
					<hr/> 100·00

This species is dedicated to Prof. A. Liversidge, M.A., LL.D., F.R.S., of the Sydney University, and twice President of our Society, as a slight recognition of his efforts in the furtherance of industrial science in Australia. It was due largely to his efforts that the Technological Museum, Sydney, was established, and as one of the original Committee of Management he was ever enthusiastic in its development, and is always ready to place his mature experience at the disposal of its officers.

We have to acknowledge our indebtedness to Mr. J. H. Maiden, F.L.S., for his kindness in allowing us the use of the *Leptospermums* of the National Herbarium for comparative purposes, and also to Mr. E. G. Duffus, Secretary for Agriculture, Melbourne, and Mr. J. R. Tovey, the officer in charge of the Victorian Herbarium, for similar favours.

#### EXPLANATION OF PLATE

1. Flowering twig. 2. Bud. 3. Bud partially expanded. 4. Expanded flower. 5. Horizontal section of flower. 6. Spray with fruits. (2, 3, 4, 5, enlarged.)

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