NOTES ON THE CHEMISTRY OF CERTAIN AUSTRALIAN PLANT PRODUCTS, PART I.

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With Plate VI.

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DURING the long period throughout which the writer occupied the position of Economic Chemist to the Sydney Technological Museum many chemical problems connected with Australian plants were submitted for investigation. The present notes are designed to place on permanent record a number of results obtained in this way, and which for various reasons have hitherto remained unpublished. It should be added that in every instance the writer is indebted to his colleague, Mr. R. T. Baker, F.L.S., for botanical assistance.

1. *Resin coating the leaves of Acacia verniciflua.*

The material for investigation was sent from Eden, New South Wales, by Mr. W. Stafford. As received, the foliage was cemented together with a sticky glutinous material which had exuded from the leaves and terminal branchlets, and which proved to be a resin consisting of resin acids and neutral resins in approximately equal proportions. Although the resin was soft, it is doubtful whether it contained any essential oil at the time of examination. Resin is a very unusual constituent in members of the N.O. Leguminosæ, the principal secretion in this group of plants being rather of a carbohydrate nature.[1] It has been suggested, however, that under certain conditions tannin may

[1] See in this connection Solereder, Vol. I, page 292, for resin from *A. dodonœifolia.*

be an intermediate product in the formation of resin, and the Acacias as a group are well known to secrete considerable amounts of tannin. Whether the formation of resin in this particular case may also be ascribed to the prior existence of tannin, or of polymerised and oxidised hydrocarbons, can only be determined by systematic chemical studies continued for a sufficient period.

The resin in question was readily soluble in alcohol, and almost entirely so in ether. In order to effect its isolation, the leaves and terminal branchlets (76 grams) were immersed for several periods of one hour in successive small amounts of alcohol. After filtering the mixed alcoholic extracts, which possessed only a pale brown colour, the solvent was expelled by evaporation followed by drying at 105°. The residual resin (11·2 grams) amounted to 14·7 per cent. of the weight of the original material. The resin was treated with ether, in which most of it dissolved. The filtered ethereal solution was next rendered slightly alkaline with alcoholic potassium hydroxide; the mixture was then diluted with an excess of water, and shaken in a separating funnel with ether, in order to extract the uncombined resin. The neutral resin recovered from this ethereal extract represented 45·5 per cent. of the total resin. The aqueous solution was heated to expel the ether, and then acidified with hydrochloric acid. The resin acids obtained in this way amounted to 34·9 per cent. of the total resin. The quantity of tannin extracted by the alcohol was insignificant, and the aqueous filtrate from the precipitated resin did not reduce Fehling's solution, thus indicating the absence of reducing sugars. I am indebted to Mr. F. W. Byrne for assistance in the determination of this resin.

2. *Essential Oil of Bœckea Gunniana.*

The material for distillation was obtained in the month of March, at Mount Kosciusko, New South Wales, by Mr.

L. G. Irby: 160 lbs. of leaves and terminal branchlets gave $5\frac{1}{2}$ oz. of oil, equal to 0·214 per cent.

The crude oil was reddish, owing to the action of phenolic constituents on the iron digester during the process of distillation, and it had a decidedly unpleasant odour reminiscent of certain terpenes. Nearly 50 per cent. of the oil consisted of dextro-rotatory pinene, whilst the less volatile fraction was composed largely of a sesquiterpene; cineole was also present in small amount.

The specific gravity of the crude oil at 15° was 0·9172; optical rotation α_D +8·4°; and refractive index at 19° 1·4856. On distillation, 46 per cent. came over at 153–170°; 26 per cent. at 170–200°; and 18 per cent. at 240–265°. These three fractions gave the following results:—

Fraction.	Sp. gr. at 15°.	α_D.	n_D^{15}.
153–170°	0·8725	+15·6°	1·4723
170–200	0·9104	+6·6	1·4800
240–265	0·9477	+1·2	1·5133

After redistillation, the first fraction yielded a nitrosochloride melting at 103–104°, thus indicating the terpene to be pinene. Cineole, determined by the resorcinol method in the oil distilling below 200°, amounted to 9 per cent., calculated on the crude oil. The saponification number for the esters together with the free acid was only 5·5, so that esters were only present in small amount. Phenolic constituents were extracted from the crude oil by agitation with a 5 per cent. aqueous solution of potassium hydroxide in the usual way. Only a very small quantity of a liquid product was thus obtained; this gave a persistent reddish colour with ferric chloride. Tasmanol, the liquid phenol of eucalyptus oils, gives a similar test. A small amount of an aldehyde was removed by shaking the phenol-free oil with a saturated solution of sodium bisulphite. The aldehyde had an odour resembling that of cinnamic aldehyde, but the amount isolated was insufficient to allow of accurate

characterisation. No sign of a crystalline constituent was detected in this oil.

3. *Rubber and Wax from Sarcostemma australe*, *N.O. Asclepiadaceæ.*

This plant, which occurs in all the Australian States except Victoria and Tasmania, is known as "Caustic Vine," or "Caustic Plant." The material was forwarded to the Technological Museum by Messrs. Faulding and Co., of Adelaide, and was collected in Central Australia.

The leafless stems were pea-green in colour, and coated with a silvery, bronze-like material, loosely attached to the stem, easily removed, and containing a fair amount of a vegetable wax. The thickest stems of the material received had a diameter of about 8 mm.; whilst the bark-like portion was about 1 mm., and the wooden, pipe-like portion just over 1 mm. in thickness. The central, pipe-like stem, when freshly cut, was filled with a delicate fibrous material through which the latex travelled. When dry, this spongy matter shrivelled up, leaving the stem with a central channel which in section resembled a pipe-stem. As the specimen when received had been collected for some time, it had partly dried, but even so the central channel still contained a quantity of the milky latex, which exuded when the stem was cut. The latex, which was also circulating through the bark-like portion of the plant, was of the consistency of milk and very adhesive. The small amount of material received did not produce sufficient latex for an exhaustive examination, although the results obtained give a very good idea of the amount of rubber likely to be derived from the plant, and of the general character of its chemical products.

The stems were cut into short pieces and the latex collected. It was then coagulated with acetic acid, and the coagulated mass, which represented about 16 per cent. of the latex, was well washed with water and air-dried. It was thereupon dissolved in chloroform, and the filtered solution evaporated so as to form a film on a glass vessel. This film, which was of a rubber-like consistency, was

treated with acetone, in which the resinous portion easily dissolved. The remaining rubber, representing about 7 per cent. of the latex, was elastic, and although somewhat soft had all the properties of a caoutchouc. The portion soluble in acetone was white, easily powdered, and melted to an almost colourless resinous mass.

Whether this Australian plant could be economically utilised for the rubber it contains can only be decided by further systematic investigations, but it would not be possible to collect the latex by incisions in the stems. It would be necessary to treat the whole plant by solvents, or by mechanical means, as in the case of "Guayule Rubber" btained from *Synantherea Mexicana*—the coagulated rubber from which plant also contains a high percentage of resins, although the rubber itself is of fair quality.

The wax which occurs on the outside of the stems was not easily soluble in ether or in cold alcohol, but was soluble in boiling alcohol, from which it separated as the solution cooled. Purified in this way, the wax melted at 79°, in a capillary tube in water. This is a somewhat high melting point for a vegetable wax, so that, if obtainable in quantity, this product should have commercial value.

The accompanying illustration of the material worked upon indicates that *Sarcostemma australe* grows as a leafless shrub, although it is described in the Flora Australiensis as a twiner. That the plant assumes both forms of growth has already been shown, and Tate (Journ. Proc. Roy. Soc., South Australia, IV, 136) describes it as a shrub two or three feet high, growing on the granitoid-felstone cliffs about Tickera, S.A., and also as a twiner in other localities (same Journ., V, 9). Mr. S. Dixon (same Journ., VIII, 26) also describes it as growing in the bush form with stems scarcely as thick as a penholder, and states that in the North Western districts sheep have lived upon it for months without water; a similar statement is also made by Max Koch (same Journ., XXII, 114). The above authors also describe the use made of the latex by the aborigines and others as a remedy for healing sores.