

On adding small quantities of lead (within 2 per cent.),  $\chi_{\perp}$  was found to increase slightly while  $\chi_{\parallel}$  decreased considerably. The magnetic anisotropy fell from 2.56 for the pure metal to 2.00 when there was 2 per cent. of lead. Bismuth produced the same change as lead but the changes were much more pronounced.

We have also studied the influence of adding small quantities of tin.  $\chi_{\perp}$  increased considerably while  $\chi_{\parallel}$  decreased rapidly when the percentage of tin in the crystal was increased. When nearly 1.5 per cent. of tin was present in the crystal the magnetic anisotropy was found to be 1.

The influence of cold working on the single crystals was also investigated. The general effect was found to be an increase of  $\chi_{\perp}$ , a decrease of  $\chi_{\parallel}$  and consequently a decrease in the value of the magnetic anisotropy.

Full details of this investigation including a discussion of the results will be published elsewhere.

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<sup>1</sup> Rao and Subramaniam, *Phil. Mag.*, 1936, **21**, 609.

<sup>2</sup> Susceptibility values are given in  $10^{-6}$  units.

<sup>3</sup> Rao, *Proc. Ind. Acad. Sci.*, 1936, **4**, 186.

### Rottlerin—Part II.

THE substance  $C_{19}H_{21}O_6N$  (?) m.p.  $206^{\circ}$ , described by us<sup>1</sup> has been further investigated. Rottlerin tetramethyl ether (19.5 g.) was treated with sodium nitrite in glacial acetic acid and 17.5 g. of the above substance was isolated. Therefore it is clear that the substance cannot have 19 carbon atoms. The other possibility, namely, that oxides of nitrogen have added to one of the double bonds seems more plausible in view of the high yield. This point is being further investigated.

The above substance, m.p.  $206^{\circ}$ , on catalytic reduction with palladium and hydrogen is converted into a substance m.p.  $162^{\circ}$  after crystallisation from alcohol. [Found: C, 63.44; H, 6.23; N, 4.0.] These analytical values have yet to be established by duplicates. This substance (m.p.  $162^{\circ}$ ) when treated with alcoholic alkali and warmed, passes into solution and unlike the unreduced substance, m.p.  $206^{\circ}$ , does not give any benzaldehyde. This latter observation proves that the addendum has not added to the

double bond carrying the phenyl group (Ph. CH = CH —). The alkaline solution of the substance (m.p.  $162^{\circ}$ ) furnishes another substance, m.p.  $139^{\circ}$  (pale yellow needles from alcohol) on acidification. This substance gives C, 63.33; H, 6.12; N, 4.13% and seems to be isomeric with the substance, m.p.  $162^{\circ}$ .

We have considered the possibility of  $C_2H_3N_2O$  adding to one of the double bonds of tetramethyl rottlerin, the calculated values of C, H and N of the substances m.p.  $206^{\circ}$ , m.p.  $162^{\circ}$  agree well with those found but difficulty arises with the substance m.p.  $139^{\circ}$  which can be accommodated only if it is assumed that the acetoxy group has not been split off by alkali—rather a difficult assumption to make. We are further investigating the nature of these substances.

We may mention that the substances (m.p.  $162^{\circ}$  and m.p.  $139^{\circ}$ ) are resistant to reduction by platinum oxide catalyst. The substance m.p.  $162^{\circ}$  on oxidation with aqueous acetone potassium permanganate solution gives a substance m.p.  $123^{\circ}$ . (Found N, 2.89 per cent.)

Further work is in progress.

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<sup>1</sup> Narang, Ray and Roy, *Curr. Sci.*, 1937, **6**, 156.

### Cyclopentyl and Cyclohexyl Succinic Acids and Resolution of Cyclopentyl Succinic Acid.

THE cardiac aglucones would seem to owe their physiological action to the lactone group in the molecule, and the ætiocholane ring structure perhaps serve the purpose of a convenient framework for the resting of the lactone group. To throw light on this assumption as also to verify the mechanism of formation of the lactone group from the side chain of norcholanic acid as postulated by Windaus,<sup>1</sup> work has been started. The object is to synthesise lactones of relevant structure but carrying different rings.

A standard method had to be devised for the synthesis of  $\alpha$ -ring-substituted succinic acids which are to constitute the starting material for the synthesis of the lactones. The condensation of cyclopentanone with ethyl  $\alpha$ -bromosuccinate was studied with a

view to obtaining ultimately  $\alpha$ -cyclopentyl succinic acid. Due to poor yields the method was not found feasible. We find cyclopentyl and cyclohexyl-bromides condense with ethyl sodio- $\alpha$ -carbethoxy-succinate<sup>2</sup> to give  $\alpha$ -cyclopentyl and  $\alpha$ -cyclohexyl  $\alpha$ -carbethoxy succinate, b. p. 166°/mm., and 168°/45 mm. respectively, in good yields. Hydrolysis followed by decarboxylation of the tri-esters yields cyclopentyl succinic acid, m.p. 117° (anhydride, b.p. 176°/30 mm; and Et ester, b. p. 142°/6 mm.) and cyclohexyl succinic acid, m.p. 143°. The Wislicenus reaction<sup>3</sup> on the two succinic acids are being studied to obtain the  $\alpha$ -formyl succinic acids.

$\alpha$ -Cyclopentyl-succinic acid has been resolved with the help of brucine (neutral salt). The *d* and *l* acid had  $[\alpha]_D^{20} + 17.81^\circ$  ( $l = 1, c = 2.358$  in acetone) and  $[\alpha]_D^{20} - 16.94^\circ$  ( $l = 1, c = 1.830$  in acetone) respectively. The active forms melted at 135°.

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<sup>1</sup> Windaus, *Nachrichten von der Gesellschaft der Wissenschaften zu Göttingen*, new series, **1**, No. 7.

<sup>2</sup> Bischoff, *Annalen*, 1882, **214**, 38.

<sup>3</sup> Wislicenus *et alia*, *Annalen*, 1908, **363**, 365, *et ante*.

### Influence of Spike Disease on the Mineral Metabolism of Sandal.

SPIKE disease in sandal has been shown to adversely affect the chemical composition of its leaves<sup>1</sup> and twigs.<sup>2</sup> Thus, the most significant features of the diseased tissues are manifest in a striking diminution of their lime content and a characteristic accumulation of starch in them. Although the nitrogen and potassium make up of such material is also seriously affected, the nitrogen changes of diseased specimens are more pronounced than their potassium contents. It was also shown that the infective tissues are characterised by a lower ratio for Ca/N than that for the corresponding healthy ones.<sup>1</sup> An examination of the roots from healthy and spiked plants yielded some interesting data which are presented here.

### Calcium and Nitrogen Contents of Different Parts of Sandal (expressed as per cent. on dry weight.)

Part of plant examined	Calcium		Total Nitrogen	
	Healthy	Spiked	Healthy	Spiked
Leaves .. ..	2.85	0.28	2.19	3.64
Stems .. ..	0.84	0.31	1.05	1.94
Roots .. ..	0.35	0.67	0.85	0.14

This feature of spike has been verified for a large number of plants derived from different localities. The rapid mobilisation of nitrogen from the roots to stems and leaves in spiked plants is worthy of note. On the other hand, the corresponding roots are significantly richer in calcium. Again, in regard to this entity, the gradient is reversed being low in the foliage and high in the roots of the affected plants. Therefore, the availability of this constituent to the growing points is limited. A similar abnormality was recorded in the case of *Vinca rosea*<sup>3</sup> spike.

It is extremely difficult to account for the above modifications. It is well known that the haustorial connections of sandal roots are slowly weakened with the onset of disease, with the result that in advanced stages, very few of them function actively. Moreover, the root ends also are dead. While it may seem plausible for the mobilisation of calcium from the crown to the roots, careful examination of soils on which sandal plants were growing, revealed some interesting facts. Thus, the calcium content of soils below healthy plants was nearly 50% of that with reference to spiked specimens. This is irrespective of localities and seasonal variations. Although the parasitic habit of sandal is an important factor to reckon with, the facts that the foliage of predisposed plants contains an abnormally high amount of calcium and evinces a low value for nitrogen,<sup>4</sup> combined with our own observations that applications of lime as manure have not tended to decrease the incidence of spike in the field, point to a necessity for a critical examination of the rôle of calcium and nitrogen in health and disease.