

**NOTE ON THE RECOVERY OF OIL FROM SEED CAKES OF OIL EXPELLERS**

NARASINGA RAO AND SUBBAIAH,<sup>1</sup> have enriched the sugar factory press-cake with respect to its wax content, by a simple froth flotation process. Similar experiments were conducted with an oil-cake containing 12.3% oil. The material is ground up with water, and the slurry is froth floated in a small Callow's cell.

Expt. No.	Conditions	Froth		Gangue	
		Wt. % Cake	Oil %	Wt. % Cake	Oil %
1	10% slurry + .5 c.c. pine oil per litre	32	22.5	68	7.5
2	15% slurry + .5 c.c. pine oil per litre	27	20.2	73	9.3
3	10% slurry alone	21	21.1	77	9.9

The emulsion was extracted with petroleum ether for estimating the oil. The separation of the emulsion was also attempted in laboratory Sharples' super-centrifuge with promising results. A study of the factors which control this separation is now in progress.

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1. *J. Sci. Ind. Res.*, 1947, 68, 178.

**A NOTE ON "THE FORMATION OF COMPLEX COMPOUNDS BETWEEN LEAD NITRATE AND ALKALI NITRATES"**

ACCORDING to Ephraim,<sup>1</sup> "Nitrates do not easily form complex compounds in which several NO<sub>3</sub> groups co-ordinate with a metal atom. The number of easily dissociated nitrate salts, the so-called double nitrates, is not comparable with that of double halides or sulphates. Almost the only metals which can act as central atoms in double nitrates are those with high atomic weights, in particular Ba, Hg, Au, Tl, Pb, Th and Bi. The formula of potassium barium nitrate, K<sub>2</sub> [Ba (NO<sub>3</sub>)<sub>4</sub>], serves as an example of the constitution of these compounds".

When aqueous solutions are prepared in such a way that the concentration of alkali nitrate is kept constant while that of lead nitrate is systematically varied and the physico-chemical properties of the solutions are measured and plotted with respect to the concentration of Pb (NO<sub>3</sub>)<sub>2</sub>, regular curves are obtained in some cases, while abnormalities with specific maxima are observed in others. There is excellent similarity in the curves with respect to all the physico-chemical properties, so that there is no question about the genuineness of the phenomenon. Maxima occur at exact

stoichiometric ratios of concentrations corresponding to the compounds:—

4 RNO<sub>3</sub>.Pb(NO<sub>3</sub>)<sub>2</sub>, 2 RNO<sub>3</sub>.Pb(NO<sub>3</sub>)<sub>2</sub> and RNO<sub>3</sub>.Pb(NO<sub>3</sub>)<sub>2</sub> (where R = K, NH<sub>4</sub> or Rb). No abnormalities, however, are observed in the case of LiNO<sub>3</sub> (or NaNO<sub>3</sub>)-Pb(NO<sub>3</sub>)<sub>2</sub>-H<sub>2</sub>O systems.

When attempts are made to prepare these compounds from solution by evaporation or cooling, the constituents separate out indicating that these compounds are stable only in solution. The physico-chemical properties employed for their detection were: viscosity, rheochor, parachor, conductivity, freezing point, E.M.F., magnetic susceptibility, pH and transport number. The compounds are produced in solution presumably according to the equation:

$x \text{KNO}_3 + \text{Pb}(\text{NO}_3)_2 \rightleftharpoons \text{K}_x [\text{Pb}(\text{NO}_3)_{2+x}]$   
(where x = 1, 2 or 4). That such a reaction does take place is convincingly indicated by experiments on transport number, where the cationic Pb is seen to be converted to anionic Pb. Therefore in solution the equilibrium shown above shifts to the right, while on crystallisation there is rapid reversal, so that crystals consist of either KNO<sub>3</sub> or Pb(NO<sub>3</sub>)<sub>2</sub> or a mixture of the two.

The fluoberyllates and chloroberyllates reported by Purkayastha<sup>2</sup> probably behave similarly.

Full details of our work on the complex nitrates of lead appear in the *Proceedings of the Indian Academy of Sciences*<sup>3</sup>

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1. Fritz Ephraim, *Inorganic Chemistry*, 4th edition, 1943, 699. 2. *J. Indian C.S.*, 1943, 25, 81; 1947, 24, 257. 3. *Proc. Indian Acad. Sci.*, April 1948 and subsequent issues.

**PROTHALLUS OF LYCOPodium HAMILTONII SPRING**

IN 1938, while describing the species of *Lycopodium* in the Bombay Presidency, the rare occurrence of an epiphytic species, *L. Hamiltonii* was noted by me.<sup>1</sup> The material on which this observation was based came from Ainsie, a village in the forests of North Kanara District. Subsequently lot of material of the same species came to my hands through the kindness of Professor H. G. Champion and Dr. S. P. Agharkar who had collected it at Lohjang, Kailganga Valley in the Garhwal Himalayas and at Mawphalong in Assam respectively. A comparison of this material with the one I had from the Bombay Presidency clearly showed that under the name *L. Hamiltonii* several species have been lumped together, which now have been rightly separated into *L. Hamiltonii* proper, *L. aloifolia*, *L. petiolatum*, *L. obtusifolium* by Chowdhury.<sup>2</sup>

On a recent collecting trip to Lonawala during last August, some specimens of this species proper were noticed on the tree trunks of *Holigarna Grahamii*, *Mangifera indica*, etc., at

a height of about 30-40 feet on fully grown trees thriving luxuriantly in a cool and shady grove. Curiously enough, the plants though epiphytic were not pendulous as in *L. Phlegmaria* and other epiphytic species but were erect or suberect. Their bases were enveloped in rich humus and blue green algæ growing together with some grasses, orchids such as *Eria Dalzelii*, *Eria crispa*, and ferns such as *Nephrolepis paucifrondosa*, *Leucostegia oulchra*, etc. Within this particular locality the lycopod was fairly common on the tree trunks and older branches at great heights, but outside the locality it was not noticeable at all. This suggests that like *Psilotum triquetrum* Sw. growing not very far from this locality<sup>3</sup> this lycopod also is both local and rare. The fully formed plants were about a foot long,

occasionally epiphytic.<sup>4</sup> The vegetative propagation by means of bulbils seems to be the main mode of propagation in this lycopod as in several other species. It thrives in the monsoons and forms spores from about August to October. The older branches gradually die out, but the young ones survive and the plant is able to parennate thereby.<sup>5</sup>

The species belongs to the subgenus "*Urostachya*" and to the group "*Selago*" in which the axillary sporangia are not clustered into a cone, but rather alternate with the vegetative parts on the plant (Fig. 2). The spores are finely tuberculated, the tubercles being mainly present on the lower hemispherical face, sometimes fusing into irregular thickening (Fig. 4).

Repeated attempts were made to find the prothalli on subsequent occasions and resulted

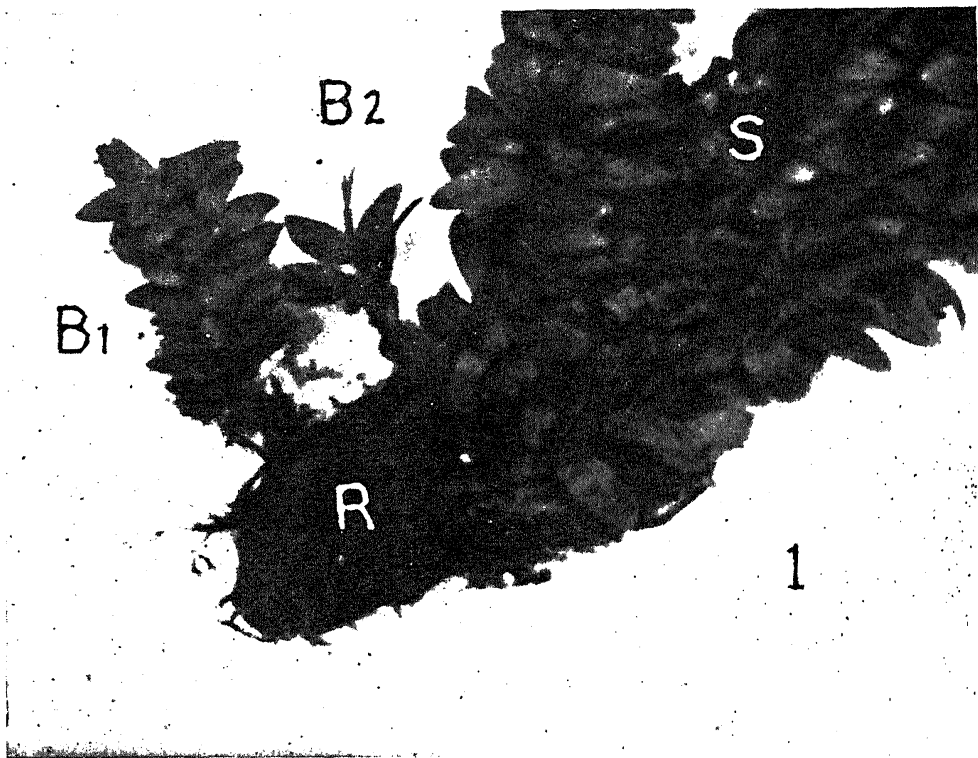


FIG. 1. *L. Hamiltonii* Spring  $\times$  N. S. R—the mattress of roots at the base of the plant showing suberect branches—S. B<sub>1</sub> and B<sub>2</sub>—bulbils arising from the axils of older leaves from the hinder parts of the plant.

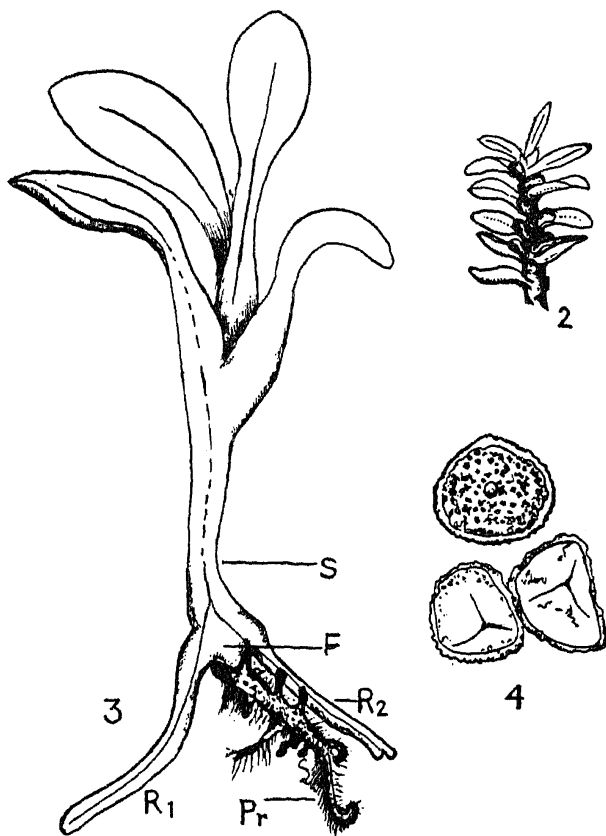
having 6-7 suberect or erect, dichotomised branches. The hindmost part of the plant consisted of a thick mattress of roots which had collected some humus in which were growing small bulbils, and a few sporelings occasionally (Fig. 1). The dichotomised branches were springing from this part and bore sporangia in the axils of leaves towards the apices (Fig. 2). The lower part of the shoots was sterile but a few bulbils were seen developing on them in the axils of some old leaves which possibly had remained dormant during the past years and had not formed the sporangia (Fig. 1). The bulbils were easily detachable from the parent plants and a few of them had fallen on the ground below the tree on which the lycopod was growing: a few of them were also noticeable on the adjoining trees. The species appears to be facultatively terrestrial quite opposite of *L. varium* from New Zealand which is mostly terrestrial but

in obtaining 4 prothalli attached to the germ plants growing deep in the humus collected by the network of roots. All the four specimens were fairly well advanced and had sporophytes attached to them. No early stages or the young prothalli were seen, as it was rather late in the season, that this lycopod was collected this year. At the same time to collect or search prothalli on moist slippery branches of trees at a height of about 30-40 feet on tall tree trunks or branches is not an easy task. The young plants attached to the prothalli bear a close resemblance to the bulbils, but they have a very delicate stem with long internodes, and one or two roots only (Fig. 3). They also do not arise in the axils of older leaves or lie there as do the bulbils. As the prothalli in none of the epiphytic species of the genus *Lycopodium* in India have been described, I venture to give here a brief account of the prothallus in this species, notwithstanding the

small number of specimens with me. I hope to give a detailed account if and when some more specimens become available.

and on the other aspects of the plant is in progress.

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FIGS. 2-4. *L. Hamiltouii* Spring. Fig. 2. Apex of a shoot showing axillary sporangia of the *Selago* type  $\times$  N. S. FIG. 3. The prothallus with a young sporophyte attached to it  $\times$  8. S - Primary shoot; F-foot; R<sub>1</sub> - first root; R<sub>2</sub> - second root on the germ plant; Pr - prothallus. Note the paraphyses and rhizoids growing in great profusion on the prothallus. Fig. 4. Spores  $\times$  220.

The prothallus shown in Fig. 3 is typical of the specimens with me and is probably typical for the species. It consists of a long drawn out, stout central conical portion with several lateral branches ramifying in the humus in which it was found growing. Empty antheridia are noticeable on the lateral branches and archegonia on the central stout conical portion only. Numerous rhizoids and paraphyses are seen all over the prothallus except near the terminal part where the embryo is seen attached to the prothallus. There is no "Primary Tubercle" in this species as in *L. cernuum* or *L. ramulosum* (see Mahabalé,<sup>6</sup> 1937). The foot is highly conspicuous and transparent. The lateral antheridia-bearing branches are pale yellow in colour but the central conical part and the lowermost part of the prothallus are dark brown. It is quite evident from this that the structure of the prothallus in this species agrees in general with the structure of the prothallus in other epiphytic species such as *L. Phlegmaria* described by Trueb<sup>7</sup> (1886), in *L. Billardeiri* described by Edgerley<sup>8</sup> (1915) and Holloway<sup>9</sup> (1920), and in *L. lucidulum* described by Spessard<sup>10</sup> (1920).

Further work on the germination of spores

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#### A NEW BACTERIAL DISEASE OF *MANGIFERA INDICA* L.

A bacterial disease of mango, observed on the Agricultural College Farm, Poona, and in the mango gardens at Dharwar in 1947, seems to be similar to that described from South Africa by Doidge.<sup>1</sup> Yet, the pathogen differs in several characters, to justify assigning it a specific rank.

On leaves, the pathogen produces a number of small, angular, water-soaked areas of varying dimensions ranging from 1 to 4 mm. in diameter. These, initially, light yellow, later turn deep brown with a clear halo around the necrotic spots. The surface of such spots is often rough and raised due to drying of heavy bacterial exudation. The marginal infection of the leaves results in deformities and cracking. In most cases the spots crowd towards the tip of the leaves. The pathogen is able to infect the petioles, fruits and tender stems.

*Pseudomonas mangiferae-indicae* sp. nov.

Short rods, single or in chains of 2 to 4, 1.44-1.45  $\mu$   $\times$  0.54-0.36  $\mu$ . motile, no endospore, non-capsulated, gram-negative.

On the potato dextrose agar, the colonies are circular, smooth, glistening, pulvinate, with entire margin, measuring 1 to 1.5 cm. in diameter after 7 days' growth; white to creamy white; no distinctive odour; gelatin liquefied; casein digested; starch attacked; hydrogen sulphide produced; litmus reduced; acid but no gas in dextrose, sucrose, lactose and mannitol; M. R. and V. P. test negative; no growth in Cohn's, but fair growth in Uschinsky's solution; no production of nitrite