

analysed for their total manganese contents. In addition to manganese they were also analysed for their iron contents. The results of this analysis given in Table II show that the leaves of the areca palm in diseased gardens contain much more manganese and iron than those in healthy gardens at both Kirkee and Sirsi where this disease is absent. Similarly even in diseased gardens the leaves of the tree affected with band contain much more manganese and iron than those of healthy trees. The high manganese and iron contents of the leaves in diseased gardens seem to be brought about by the high availability of these two

constituents in the soils of this tract. The abnormally high absorption of these elements is likely to prove toxic and the toxicity so produced seems to be the cause of the disease.

It is intended to carry on further work to confirm these views when the work under a scheme of investigation submitted to the Indian Central Coconut Committee is started.

The author is indebted to Mr. M. M. Kibe for carrying out the analysis.

1. Piper, C. S., "The availability of manganese in the soil," *J. Agric. Sci.*, 1931, 21, 762.

THE OCCURRENCE AND UTILIZATION OF LIGNITES

C. KARUNAKARAN, M. NARASINGA RAO AND R. SUBBIAH

(Andhra University, Waltair)

OCCURRENCE

LIGNITE is immature coal or partially carbonised fossil wood, brown or black in colour, amorphous or having a conchoidal or cubical fracture and generally retaining its woody fibre. It is intermediate in its qualities between peat and coal. It occurs in large deposits in various parts of the world, chiefly in Australia, Canada and Central Europe. In India, its occurrence is reported from several localities mostly from tertiary deposits¹; the Kashmir Valley formation,² in Pondicherry,³ in Palana (Bikaner), Jurassic strata of Cutch and in Mianwali Dist. (Kalabagh) in N.W.F.P., in Ganges delta. In South India lignites in Malabar and Travancore⁴ are of importance; the areas mentioned therein are Warkalai in Travancore, Beypore in S. Malabar and between Palghat and Calicut.

During the course of investigation in N. Malabar, beds of lignite were found at several places in Cannanore, an account of which does not appear to have published till now. The lignite in this place is seen at the cliff faces overlooking the sea and is overlain by hard laterite the latter having a thickness of about twenty feet. The base of laterite above the lignite beds is clearly marked by a hard pan about an inch thick. The lignite occurs as two beds separated by bluish clay and partly inter-mixed with it. The upper bed is about a foot thick and the lower about five feet in thickness. Numerous lumps and 'twigs' of marcasite are found in these beds probably formed as pseudomorphs after the woody matter. The

Per cent.	Present sample	Place cliff	Chilakur cliff		Vettur cliff
			(i)	(ii)	
Moisture ..	18.84	13.5	16.49	11.18	11.51
Vol. mat. ..	35.5	28.35	38.24	23.57	21.28
Fix. carbon	34.3	21.4	40.83	10.75	6.77
Ash ..	11.36	36.7	4.43	54.5	60.4
sulphur ..	2.88	..	..	..	..
Water sol.	5.2	..	..	..	..
Lignin ..	6.1	..	..	..	..

outcrop is traceable along the coast for a distance of about half a mile and inland wells penetrating beneath the laterite shows the lignite and blue clay and finally the archæan

gneiss. The lignite is brown in colour and has a strong smell of sulphur. Here and there, lumps of fossil gum are found. The woody structure is visible on breaking the lignite.

ANALYSIS

The analysis of the sample is given in the above table along with those of others from different sources.

On extraction with chloroform under slight pressure the present sample of lignite yielded about 2% of yellow, brittle, non-sticky wax which had the following characteristics:

Solvent	% Wase.	M.P. ° C.	Sap. V.	Iod. V.	Ref.
Benzine ..	..	78.9	60-105	10-20	(5)
Chloroform	2	81.85	120.0	69.9	Present sample

UTILIZATION

The value of lignite as a fuel is low. Various methods, such as briquetting, low temperature carbonization, gasification to produce water gas and producer gas and hydrogenation under high pressures and temperatures to convert to hydrocarbons have been suggested and worked to improve its fuel value. Technical methods of preparing charcoal from it have been recorded.

A preliminary experiment carried out to produce active charcoal from the present sample is reported here. After extraction of the wax, it is dipped in zinc chloride solution, dried and heated in a tubular furnace in the absence of air at about 700-800° C. 26% Distillate—tar containing 12% phenol and 52% residual of carbon are obtained. The carbon is cooled, treated with sulphuric acid, washed, dried and ground. The ground sample is found to be a good absorbent of color of jaggery solution. Further detailed investigation on the distillation of lignite under different conditions, especially at higher temperatures and in the presence of steam are under programme of work.

1. *Index to Records*, G.S.I., T. H. D. La Touche, 1936, 1-65, 338-39; *Memoirs*, 1-54, T. H. D. La Touche, 1932, 201-202. 2. *Rec. G. S. I.*, 1924, 55, 241. 3. Pitchannuthu, C. S., *Dept. of Industries Bulletin No. 26 (Travancore)*. 4. *Rec. G.S.I.*, 16, 9, 102; *Rec. G.S.I.*, 15, 98, 99. 5. *Industrial Fats and Waxes*, by Hilditch, V., 149.