diffusion of gases. On the basis of this it might be inferred as indeed it has been suggested by several investigators—that the actual concentrations of gases present within the plant organs, together with the gradients of gaseous concentration created in conjunction with the external atmosphere as well as the permeability of the superficial tissues to the diffusion of gases, are important in determining the rate at which CO_2 will be liberated from the surface under various circumstances. Evidently this disparity—between the metabolic production and superficial evolution of CO_2—is likely to introduce serious complications in the measurement of plant respiration by the usual methods.

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[1] Blackman and Parija, *Proc. Roy. Soc.*, (London), 1928, **103 B**, 412.
[2] Kidd and West, *Ibid.*, 1930, **106**, 93.
[3] Gustafson, *Plant Physiol.*, 1929, **4**, 349.
[4] Willaman and Brown, *Ibid.*, 1930, **5**, 535.
[5] Smith, *Hilgardia*, 1929, **4**, 273.

Some New Aspects of Nitrogen Fixation in the Soil.

IT has already been shown[1] that in presence of the mixed flora of the soil, non-symbiotic fixation of atmospheric nitrogen takes place largely after the added carbohydrate is used up. Evidence has also been adduced to show that the residual organic matter, consisting chiefly of volatile fatty acids and their salts, are utilised in the fixation.

Subsequent studies[2] have shown that if the initial fermentation is conducted outside the field and under conditions of restricted air supply, there is very little loss of carbon. It has also been found that if the products of fermentation are neutralised and applied to the soil in the form of their mixed calcium salts, then there is greater return of fixed nitrogen for the carbon utilised than would otherwise be the case. The following (Table I) will illustrate the type of results obtained :—

TABLE I.

Time in days	Organic carbon (in mg.) in 100 c.c. medium		Nitrogen fixed (in mg.) in 100 c.c. medium (Experimental-Control)	Ratio of nitrogen fixed to carbon utilised
	Control*	Experimental†		
0	28·4	48·7	Nil	..
4	..	38·1	0·77	..
8	28·0	34·8	0·80	1 : 17·4
12	24·0	31·6	0·83	1 : 20·6

* Ashby's liquid medium without sugar.

† Ashby's liquid medium + the concentrate of the products of fermentation to correspond to 20 mg. of organic carbon.

These observations have been confirmed by direct experiments with soils (Table II).

TABLE II.

Time in days	Organic carbon (in mg.)		Nitrogen fixed (in mg.) (Experiment-Control)	Ratio of nitrogen fixed to carbon utilised
	Soil (10 g.) 20 mg. equivalent of mixed calcium salts	Carbon utilised		
*Bangalore Soil.**				
0	70·5	Nil	Nil	..
4	65·1	5·4	0.32	1 : 16·9
12	61·8	9·9	0·88	1 : 11·3
17	58·2	12·3	0·93	1 : 13·2
*Kalar Soil (Sindh).**				
0	69·0	Nil	Nil	..
4	66·3	3·6	0.50	1 : 7·2
8	62·3	7·6	0·66	1 : 11·5
12	57·1	12·8	..	..
17	54·7	15·2	0·91	1 : 16·7

* In both the cases, the untreated soil did not show any appreciable variation in organic carbon, so the corresponding figures have not been recorded.

It has already been shown that if the carbohydrate is applied directly to the soil then the return of fixed nitrogen for the carbon used up will be of the order of 1 to 60 (Bhaskaran and Subrahmanyan, *loc. cit.*). The above results, representing nearly four times that efficiency, should be regarded as a distinct advance on any of the results so far obtained.

In addition to the acids, the products of fermentation include other forms of organic matter, as also considerable quantities of mineral salts (chiefly iron, aluminium and manganese), in solution. Further work is in progress to determine as to how far these constituents (collectively or individually) contribute to the fixation. Attempts are also being made to prepare the mixed products in solid form and to standardise the conditions for their application in field practice.

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[1] Bhaskaran, T. R., and Subrahmanyan, V., *Curr. Sci.*, 1935, **4**, 234; *Proc. Ind. Acad. Sci.*, 1936, **3B**, 143.
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The Electrical Resistance of Wood and its Variation with Moisture Content.

THE electrical resistance of wood has been the subject of study by a number of investigators. Hasselblatt[1] and Stamm[2] noticed a linear relationship between the logarithm of the electrical resistance of wood and the moisture content below the "fibre saturation point". On the other hand, Suits and Dunlap[3] found that the degree of linearity is not so great as that observed by Hasselblatt and Stamm. The same is suggested by the experiments of Gaitzsch.[4] Stamm comes to the conclusion that the electrical resistance does not show any appreciable variation with species and density and that the steep logarithmic relationship established permits considerable variation in the resistance without largely affecting the calculated moisture content. Based on these findings a number of electrical moisture meters have been put on the market in Europe and America for the determination of the moisture content of wood between 7 and 24%.

Recently, in response to an enquiry the author had to design a cheap and reliable moisture meter suitable for this country. While the data mentioned above relate to American and European woods no data are available for Indian woods. In view of this fact and as the electrical resistance of wood has not been studied exhaustively under a variety of conditions a detailed investigation of the electrical resistance of Indian woods has been taken up by the author. In Fig. 1, some of the preliminary results obtained by the author are shown,

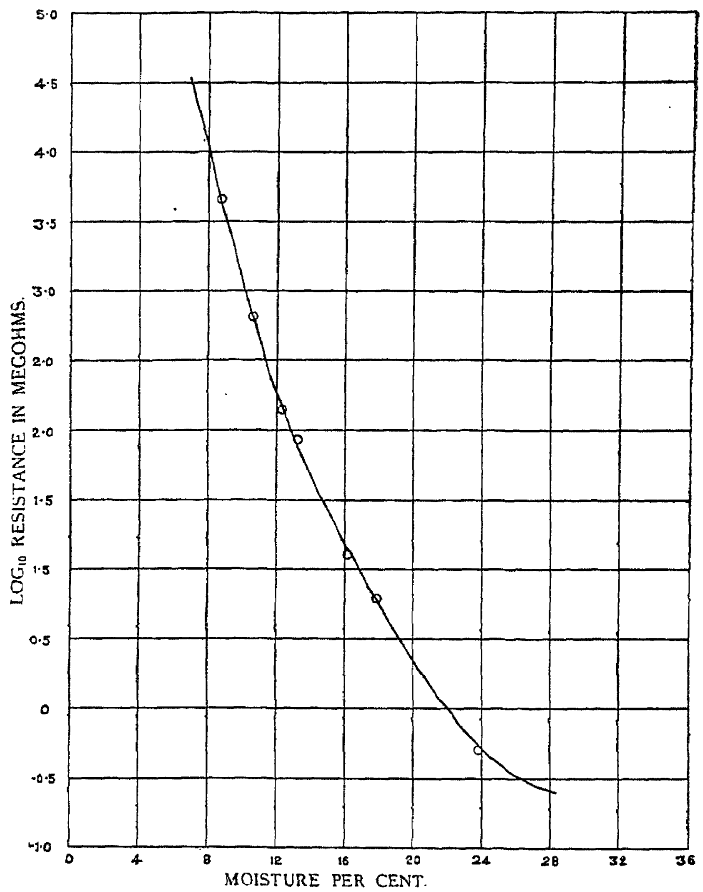

Fig. 1.

the logarithm of the resistance being plotted against the moisture content. They relate to small specimens of *Canarium euphyllum* (white dhup) which had been carefully conditioned in air-conditioning chambers[5] and hence were practically free from moisture gradients. The density of the pieces (based on oven-dry weight and oven-dry volume) varied from 0·333 to 0·484 gm./cm³. The results were obtained with a special type of knife-shaped needle contacts (which penetrate better into the Indian hard wood than the usual round ones) ¾ inch apart and a suitably designed thermionic vacuum tube amplifier. These results show that the degree of linearity is probably not so great as that observed by Stamm and the curve is more similar to that obtained by Suits and Dunlap. In Fig. 2, the same results are plotted on a logarithmic scale. The results of Suits and Dunlap have also