

### The Thickness of the Surface Layer of the Soil Exchanging Moisture with the Adjacent Air Layers during the Clear Season at Poona

RECENT work<sup>1,2,3,4,5,6,7</sup> on the exchange of moisture between the soil and air layers near the surface of the ground has shown that during the clear season when the "surface layer" of the soil is so dry as to contain only hygroscopic moisture, the evaporation from the soil by day up to the maximum temperature epoch is compensated by re-absorption later of moisture from the adjacent air layers by the soil until the next morning. Further, it was shown that this exchange phenomenon is confined to the first inch or so of the soil, the diurnal variation of moisture at lower depths being negligible. The next question is what is the actual thickness of the "surface layer"? This engaged our attention during the current clear season. A brief report of the results obtained in the course of preliminary experiments is given below.

A series of brass cylinders, 4.75 cm. in diameter for exposing soil with depths ranging from 1 mm. to 40 mm. were made with their tops open and bottoms closed. Air-dry Poona soil passed through a 1 mm. sieve was filled in these vessels, the actual depths of soil being 1, 2, 3, 4, 5, 10, 20 and 40 mm. respectively. These were kept embedded in the ground with the top fully exposed to the atmosphere. The surface of the soil in the experimental vessels was at the same level as that of the soil outside. The experiment consisted of weighing the vessels at intervals to study the diurnal variations in the weights, i.e., in the moisture contents of the soil samples. The table below is based on the observations made on the 23rd, 24th and 25th March 1939 and gives (1) the mean maximum weights of the soil samples (recorded in the morning), (2) the mean minimum weights of the samples (recorded in the afternoon about the maximum temperature epoch) and (3) the diurnal range of the moisture content, i.e., (1) minus (2). At the bottom of

the table, the relative humidity at the two epochs is also given.

TABLE I

Thickness of soil layer in millimetres	Mean maximum weight of soil in grammes	Mean minimum weight of soil in grammes	Difference between the mean maximum and minimum weight of the soil samples
1 mm. ..	2.720	2.454	0.266
2 ,, ..	5.936	5.608	0.328
3 ,, ..	7.645	7.173	0.472
4 ,, ..	11.102	10.524	0.578
5 ,, ..	13.152	12.464	0.688
10 , ..	26.951	26.170	0.781
20 ,, ..	54.288	53.574	0.714
40 , ..	102.950	102.254	0.696
Relative Humidity	51.3%	11.7%	Diurnal range = 39.6%

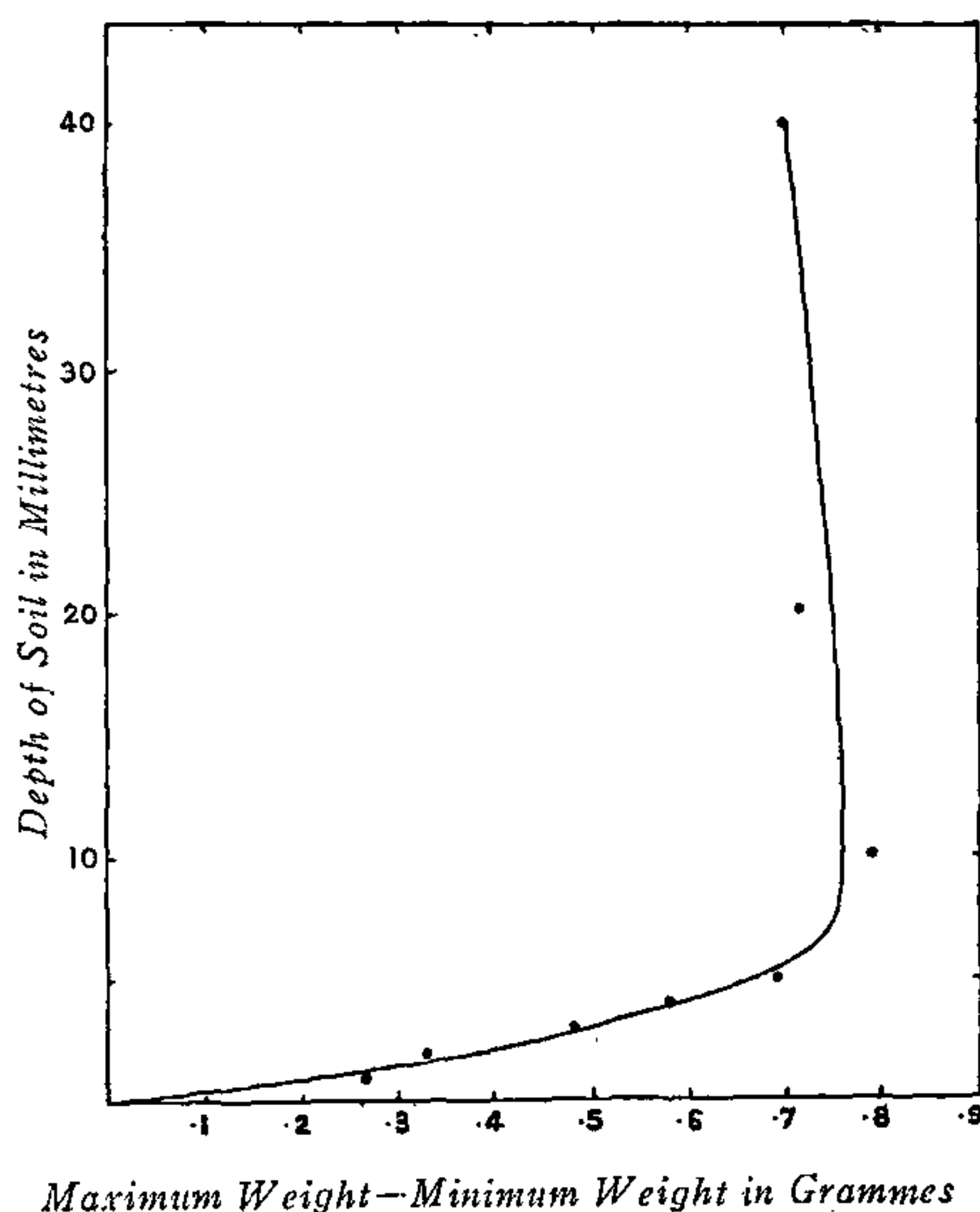


FIG. 1

The difference between the maximum weights and the minimum weights of the soil have been plotted against the thickness of the soil layer in Fig. 1. It will be seen that the difference in weight (this difference represents the weight of moisture lost by evaporation by the soil or gained by absorption from the atmosphere) increases with thickness up to about 10 mm., the variation being comparatively small thereafter, showing that the thickness of the "surface layer" of the soil which is affected by the diurnal exchange of moisture is of the order of a centimetre. The details of the experimental results will be discussed more fully elsewhere. Similar work with other typical soils of India is in progress.

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Poona,

<sup>1</sup> Ramdas, L. A., *Curr. Sci.*, 1934, 2, 445.<sup>2</sup> — and Katti, *Ind. Jour. Agri. Sci.*, 1934, 4, 923.<sup>3</sup> — —, *Curr. Sci.*, 1934, 3, 24.<sup>4</sup> — —, *Ibid.*, 1935, 3, 612.<sup>5</sup> Katti, *Ibid.*, 1935, 4, 419.<sup>6</sup> Ramdas, L. A., and Katti, M. S., *Ind. Jour. Agri. Sci.*, 1936, 6, 1163.<sup>7</sup> — and Mallik, A. K., *Curr. Sci.*, 1938, 6, 452.

### Rottlerin V

NARANG, RAY AND ROY<sup>1</sup> isolated a second colouring matter (pale yellow needles, m.p. 181°) from the benzene filtrates in the preparation of rottlerin from Kamala. This substance has now been more fully investigated. We have found that it can be easily separated from rottlerin if the crude colouring matter is crystallised from toluene. The toluene filtrates on concentration deposits a sticky mass which, on dissolution in ether and chromatographic adsorption on alumina, separates into six zones. The first, darker zone, is that of rottlerin, the second zone contains the substance m.p. 181° (Found: C, 69.95; H, 5.57%,  $C_{31}H_{30}O_8$  requires

C, 70.19; H, 5.66% and  $C_{30}H_{28}O_8$  requires C, 69.76; H, 5.4%). The other zones are being investigated. The clear ethereal filtrate gives a colourless waxy substance.

If rottlerin (5 g.) in 90% alcohol (250 c.c.) be heated with hydrochloric acid (15 c.c., density 1.14) for 7 hours (the solution becoming clear after 3½ hours) and then left overnight a solid deposit. The filtrate on dilution gave a pale yellow product which was crystallised from ether and found to be identical with the substance m.p. 181° isolated from natural sources. In later experiments the substance as obtained by dilution was purified by chromatographic adsorption on alumina. We have now come to the conclusion that this substance is identical with the substance m.p. 180° described by Brockmann and Maier<sup>2</sup> subsequent to our isolation of the substance in 1937. Brockmann and Maier have described it as a flavanone formed by the isomerisation of a hydroxy chalcone grouping in the rottlerin molecule. At first we were inclined to this view also, because the methyl ether of the substance (m.p. 135°–137°, not 105° as was wrongly reported<sup>1</sup> due to typographical error) gave a characteristic piperonylidine derivative (m.p. 145–147°, rectangular plates). Since rottlerin methyl ether did not give any condensation product with piperonal, therefore we thought that the easy formation of the piperonylidine derivative of this substance was due to the presence of CO-CH<sub>2</sub> group in iso-rottlerin. (We are adopting the nomenclature of Brockmann and Maier for this substance.) But the methyl ether of iso-rottlerin (Found: C, 71.64; H, 6.42;  $C_{35}H_{38}O_8$  requires C, 71.67; H, 6.48; and  $C_{36}H_{40}O_8$  requires C, 72.0 and H, 6.66%) prepared in a manner analogous to rottlerin methyl ether gave an oxide, with hydrogen peroxide similarly to rottlerin methyl ether. This substance (the oxide of iso-rottlerin) had m.p. 120–122° and gave C, 69.99 and H, 6.43% whilst  $C_{35}H_{38}O_9$  requires C, 69.77; H, 6.3% and  $C_{36}H_{40}O_9$  requires C, 70.01; H, 6.5%. On being heated just above its m.p. it evolved benzaldehyde copiously. Therefore, it seems