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A Note on the Variations of Soil Temperature at Coimbatore

by

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Introduction: Ramdas and Dravid (1) studied the variations of soil temperatures at Poona using soil covers of different colours. Dravid (2) has stated that Poona black cotton soil absorbs 84 per cent of the incident solar radiation while Sakrand soil absorbs only 59 per cent, by virtue of the difference in their colours. At the Central Farm, Coimbatore, black, red and alluvial soils (Tank silt) exist side by side and crops are grown on all of them. The three types of soils may be have differently to the same incident solar radiation. In the following note, the results of the study on the variations of surface soil temperature on the above three agriculturally important soils are summarised.

Materials and Methods: Red and black soils and tank silt were respectively filled and compacted in three pits of $2' \times 2' \times 2'$ prepared in the Agricultural Metreological Observatory, Coimbatore. Surface soil temperatures were recorded daily at 0735 Hrs. and 1435 Hrs. Indian Standard Time from 19—11—53 to 21—9—54. The three plots were kept barren and free from growth of any weed.

Correlation cœfficients worked out, separately for the months November 1953 to September 1954, between the maximum temperature attained during the day in the Stevenson screen and the surface soil temperatures at 1435 Hrs. in the red and black soils and tank silt plots respectively are presented in Table I. Similarly, correlation cœfficients, worked out between the minimum temperature recorded during the day and surface soil temperatures recorded at 0735 Hrs., in the three plots of soils, mentioned above, are given in Table II. The diurnal variation of surface soil temperature in these three different types of soil for each month is indicated in Table III.

Discussion: When the experiment was commenced it was expected that the black soil would record high temperatures in the afternoon, by virtue of its colour, but it is seen that tank silt has recorded higher values of temperature, as shown in Table III. The highest values of surface tempatures recorded by the three types of soils are: (1) Red Soil 63·9°C. on 3—4—1954; (2) Black soil 64·5°C. on 6—4—1954; (3) Tank silt 65·9°C. on 6—4—1954.

It may be noted that the surface soil tempature was higher in tank silt than in the black soil at 1435 Hrs. on 6—4—1954. Table III indicates the nature of diurnal variation of surface temperature and as to how it depends mainly on the colour of the soil.

TABLE I.

Values of cœfficients of correlation between maximum temperature in the screen and surface soil temperature at 1435 hrs.

Month	Red Soil	Black Soil	Tank silt
November 1953 *	0·8082	0·8463	0·7889
December 1953	·6918	·7657	·8336
January 1954	·7616	·8095	·7703
February ,,	·8695	·8105	·8331
March ,,	·8205	·7885	·7842
April ,,	·8287	·8014	·7743
May ,,	·7420	·7465	·7295
June ,,	·8926	·9100	·8569
July ,,	·7257	·7111	·7567
August ,,	·8230	·8258	·8534
September ,, £	·6221	·5716	·6015

Remarks: * Only for 12 days from 19—11—1953.
£ Only for 21 days from 1—9—1954.

TABLE II.

Values of cœfficients of correlation between minimum temperature and surface soil temperature at 0735 hours.

Month	Red Soil	Black Soil	Tank silt
November 1953 *	·2271	·3626	·2504
December 1953	·6257	·6248	·5361
January 1954	·7559	·6746	·5981
February ,,	·8791	·8683	·9346
March ,,	·9008	·8961	·8935
April ,,	·6418	·6125	·5982
May ,,	·6920	·7062	·6734
June ,,	·3302	·2724	·0802
July ,,	·2906	·1883	·0806
August ,,	·5082	·5154	·4689
September ,, £	·1807	·0015	·0860

Remarks: * Only for 19 days from 12—11—1953.
£ Only for 21 days from 1—9—1954.

TABLE III.

Diurnal Variation of Surface Soil Temperature.

Month	Red Soil	Black Soil	Tank silt
November 1953 *	14·6	17·0	16·7
December 1953	21·7	23·5	23·1
January 1954	21·5	21·3	22·6
February ,,	30·4	30·2	32·2
March ,,	26·9	27·3	28·5
April ,,	26·0	25·4	25·9
May ,,	20·1	18·5	18·4
June ,,	12·8	11·6	10·3
July ,,	12·6	11·8	11·2
August ,,	14·9	13·8	14·1
September ,, £	16·9	14·3	14·5

Remarks: * Only for 12 days from 19—11—1953.
£ Only for 21 days from 1—9—1954.

The diurnal variation of surface temperature of black soil is higher than either red soil or tank silt in November and December. It is the highest in tank silt in January, February and March while from August to September, it is the highest in the red soil.

From the Cœfficients of correlation between maximum temperature and surface soil temperatures of the three types of soils, presented in Table I, it may be seen that all of them are significant, indicating that the increase in the maximum temperature causes an increase in the surface temperature in all the three types of soils, as both are factors influenced by solar radiation. Further, the highest correlations are obtained in all the three types of soils in June 1954. As all the correlations are in general, highly significant it will be possible to calculate with a fair amount of success, the temperatures that may be attained by the respective soils, taking the screen maximum temperature into account.

The correlations between the minimum temperature, recorded in the Stevenson Screen, and the surface soil temperatures, recorded at 0735 Hrs., are not significant in the months of November 1953 and June, July and September 1954. During the other months they are significant for all the three typs of soils and the highest correlation cœfficients have been obtained in March. These factors indicate that only during the period December to May, the surface soil temperatures at 0735 Hrs., are proporational to the minimum temperature, recorded in the screen.

Summary and Conclusions: (i) The physical and chemical properties of soils play an important role in the absorption and disposal of solar energy, in addition to the colour of the soil.

(ii) High coefficients of correlation oxist between maximum temperature and surface soil temperature at 1435 Hrs., in the three types of soils in all the months while the correlations between minimum temperature and surface soil temperature at 0735 Hrs. are not significant in the months of November, June, July and September.

(iii) The diurnal variation of temperature varies differently in the three soils in the different months.

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Synthetic Ion Exchangers (Amberlite Resins) Purify Water

by

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Water is chiefly used for domestic purposes, for irrigation and in industry. Yet, the same quality of water will not meet all purposes. The total solids should not exceed 500 ppm. for a water of good chemical quality for drinking purposes (U. S. Public Health Service Drinking Water Standards, 1946). Among the ions, bicarbonate is preferable to carbonate, sulphate and chloride, and calcium to sodium. For industrial purposes, waters containing calcium and magnesium salts are undesirable because such waters cause boiler-scale and corrosion of the material. Irrigation water is usually judged by three criteria; (a) boron atom concentration, (b) the ratio of sodium ion content to the sum of sodium, magnesium, calcium and potassium ions and (c) total dissolved salts. The following table gives the permissible limits for total solids and percent sodium of several classes of irrigation water as generally adopted in the U. S. A. (1).