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NOTICES OF PUBLICATIONS OF GENERAL BEARING

SOIL

Greaves, J. E. and Carter, E. G. "Influence of Moisture on the Bacterial Activities of the Soil." *Soil Science*, **10**, 1920, pp. 361.

Twenty-two soils have been experimented with from farm lands in the neighbourhood of Lake Bonneville, Utah. These soils are the richest agricultural soils in the district and most of them are fertile even without the addition of manure. All of them contain good supplies of potash, phosphorus and other essentials, though like most soils in arid regions the percentages of nitrogen and humus are usually low. These soils vary greatly in their physical properties, from loose sand to tough clay. The water-holding capacity (saturation) varies from 31–79 per cent. and depends on the amounts of clay and organic matter present. Experiments have been made on the powers of ammonification, nitrification and of fixing nitrogen in these soils with varying water contents. To obtain comparable results the water content was based on the water-holding capacity and the values for each soil used from 10 per cent. to 100 per cent. saturation rising by 10 per cent.

In regard to ammonification the soils vary greatly but each gave a maximum value at 60 per cent. saturation. The physical characters greatly alter the total amount produced. With water contents above 60 per cent. there was a gradual decrease to the saturation point.

In nitrifying power about half the soils showed a maximum at 50 per cent., the others at 60 per cent. saturation. The optimum water content here is thus rather lower than for ammonia production. There is a sharp decline when the water content rises about the optimum.

The soils exhibited great variation in nitrogen fixation, those with the largest quantities of organic matter were the most active. Many lost nitrogen with low water percentage but showed a gain when more was present, suggesting that anaerobes are the more active in this reaction. One soil showed a loss in nitrogen in all the experiments and one showed a gain with little water and a loss with more. The average for all the soils used showed a maximum with 70 per cent. saturation. Fixation at 90 per cent. and 100 per cent. saturation was uniformly low but very few of the soils exhibited a loss.

The nitrogen fixation organisms do not respond so readily to varying water contents as do the other groups. The optimum value for nitrification found in these experiments are not far from those observed for crop production.

Scofield, C. S. and Headley, F. B. "Quality of Irrigation Water in Relation to Land Reclamation." *Journ. Agric. Res.* **21**, 1921, pp. 265.

Especially in arid regions many soils exhibit "hardness," that is, they are relatively impermeable and difficult to work. Such soils are very unproductive and especially so in dry weather: they often contain large amounts of soluble salts which are washed out with very great difficulty.

This character in soils has usually been associated with the presence of "black alkali," sodium carbonate, but the experiments show that other sodium salts, chloride or sulphate, may have the same effect.

A soil leached with a solution of a sodium salt and then subsequently with distilled water shows a very greatly reduced permeability. The percolate also becomes alkaline. The effect can be eliminated and the soil rendered again permeable by leaching with a solution of calcium or aluminium salts. Aluminium is much more effective in "softening" and the effects continue even after continued leaching with pure water.

The theory suggested to explain these phenomena is that the sodium replaces bases on the surface of the soil particles and becomes combined, at any rate in part, as sodium silicate which forms a hydrogel. Hence the effects on drying. With calcium and aluminium on the other hand colloid gels are not formed and sodium silicate gels present are masked by the formation of an insoluble precipitate of calcium or aluminium. With calcium and aluminium other bases are set free in solution.

From this it is seen that the quality of irrigation water is not to be judged by total salts present or by their acid radicals but by the proportion of sodium to calcium and magnesium. Where the sodium is greater in amount hardness is to be feared or tersely "soft water gives hard soils and hard water soft soils."

Examination of some important supplies of irrigation water showed that the amount of sodium was greater than that of calcium and in the regions supplied from these "hardness" in soils was increasing. The remedy lies in supplying calcium salts either to the land or to the water supply.

FOREST AND PRAIRIE

Vestal, A. G. "Local inclusions of prairie within forest." *Trans. Illinois State Academy of Science*, **11**, 1918, pp. 122.

Vestal calls attention to, and illustrates by a chart and photographs, the occurrence of typical prairie communities within the forest region of eastern Illinois on and near the crests of the slopes of valleys and ravines which have a S., S.W. or W. aspect, where the soil is consequently too dry for forest owing to exposure to the drying winds from these quarters. Such islands of prairie maintain themselves for a considerable time but are subject to invasion by forest, which progresses from below upwards owing to the shade cast on the edge of the prairie patch by the trees below. Where other factors, such as instability of surface owing to steepness of slope, cooperate, the forest is apparently unable to invade. It is suggested that such physiographic entities should be called *upland salients* or *spur tops*.

Vestal, A. G. "Invasion of forest land by prairie along railroads." *Ibid.* pp. 126.

Where railroads have been cut through forest land in the immediate neighbourhood of prairie, the sides of the "right of way" are invaded partly by prairie and partly by forest. The latter is represented by forest shrubs and herbs only because the trees are not allowed to grow up. The former is favoured by coarse, well-drained soil, considerable exposure to wind and sun, drought during the critical seasons of establishment, and, of course, burning and mowing. The opposite conditions favour the re-establishment of forest.