

cumulate in the soil; and as the condition of the soil, as a body at large, is due to its mechanical texture, or to the proportion in which the fundamental constituents are present in it, it follows that a regular supply of this nutriment, neither more nor less than wanted, can only be secured by a proper mechanical texture of the soil. In this case the soil will, at one time, reserve to the utmost, the needed quantity of water, whilst at another, it will freely dispense with all superabundance.

The quantity of water required by plants during their growth is very considerable. It is the medium by which all other nutriments are conveyed to the plants, and with which they dispense again as soon as this function has been fulfilled. Boussingault states that annually by a good crop from one acre, about six millions pounds of water evaporate from the leaves of the plants that was previously taken up by their roots. Besides, plants contain about 12 per cent. of their weight of water in the dry state, which forms a constituent part of their body.

*Carbonic acid*, the second of this class of nutriments, is the substance from which plants derive all their carbon, or about 43 per cent. of their whole weight. A regular supply of carbonic acid is likewise dependent on the mechanical texture of the soil; for carbonic acid is the product of the decomposition of humus, a substance which forms a fundamental constituent of soils, without which a proper mechanical texture cannot exist. Where there is no humus in the soil, no proper mechanical texture exists, nor can there be any regular source for the supply of carbonic acid to meet the wants of the growing crop. The supply of carbonic acid is, in truth, not altogether dependent on the condition of the soil itself, as is the case with water, which enters the system of plants exclusively through their roots, and therefore always by the medium of the soil. Independently of this manner of assimilation, carbonic acid is also taken up by the plants, to a large extent, directly from the atmosphere by the medium of their leaves. It has even been proven by experiment that plants can be raised in a soil entirely destitute of humus, in which case they are solely referred to this latter mode of appropriating their carbon. This state of things, however, merely shows to what extent plants can be forced to feed themselves in a partial manner, but in no way prove that under this condition their development is the most prosperous. Experience teaches us on the contrary, that the co-operation of the humus in the soil is indispensable for securing a regular supply of carbonic acid to plants, and their production in the most perfect form. The gas arising from the humus furnishes a constant source of carbonic acid for that portion of the atmosphere which immediately rests upon the soil and surrounds the upper part of the plant. It