

nitric or chloric acid. Oxygen is largely consumed in numerous natural and artificial operations, as respiration, vegetation, combustion—in the preparation of oxides, acids, salts, and other compounds.

Carbon enters into the composition of all plants, and of all their different parts, or organs, combined with different proportions of oxygen and hydrogen, or hydrogen with little or not any oxygen; these different combinations form woody fibre, starch, sugar, gum, volatile, or, fixed oils, wax, resin, &c.

Nitrogen is an element of vegetable albumen and gluten. Vegetable albumen bears a great resemblance to animal albumen, of which the white of an egg is an example; gluten is a tough substance remaining after the starch of wheat has been washed away—it is the nutritious part of wheaten flour. Nitrogen is a constituent in the acids, and of what are termed the indifferent substances of plants. It forms by weight a very small proportion of plants, but it is never entirely absent from any part of them. Even when it does not enter into the composition of a particular part or organ, it is always to be found in the fluid which pervades it.

The developement of a plant requires the presence of substances containing carbon and nitrogen, and capable of yielding these elements to the growing organism; it requires the presence of water and its elements, and it requires the presence of a soil to furnish the *inorganic* matters, which are likewise essential to vegetable life. The fertility of every soil has generally been supposed by vegetable physiologists to depend on the presence in it of a peculiar substance, to which they have given the name of *Humus*—which is a Latin word signifying earth, or soil.

This substance, the *humus*, believed hitherto to be the principal nutriment of plants, and to be extracted by them from the soil in which they grow, is itself, the product of the decay of other plants. It is described as a brown substance, easily soluble in alkalies, but only slightly soluble in water. It has received various names, according to its different external characters and chemical properties, as, *ulmin humic acid*, *coal of humus* and *humin*.

The modifications of *humus*, which are soluble in alkalies are called *humic acid*, whilst those which are insoluble are called *humin*, and *coal of humus*. Berzelius, a Swedish Chemist, called the former *extract of humus*, and the latter, *Geine*, (from a Greek word, signifying earth) also *Apothe-me* and *Carbonaceous humus*. Chemists have been in the habit of designating all products of the decomposition of organic bodies, which had a brown, or brownish black colour, by the names of *humic acid*, or *humin*, according as they were soluble or insoluble in alkalies; although in their composition and mode of origin, the substances thus compounded might be in no way allied. Leibeg continues to observe—"not the slightest ground exists for the belief that one or the other of these artificial products of the decomposition of vegetable matter exists in nature in the form, and endowed with the properties of the vegetable constituents of mould; there is not the shadow of a proof that one of them exerts any influence on the growth of plants either in the way of nourishment or otherwise." The opinion that the substance called *humus* is extracted from the soil by the roots of plants, and that the carbon entering into its composition serves in some form or other to nourish their tissues is so general and firmly established, that hitherto any new argument in its favour has