

dem science has demonstrated that certain mineral substances, which the results of combustion proved always to exist in plants, were quite as essential to their growth.

We might illustrate this position by the investigation of animal and vegetable physiology, but we must avoid digressing more than is absolutely necessary to the proper understanding of the subject under consideration, and be content with the remark, that nature has decreed that plants shall receive certain matters, in a great part from the atmosphere, and those we call their organic part—but their mineral constituents *must* come from the soil. The most important of these mineral substances are potash, soda, lime, silica magnesia, iron, manganese, phosphorus, sulphur, chlorine and iodine. There are others found in smaller proportion in plants, but most of these are perhaps non-essentials.

The mineral matters constitute, generally, from one to two per cent. of the living plant, and are what we call ashes, when the combustible parts have been burned away. Their state of combination is varied by every different plant.

The phosphorus is, perhaps, always united to oxygen, forming phosphoric acid, which in plants usually exists in combination with lime or magnesia, or with both, as in the grain of wheat, and in many other seeds. The sulphur, in most instances, exists as sulphuric acid, which is generally united with lime in plants, but often is combined with potash, soda, &c.; the chlorine is a combination with the potash, or forms with the soda the well known common salt. Iodine only exists in plants growing in or near the salt waters. Besides these mineral acids, various other acids, the products of vegetable organism, form in plants, compounds with the above named alkalies, earths and metallic oxides.

Before this subject was sufficiently investigated, it was common to consider only such substances as furnished *vegetable* food to plants "*manures*," whilst mineral or inorganic matters such as lime potash, &c., it was supposed entered the plants to act as stimulants or to have some undefinable mechanical action. Some are sufficiently fanciful yet to cling to the stimulating theory, but the exact and rigid rules for scientific investigation of the present age permits not the indulgence of fancy, which has been transferred from the more exact sciences to poetry. Each plant always contains certain mineral or organic compounds, (subject to little variation, as will be seen) in whatever part of the world the plant may have its existence. If these essentials be deficient, the plant will languish and produce a stunted growth: if entirely absent from the soil the plant will die soon after, exhausting the minute quantity which the seed contained. In order to show what is necessary to some of our most important plants, we will state the quantities and kinds that exist in Tobacco, Wheat and Clover.