

§ 7. *Excretion in Vegetables.*

It had long been conjectured by De Candolle, that the superfluous or noxious particles contained in the returning sap are excreted or thrown out by the roots. It is evident that if such a process takes place, it will readily explain why plants render the soil where they have long been cultivated less suitable to their continuance in a vigorous condition, than the soil in the same spot was originally; and also why plants of a different species are frequently found to flourish remarkably well in the same situation where this apparent deterioration of the soil has taken place. The truth of this sagacious conjecture has been established in a very satisfactory manner by the recent experiments of M. Macaire.* The roots of the *Chondrilla muralis* were carefully cleaned, and immersed in filtered rain water: the water was changed every two days, and the plant continued to flourish, and put forth its blossoms: at the end of eight days, the water had acquired a yellow tinge, and indicated, both by the smell and taste, the presence of a bitter narcotic substance, analogous to that of opium; a result which was farther confirmed by the application of chemical tests, and by the reddish brown residuum obtained from the water by evaporation. M. Macaire ascertained that neither the roots nor the stems of the same plants, when completely detached, and immersed in water, could produce this effect, which he therefore concludes is the result of an exudation from the roots, continually going on while the plant is in a state of healthy vegetation. By comparative experiments on the quantity of matter thus excreted by the roots of the French bean (*Phaseolus vulgaris*) during the night and the day, he found it to be much more considerable at night; an effect which it is natural to ascribe to the interruption in the action of the leaves when they are deprived of light, and when the cor-

* An account of these experiments was first published in the fifth volume of the "Mémoires de la Société de Physique et d'Histoire Naturelle de Genève," and repeated in the "Annales des Sciences Naturelles," xxviii. 402.