

§ 3. *Exhalation.*

THE nutrient sap, which, as we have seen, rises in the stem, and is transmitted to the leaves without any change in its qualities or composition, is immediately, by the medium of the stomata, or orifices which abound in the surface of those organs, subjected to the process of *exhalation*. The proportion of water which the sap loses by exhalation in the leaves, is generally about two-thirds of the whole quantity received; so that it is only the remaining third that returns to nourish the organs of the plant. It has been ascertained that the water thus evaporated is perfectly pure; or, at least, does not contain more than a 10,000,000th part of the foreign matter with which it was impregnated when first absorbed by the roots. The water, thus exhaled, being dissolved by the air the moment it escapes, passes off in the form of invisible vapour. Hales made an experiment with a sunflower, three feet high, enclosed in a vessel, which he kept for fifteen days; and inferred from it that the weight of the fluid daily exhaled by the plant, was twenty ounces; and this, he computes, is a quantity seventeen times greater than that lost by insensible perspiration from an equal portion of the surface of the human body.

The comparative quantities of fluid exhaled by the same plant, at different times, are regulated, not so much by temperature, as by the intensity of the light to which the leaves are exposed. It is only during the day, therefore, that this function is in activity. De Candolle has found that the artificial light of lamps produces on the leaves an effect similar to that of the solar rays, and in a degree proportionate to its intensity.* As it is only through the stomata that exhalation proceeds, the number of these pores in a given surface must considerably influence the quantity of fluid exhaled.

By the loss of so large a portion of the water which, in the rising sap, had held in solution various foreign materials, these

* Physiologic Végétale, i. 112.