

contact with the wet surfaces of the soil particles. The cellular membranes which clothe the root hairs and rootlets being from the nature of the case perfectly permeable to water, it follows that, if the root be exposed to air which is not saturated, it will give off moisture and dry up. The soil roots of a plant which has become partially or completely uprooted thus constitute its most vulnerable spot.

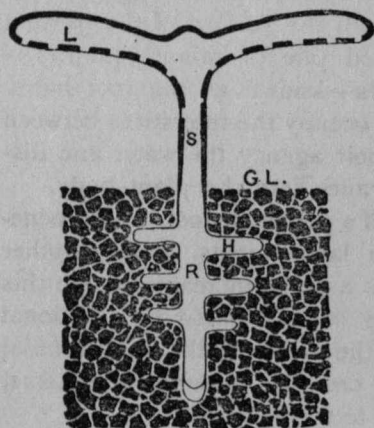


Fig. 8.—Diagram of a Plant in the Soil

The root (R) with its absorbent root hairs (H) is expanded in the soil, the interstices of which are indicated. The stem (S) and leaves (L) are raised aloft. The heavy black edge represents the cuticularized impermeable surface membrane of the shoot. The gaps are the stomata, the points of gaseous interchange. The root system, bordered by a thin line, is water-permeable. G.L., Ground level.

In practice only roots which have developed *in situ* are of any service, and for their continued efficiency it is evident that they must not be disturbed.

A very important consequence of the intimate relations that obtain between all the ramifications of a root and the soil in which it grows is the firm fixing of the plant in the ground, so that the plant is hardly liable to be uprooted even by the most tempestuous buffeting by wind.

The shoot, on the other hand, is mainly developed above ground, where it displays to the light its green canopy of living cells. It is by the agency of its leaves and

other green parts that the plant is able to utilize the CO_2 of the air as its source of carbon; moreover, it is also through the leaves that water vapour is transpired into the air. These functions are carried out under cover of a non-permeable membrane (the cuticle) by special adjustable pores, the stomata, which lead into the interstices of the plant (fig. 8). As these pores can be closed and communications interrupted when necessary there is little fear of a plant drying up.

We see, therefore, that both the root and shoot of a plant are necessarily permeable to water, but that, whilst the root