WATER ABSORPTION BY LEAVES

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Do leaves absorb water, is a question that has been asked by botanists. The answers have been various and confusing. A consideration of the factors involved show that under ordinary conditions mesophytic leaves may absorb liquid water in reasonable amounts but absorb very little or no water in the form of vapor.

The absorption of water by a leaf presupposes a deficit of water in the leaf cells. Such conditions are the result of transpiration, assimilation and an inadequate supply. Under the most ordinary conditions, at least during the daytime, leaf cells show some degree of water deficit. This deficit has been termed by the several workers as "suction force," "suction tension," "turgor deficit," "diffusion pressure deficit" and others. The terms imply that due to the unsaturated water conditions within the cell the cell possesses an ability to absorb available water.

Deficits as high as 10 atmospheres osmotic value are common in the leaf cells of transpiring plants; 20, 30 or even higher atmosphere deficits may occur in some leaves. Such osmotic value deficits represent positive water absorbing ability. Such cells placed in water will absorb it if no impervious layer intervenes. The crisping of vegetables in water is an illustration of this phenomenon. Leaves from some plants can be made to act as absorbing organs. If a stem with two or more leaves is removed from the plant and if one leaf is submerged in water, it will absorb sufficient water to keep the stem and other leaf or leaves in a fairly turgid condition. Such submerged leaves may act as absorbing organs for several months and supply the exposed leaves with water. Leaf and stem tips without such supply will wilt and dry in a few days.

For leaf cells showing a deficit of 10, 20, 30 or more atmospheres the absorption of water vapor is more difficult. The figures of 10, 20 and 30 atmospheres represent a vapor pressure deficit of .14, .30 and .43 mm. Hg. respectively with water having a vapor pressure of 23.76 mm. at 25° C. These deficits represent relative humidities of 99.4, 98.7 and 98 per cents. Leaves in light have from slightly above to several degrees higher temperatures than the surrounding air. If the air at 25° C. has 100 per cent humidity or 23.76 mm. Hg. vapor pressure; approximately one-third of a degree C. higher leaf temperature will cause the vapor pressure of the leaf showing a deficit of 30 atmospheres to equal that of the air. A temperature of more than one-third of a degree C. in the leaf will cause the leaf to lose water to the air even if quite wilted. Slight temperature differences thus make it impossible for wilted leaves to absorb water vapor. The tendency for the stomata of wilted leaves to close in the daytime, the closing of stomata at night, the exposure of only cutinized surfaces by some leaves at night as well as slight temperature differences make it rather difficult if not impossible for mesophytic leaves to absorb water vapor.