Humidity Variations Affecting Transpiration

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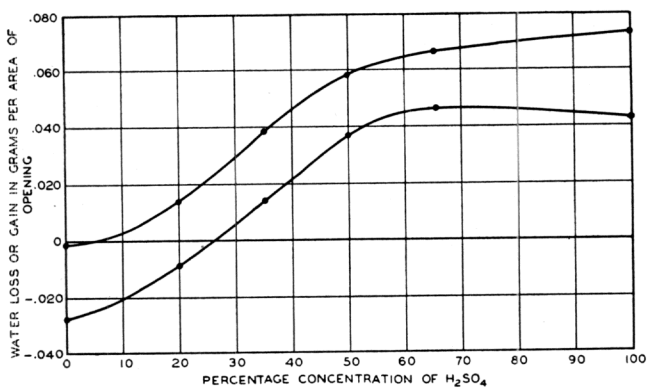
Few data are available on the influence of humidity and its effect on transpiration. General botany texts usually state something to the effect that if other things are equal, the drier the air the more rapid transpiration. No mention is made of the extent or degree of the influence of humidity. The statement is only a general one. It was hoped in this work to find some relationships between the per cent of humidity and the amount of transpiration.

The method employed was a local one on the lower surface of the leaves tested. Bottles were constructed which had an exposure area, to the leaf of .71 sq. cm. This area represented 1/25 of that of the inside area of the bottles. The humidity within the bottles was controlled by concentrations



Upper curve—Absorption of water from humid air in a 4 hour period.
Second curve—Water loss or gain by red coleus during an 8 hour period.

of sulphuric acid. Most of the experiments were performed by using 0, 20, 35, 50, 65, and 100 per cent sulphuric acid. These concentrations give a good humidity curve from near 0 to 100 per cent.

The low bottles were filled so that the sulphuric acid was 2 cm. from the opening of the bottles. The bottles were weighed and then exposed for an 8 hour period to the water loss from the lower epidermis of the plant leaves. The exposure was made by pressing the leaf against the opening of the bottle and holding it in place by a glass slide weight. After exposure, the bottles were again stoppered and weighed and the differences noted.

The results obtained were compared to the absorption by the same bottles from humid air. Exposure of the bottles to humid air gave the characteristic absorption curve predictable for these concentrations of sulphuric acid.

Results were obtained for red and yellow coleus, varieties of Coleus Blumei, cotton (Gossypium hirsutum), Hibiscus Rosa-sinensis and Lantana camara.

The graph illustrates the type of data obtained. A comparison is made between the water absorbed by the bottles from the air in a moist chamber and from red coleus plants. The two curves are quite similar. The greatest divergence in the two curves occurs at the highest concentration of sulphuric acid or in the region of the driest air.

The leaf tissues probably not only reach the limit of their water-supplying power but also there is a marked tendency for the stomata to close. Some of the other plants, especially cotton, showed a more marked drop in the curve. In the dry atmospheres there is a tendency for leaves to reach a limit in their water loss, beyond which transpiration is not increased with decreased humidity.

In the high humidity bottles, i. e., in the bottles having the low concentrations of sulphuric acid, the bottles lost water to the leaves. As these leaves were exposed to the dry air of the laboratory, they no doubt had a saturation deficit and that part of the leaf exposed to the humid air of the bottles absorbed moisture. Leaves can absorb moisture from the air.