



Shemuel Duvdevani, Caltech Research Fellow, sets up one of his dew gauge stations on the campus

DEW RESEARCH

Work in progress at the Institute's Earhart Plant Research Laboratory may have important applications in arid-zone agriculture

RECENT RESEARCH in the Institute's Earhart Research Laboratory indicates that dew may be an important factor in the growth of plants in semi-arid regions. Water-hungry plants, supplied with water by dew, were found to carry the water from their leaves and store it in their roots until it was needed.

This research project was started in Israel by Shemuel Duvdevani, head of the Dew Research Station at Karkur. It was sponsored by the Research Council of Israel and the Ministry of Agriculture.

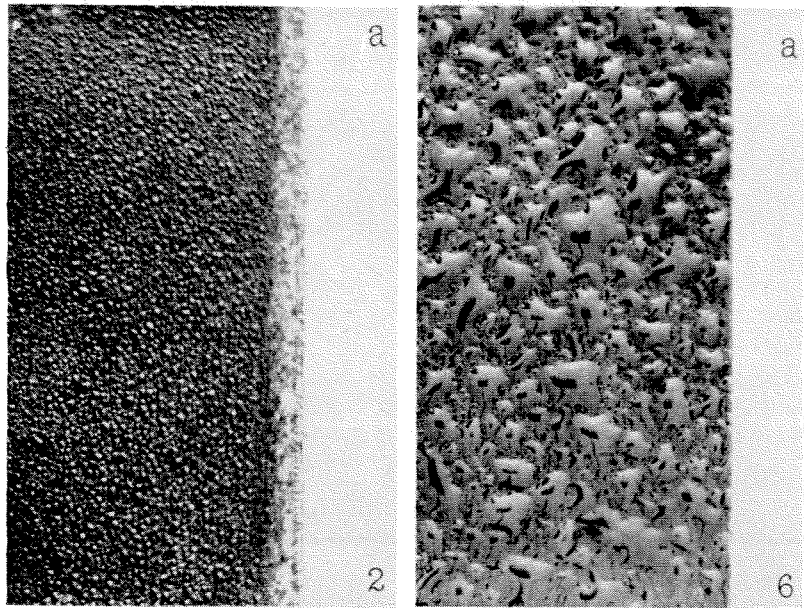
Since last December Duvdevani has continued his research on a fellowship at Caltech, working in the Earhart Plant Research Laboratory with Dr. Frits W. Went, Professor of Plant Physiology. The research is supported here by the Earhart Foundation and the United Nations Education, Scientific and Cultural Organization (UNESCO).

In Israel, Duvdevani observed that, in dry soil, plants that received dew grew better than those that did not. He also found that dew, condensing on the leaves during the cool of the night, could be taken into such summer crops as corn, cucumbers, watermelons, pumpkins and beans to promote their growth.

He came to Caltech to check his field findings under the highly controlled conditions of the Earhart Laboratory, in which the climate of virtually any area of the world can be duplicated.

Here he has been studying the relationship of water intake by leaves to the growth of corn, watermelons, cucumbers, beans, sugar beets, Brussels sprouts and tomatoes. He sealed the roots of partly-wilted plants in glass jars. Then, with temperatures held constant, the plant tops were sprayed eight hours a night with a fine spray of water to simulate dew. The plants recovered

During the night, dew is deposited on the Duvdevani gauge in certain patterns—each characteristic of the amount of dew. Patterns are identified by comparison with standard dew photographs like the two samples shown at the right.



and continued growing under this spray for weeks and months.

Duvdevani also found evidence of a “two-way traffic” for water movement through plants. During the experiments, droplets formed on the roots and root hairs and water accumulated in the jars. During one simulated dew period, some plants excreted many times their own weight in water through their roots.

For centuries it has been known that plants absorb water from the soil through their roots. They use some of it in photosynthesis and in the growth process, and give up most of it to the atmosphere through their leaves.

The experiments in Israel and at Caltech show that the reverse is also possible: Plants can absorb water through their wetted leaves and transport it to the roots

—as well as other parts—for night storage in the soil until photosynthesis begins after sunrise.

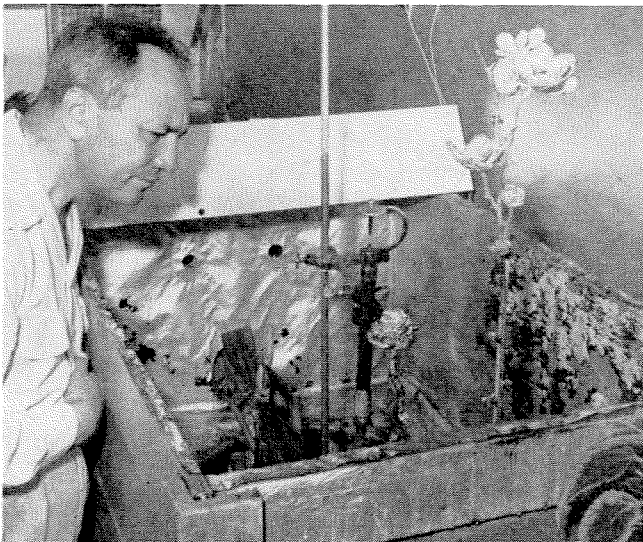
This process occurs in plants developed under fairly dry conditions, according to Duvdevani, who has also found that young plants and leaves show the best effects in the experiments.

The ability of leaves and roots to interchange their water functions under certain conditions provokes revision of basic concepts in the water physiology of plants. How much of the total water needs of plants in near-desert regions is contributed by dew or mist is not known. This phase of the problem is now being studied with the aid of a simple, easily-read dew gauge developed by Duvdevani several years ago and now in use in various countries.

Dew deposits on the gauge during the night in certain patterns, each characteristic of the amount of dew. The patterns are identified by comparison with standard dew photographs.

Systematic dew records have been obtained for a number of years with hundreds of such gauges throughout Israel. Now about 30 of the gauges have been set up on the Caltech campus, at the Los Angeles State and County Arboretum and in other southern California locations. Daily observations over a long period of time will give the distribution of dew in different localities, and this distribution can be correlated with phenomena of growth and vegetation.

Duvdevani expects that his investigations will provide information on the types of plants that can use dew and on the plant age and environment in which dew is most effective. This should help arid-zone agriculture, especially if the proper times can be determined for spraying plants with small amounts of water in areas where insufficient water exists for irrigation. Also dew, or water spray, may be a deciding factor under critical drought conditions when a few drops of water may determine whether a plant dries up or survives.



In the Earhart Laboratory Duvdevani keeps this Brussels sprout plant growing under a fine spray of water—and with its roots sealed in a glass jar.