

# Absorption of Artificial Dew

## ponderosa pine seedlings demonstrate ability to reverse usual procedure of plant transpiration

Edward C. Stone and Ami Y. Shachori

**The life expectancy** of ponderosa pine seedlings—growing in dry soil—can be materially increased by artificial dew, according to the results of recent studies.

A series of laboratory and greenhouse experiments were undertaken to find an explanation of the ability of ponderosa pine seedlings to survive in soil too dry to support associated grasses and herbaceous vegetation. Some of the experiments are still under way.

Two-year-old ponderosa pine seedlings obtained from the United States Forest Service nursery at Oakdale were received in Berkeley where they were immediately placed in cold storage and held at 41°F until used. The seedlings were in excellent condition with well-developed top and root systems.

In the first experiment, the seedlings were removed from storage to the greenhouse, where the dirt and peat moss in which they were stored were washed from the roots. The roots were shaken free of water and lightly blotted with paper toweling. The roots of each seedling were inserted into the top of a two-liter suction flask. A split single-hole rubber stopper was carefully fitted around the stem of each seedling and inserted into the mouth of the flask. The stopper was pushed in very tightly by the use of the clamp system shown in the accompanying photograph. The side arm of the flask was attached to a manometer and a vacuum line, and checked for leaks. When it was certain that there were no leaks, the side arm was again opened to allow air to re-enter and then closed with a piece of rubber tubing and a pinch clamp. Finally, the flask, with its contained seedling, was turned upside down and placed under a continuous mist spray.

Within 12 hours, water had started to accumulate inside the flasks. This was removed periodically and measured. The amounts are shown in the table on page 10.

These results demonstrate that under the conditions of the experiment, the usual water movement in the pine seedling—from roots to top growth—can be reversed. Instead of water passing into the roots and out of the leaves, it passes into the leaves and out of the roots.

Examination of the roots during the course of the study did not show any

evidence of water being excreted as drops. Furthermore, within a week all the roots, except for the few that were in direct contact with drops of water on the walls of the flask, were shriveled and appeared dead. In spite of this changed appearance of the roots, there was no consistent change in the rate of water uptake with time. The tops remained green and in a few cases the buds opened and some new needle growth occurred.

The second experiment was organized in the same manner as the first, except that the seedlings were allowed to dry out on a laboratory shelf for a week be-

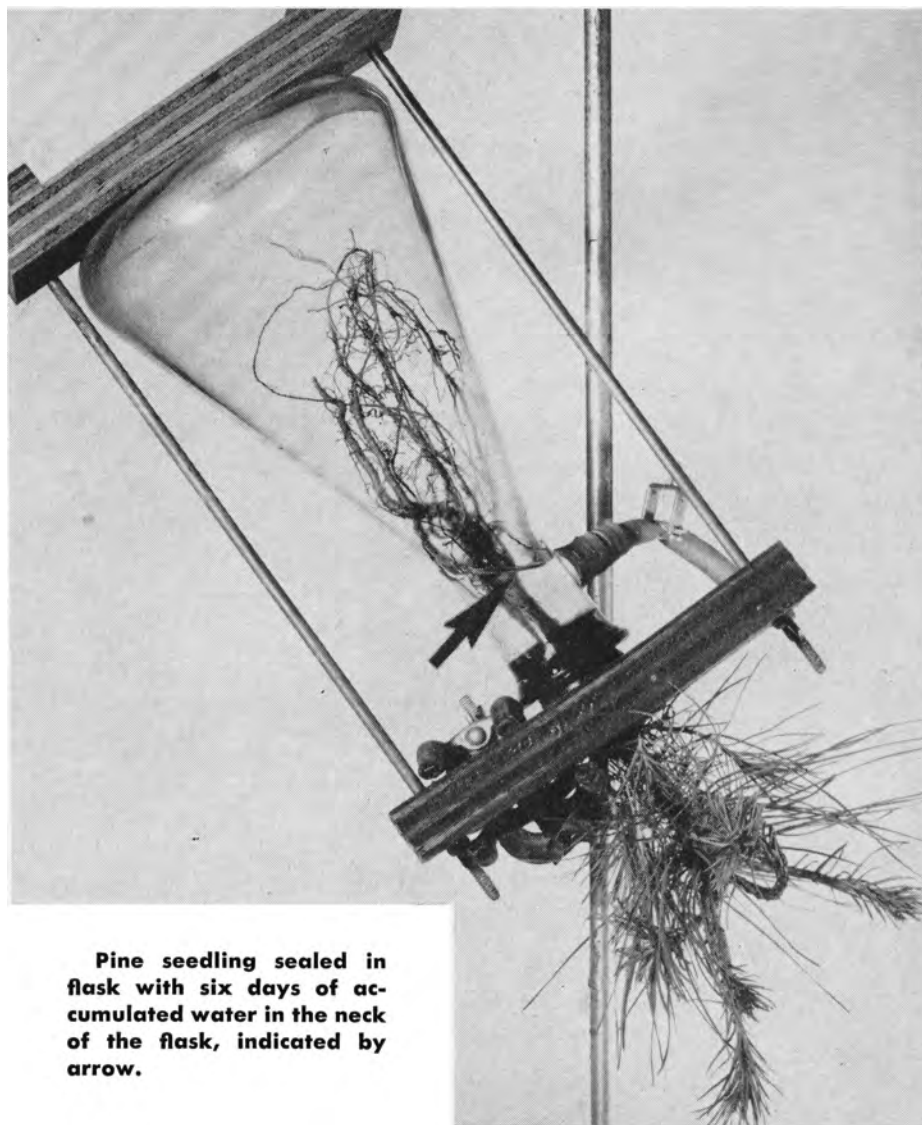
fore being placed in the suction flasks. By that time the seedlings had turned brown and seemed to be dead.

Water did not accumulate within the flasks enclosing the roots of these seedlings—even after two weeks under the continuous spray.

It would thus appear that a live top or at least one that has not dried out is necessary if water is to move backwards in the pine seedling.

At present, experimental data is much too meager to offer any explanation of the negative-transpiration phenomenon

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Pine seedling sealed in flask with six days of accumulated water in the neck of the flask, indicated by arrow.

## CARROTS

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were grown near San Jose for comparison as to composition.

The test roots were harvested at the proper stage for market. Two lots were grown in the same area; one was harvested in August and the other in February. Examination showed some variation in composition within the four varieties. Imperator seemed to be high in composition for several of the constituents—dry matter, energy, calcium, and phosphorus. The Nantes variety was low in phosphorus, vitamin A, and riboflavin. Imperator seemed relatively high in many of the nutrients. The differences between varieties as to waste in preparing the roots were not important.

The results of the tests reported here are a survey and indicate possible trends, since the experiments and plots were not replicated and therefore cannot be statistically analyzed.

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*The foregoing article is based on the technical report Some Horticultural Aspects of the Food Value of Carrots by the same authors and published in the Proceedings of the American Society for Horticultural Science, 60:351-359, 1952.*

## BROILERS

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broilers; and c, through their oversetting and undersetting practices.

The first two of these factors have their principal influence on long-run changes in output; the last principally affects short-run changes. Except for these factors, hatcheries acted in the capacity of suppliers of chicks in accordance with the orders of their customers.

During the year of this study, California broiler chick hatcheries appeared to be a neutral influence on short-run changes in output in that there was little evidence that they made significant production decisions other than decisions to utilize their excess production capacity, to take advantage of changes in their customers' minds, and to avoid surpluses. The chicks hatched as a result of these decisions represented a small proportion of their total output.

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*California, Los Angeles, when the above-reported study was made.*

*The above-reported study is part of a larger project which will include analyses of the role of hatcheries, financing agencies, processors, and broiler producers on broiler output fluctuations. The over-all project is being conducted by the Western Regional Poultry Marketing Committee, WM-7.*

## POINSETTIA

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develop properly. These deformed bracts are unable to reach maturity but abscise and leave the open center commonly seen in plants of the Henrietta Ecke variety.

Plants which were grown under maximum light intensities—about 3,000-foot candles—produced flowers with normal central bracts. Plants under low light intensities—500- to 600-foot candles—abscised bracts readily. Furthermore, plants grown under high light conditions had larger outer bracts, a more intense color, were shorter, and were generally more desirable plants than those grown under low light conditions.

Quality plants of the double-type Henrietta Ecke variety can be produced and timed for the Christmas holiday trade by growing the plants under high light intensity conditions—with modification of usual watering and fertilizing practices—and by later propagation to avoid too tall plant growth. Such changes may take some time, but when growers do make them, the public will be rewarded with top quality double poinsettias.

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*The above progress report is based on Research Project No. 1470.*

## PONDEROSA

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demonstrated in the first experiment. It may well be that within the completely artificial system that was set up in these experiments, vapor pressure gradients exist which do not exist under natural

## GROUND PEARL

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festations have been encountered in heavy clay soils.

Since ground pearls have been found on grape roots 24" deep—which was the approximate extent of root penetration—it seems likely that they may be found even deeper.

## Insect Described

The adult female of this pest has well-developed forelegs bearing strong claws. She produces an egg sac of white waxy filaments and deposits within it over 100 eggs, which are pinkish-white in color. The dead body of the female closes off the end of the egg sac. Hatching observed in 1954 began during the latter part of June and continued into late July. The crawlers are elongate, slender, and quite active. They attach themselves by means of their needlelike mouthparts to a fine rootlet and eventually secrete the hard, glassy covering characteristic of the intermediate pre-adult stages. It is from the appearance of these later immature stages—globular in shape and with a pearly, faintly yellowish-green color—that the common name ground pearl is derived. Other details of the life history of this potential pest to California grapes are at present unknown.

Additional studies of this subterranean scale insect are planned, including chemical control tests.

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soil conditions. Continuing work should provide the answer.

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### Water Removed from Flask

Accumulative total in milliliters

Elapsed time (days)	Live seedlings started May 1				Live seedlings started July 1				Dead seedlings			
	1	2	3	4	1	2	3	4	1	2	3	4
1	1.5	1	1.5	1	3	.5	1.5	.5	0	0	0	0
4	6	5	6	5	5.5	1.5	4.5	3.5	0	0	0	0
7	17	8.5	10	8.5	7.5	2.5	6.5	6.5	0	0	0	0
13	30.5	11.5	16.5	13.5	10.5	4.5	10	11.5	0	0	0	0
19	36	14	28	21	11.5	6	13	13.5	—	—	—	—
25	65	17	40	29.5	13.5	8	16.5	16.5	—	—	—	—
31	82	—	62	45	14.5	9	20.5	18	—	—	—	—