ROOT DEPTH STUDIES WITH DESERT HOLLY

Atriplex hymenelytra

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Atriplex hymenelytra (Torr.) Wats. (desert holly), a highly drought-resistant desert plant, was used as a test plant to study root behavior in wet and dry soils. Roots did not penetrate dry soil, but continued to grow profusely in soil having adequate soil moisture. Roots extracted water from soil progressively downward. They dried soil to –60 bars even though more water was available at a greater depth.

PLANTS GROWING in arid regions have developed ways of surviving conditions of low soil water content. One survival mechanism is an extensive root system which can forage for water from a large soil volume. Plants may also become partially dormant during periods of extreme water stress and may rejuvenate during rain.

A study of the effect of various water regimes on rate and depth of root penetration was conducted on desert holly (*Atriplex hymenelytra* (Torr.) Wats.). The growth containers were 10 cm in diameter and 300 cm deep. A black plexiglas tube drainline pipe was used for the container. Sections were cut out at seven positions over the length of the column for root observation. The cut-out section was then replaced and taped in place for support. The entire column was wrapped with aluminum foil to reflect light. A wooden plug with drain holes was inserted at the bottom.

Three water treatments were imposed. One treatment consisted of wetting the entire soil column initially and then adding water twice weekly to maintain a wet condition. In the second treatment the soil was initially wet throughout the column, but no further water was applied after plants were transplanted. The third treatment consisted of wetting the soil column to a depth of approximately 100 cm. Water was periodically added to maintain a relatively high water content in the upper 100 cm, but not enough to penetrate beyond 100 cm. Each treatment was replicated.

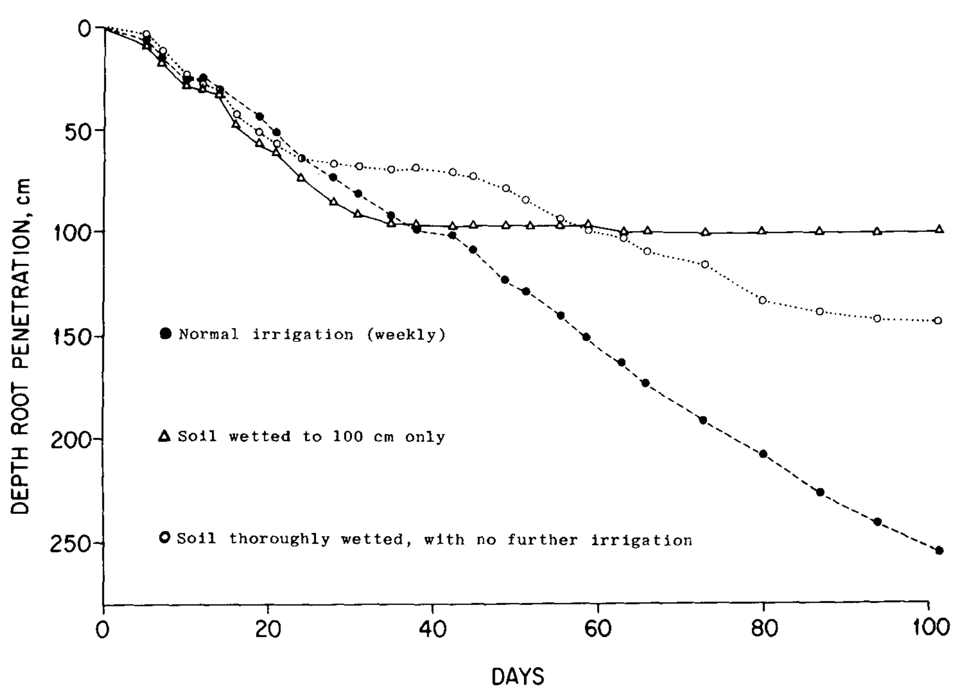
Tensiometers were installed at 30 and 100 cm in the weekly irrigated treatment to indicate resultant soil water potentials. Thermocouple psychrometers were installed slightly above and slightly below the wet/dry interface in the treatment where the upper 100 cm were maintained wet. Thermocouple psychrometers were initially installed at 15 cm for the treatment which had no watering after the initial profile soaking. When the soil water potential at 15 cm fell below –60 bars, psychrometers were moved to 30 cm and then to 100 cm.

Oxygen diffusion rate measurements were made by the platinum micro-electrode technique immediately after irrigation on the biweekly irrigated treatment.

Root penetration

The average depth of root penetration at various dates following transplanting is indicated in the figure. The rate of growth was somewhat independent of treatment for the first two or three weeks. Roots grown in containers irrigated biweekly essentially stopped elongation between the 28th and 43rd day. Readings

DEPTH OF ROOT PENETRATION WITH TIME OF **ATRIPLEX HYMENELYTRA** SUBJECTED TO THREE DIFFERENT TYPES OF IRRIGATION



on the tensiometer indicated that water was being applied when the potential at 30 cm reached between –50 and –20 centibars and reached between –5 and –0 centibars at 100 cm. The oxygen diffusion rate measured at 30 cm when the soil-water potential was –10 centibars was 0.04 $\mu g\ cm^{-2}\ min^{-1}$. This oxygen diffusion rate is very low and probably indicates too little oxygen for maximum root growth. Following these observations, the amount of water added each week was reduced and root elongation was again initiated after the 42nd day.

The roots did not grow into the dry layer in the columns which were wet to 100 cm. The data indicate that these plants were not able to transfer water within the root system from zones of ample water to zones of inadequate water supply. The roots immediately above the dry layer were growing profusely, but did not penetrate into the dry layer.

Root penetration was at a constant rate for the columns which were watered only initially. Roots extracted water from the soil progressively downward. In one container, the soil-water potential never reached as low as –60 bars at 15 cm. The soil-water potential was lowered to at least –60 bars at 15 and 30 cm in another replication. These data indicate that the shrubs are capable of lowering the soil-water potential, even though more water is available at greater depths.

Apparently roots of this desert shrub will grow wherever there is water, but will not grow into extremely dry layers.

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RESIDUAL EFFECTS OF LETTUCE HERBICIDES ON FOLLOWING CROPS

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LETTUCE IS THE most important vegetable crop grown in California's Imperial Valley, grossing up to $73,000,000 annually. Nearly all lettuce in the valley is treated with herbicides—mostly with Balan (benefin). Balan has a broad weed spectrum; however, growers have known for some time that Balan residues may cause damage to sorghum plantings that follow lettuce crops. Kerb (pronamide) has now been released for use on lettuce, and has been found to be an excellent herbicide against weeds in the mustard group, such as London Rocket, normally not controlled with Balan. Little information was available, however, about residual effects of Kerb under desert conditions, except that it could damage cereal crops planted after lettuce.

The experiment reported here was designed to evaluate the effect of Balan and Kerb on 13 crops which could be planted

Reduction in stand and growth is shown for the 4 lb (twice label rate) of Kerb. Crops were planted 84 days after a treatment to a lettuce crop which "failed."