

SOME EFFECTS OF WATER AND OXYGEN ON ABSCISSION *IN VITRO*

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(WITH TWO FIGURES)

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Some early experiments conducted in this laboratory showed an inhibition of abscission in explants (excised foliar abscission zones) immersed in water (3). Later experiments showed a similar inhibition in explants immersed in mineral oil or in nitrogen. Other experiments showed a retardation of abscission in explants treated daily with single 0.005 ml. droplets of water. The data from 10 such experiments with water droplets, each involving 20 or more explants of the Black Valentine bean, are summarized in figure 1. The methods employed in these experiments have already been reported (1).

A factor common to these experiments is restriction of the supply of oxygen. To obtain further evidence on the possibility of a relationship between restriction of the supply of oxygen and inhibition of abscission, another series of experiments was performed with explants of the Black Valentine bean. In some of the experiments explants were immersed in double distilled water in a glass-sintered filter and the gas mixture passed upward through the filter disc into the water at a rate of 100 ml. per minute. In other experiments the explants were impaled on glass pins in Petri dishes (1), placed in desiccators and the atmosphere of the desiccator replaced by flushing with a gas mixture at a rate of 243 ml. per minute for 80 minutes. By the end of this time only 0.1% of the original atmosphere remained. The desiccator was then sealed. Seven gas mixtures were used: 100, 60, 40, 20, 10, 5, and 0% oxygen, the balance in each case being made up of nitrogen. The mixtures were obtained by the use of the flowmeters described by BIALE (2).

The explants in desiccators with gas mixtures ranging from 10 to 40% oxygen abscised at a rate that was positively correlated with oxygen level. The explants immersed in water through which bubbled gas mixtures ranging from 20 to 55% also abscised at a rate positively correlated with oxygen level. That is, within the limits designated, an increase in rate of abscission occurred with each increase in oxygen level. Above the oxygen levels of 40 and 55% there was, however, no further increase in rate of abscission. And at any given oxygen level below 55% the explants in water had a lower rate of abscission than did the explants in the desiccators.

These results are summarized in figure 2, where the rate of abscission at each oxygen level is expressed in the number of days required for the abscission of half the explants exposed to that level. Each point on the curve is an average of the response of from 20 to 90 explants.

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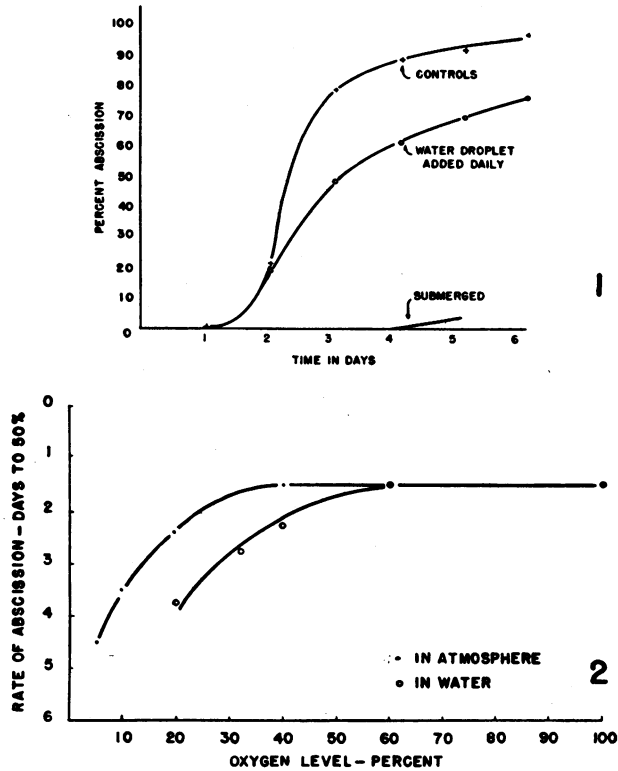


FIG. 1. The effect of water on the abscission of explants.

FIG. 2. The effect of oxygen on abscission of explants (a) in gas mixtures, (b) submerged in water.

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