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1

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Effects of NaCl, Na₂SO₄, H₂SO₄, and glucose on growth, photosynthesis, and respiration in the acidophilic alga *Dunaliella acidophila* (Volvocales, Chlorophyta)

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Abstract

Dunaliella acidophila, an acidophilic, unicellular green alga, was tested for its tolerance to the ionic solutes NaCl, Na₂SO₄, and H₂SO₄ and to a nonionic, nonpermeant solute, glucose. Since the alga suffered from osmotic stress, slow adaptation was essential in order to allow growth at high solute concentrations. There was no significant effect related to the solute type. However, in adapted organisms salts affected growth more than did glucose at similar osmotic pressures. NaCl was more inhibitory than Na₂SO₄. Growth in media at a pH lower than 1.0 needed a period of adaptation. The lowest pH limit tolerated was pH 0.2. Adaptation to a high concentration of H₂SO₄ gave rise also to an adaptation to other solutes. Moreover the effect of H₂SO₄ concentration on growth rate is similar to that of Na₂SO₄. Combined effects of temperature and solutes on the growth rate of *D. acidophila* indicated that the optimum temperature for growth is dependent on solute concentration in the medium. At 27°C the optimum solute concentration was 0.8 osmolality, and at this concentration the cells could grow even at 31°C. At a lower or higher osmolality there was a partial or complete inhibition of growth. The effects of solute on the photosynthetic and respiratory rates showed that

photosynthesis was not significantly affected, while a slow but constant increase of the respiratory rates resulted from increasing the osmolality of the medium.

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