

Air Ions Aid Plant Growth

Richard M. Smith and
Wallace H. Fuller

The term "ionizing radiation" has become alarmingly fashionable nowadays. Technically it refers to the ability of radioactive materials to ionize the air around them.

As shown in our table, radiation is just one of many agents that produce air ions in nature. Most of the time, air is a very poor conductor of electricity. If air is "ionized"—that is, if large numbers of air molecules acquire positive and negative charges—the conducting ability of air increases. This is seen most dramatically in the lightning flash.

Recently much attention has been given to the significance of air ionization in human health. A *Reader's Digest* article last year attributed extraordinary powers to air ions. Carefully controlled experiments by Krueger and Smith at the University of California have established that air ions can cause certain minor but consistent changes in animal cells and enzyme systems. The therapeutic value of these changes, if any, is still being debated.

New Aspects of Study

No comparable attention has been given to the effects of air ions on plants. Even before Benjamin Franklin's famous kite experiment, European scientists were studying the effect of electricity on plant growth. But the effect of air ions *per se* on plants has remained unexplored.

Last year, University of Arizona scientists began a systematic study of the influence of air ions on plant life. So far we have been able to show that under certain conditions ionized air will increase plant growth. We have identified the component of ionized air responsible for this

The authors are members of the Department of Agricultural Chemistry and Soils.

effect. And we have in part revealed the biochemical mechanism involved. Working first with a common species of algae, we found that positively-ionized air had an obviously stimulating effect on algal growth and reproduction.

By means of special techniques, we were able to identify the biologically active component of ionized air as positively-ionized carbon dioxide. We then turned our attention to the baffling question of just how positively-ionized CO₂ brings about these effects. Photosynthesis is not involved in the mechanism, since the increased growth effect occurs when oat and corn seedlings are grown in complete darkness. However, we soon found that air ions can change levels of the growth hormone, indole-3-acetic acid (IAA), within the plant.

Could Spur Growth

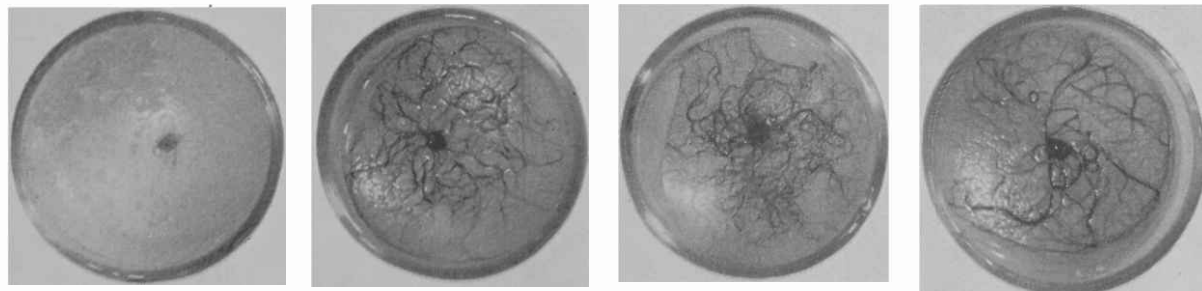
This plant hormone occurs in both a "free" and a "bound" form. The oat seedling, for example, contains 12 times more bound IAA than free IAA. If positive air ions were to release only half of this, a measurable growth increase would result. The ability of positively-ionized air to alter IAA levels within plants suggests a number of possible agricultural applications: the control of flowering and fruit-set, for example; the stimulation of rooting; the elimination of pre-harvest fruit-drop; and the control of dormancy in seeds.

Lately the importance of controlling air-ion densities in submarines and space capsules has been demonstrated. If algae are used in these vehicles to supply oxygen, our discovery that air ions can alter algal growth will be an additional factor to be considered.

Sources of Air Ion Formation in Nature

1. Radiation: (a) From radioactive substances in the soil
(b) From radioactive gases produced by the decay of (a)
2. Cosmic radiation
3. Electrical discharges
4. Short wave ultraviolet light
5. Frictional electricity generated by:
 - (a) rain or waterfall droplets
 - (b) blowing sand, dust, or snow

BELOW IS SHOWN effect of positive air ions on growth of algae. The three samples on the right received ions, while the one at the left received no ions.



Hillman New Head Of Agric. Economics

New head of the Department of Agricultural Economics at the University of Arizona is Jimmye S. Hillman, a man with a southern background and considerable firsthand knowledge of Latin America. Dr. R. E. Seltzer, former head of the department, has gone to a private research agency in Kansas.

Dr. Hillman was born in Mississippi, grew up there and received his bachelor's degree from Mississippi State College. His master's was received at Texas A and M and his doctor's degree from the University of California. Married, he is a father of three children.



DR. HILLMAN

Dr. Hillman's Latin American contacts were made during a 1955-57 leave of absence when he was economist with the U. S. Mission to Brazil, at Rio de Janeiro; also during a month in the summer of 1960, when he was economic consultant at Santiago, Chile, for the Organization of American States. The UA economist also took advanced studies at the University of Guadalajara, Mexico, in the summer of 1947.

Among his many published papers of an economic nature are several which reflect this interest in Latin America. "Economic Development and the Brazilian Northeast" was published in Portuguese and widely distributed in both Portuguese and English. "Problems of Increasing Agricultural Activity in Less Advanced Countries," published in the *Journal of Farm Economics*, has been distributed by the U. S. International Cooperation Administration as a text on economic development problems.

Dr. Hillman served in the infantry in World War II, from the spring of 1942 to the spring of 1945. He came to the University of Arizona as an assistant professor in 1954 when George Barr was head of the Department of Agricultural Economics. Hillman was named an associate professor in 1954 and full professor in 1959.