COMMENTS

by Readers

Promotion and inhibition of growth may be produced by the same substance at different concentrations. Thimann (*Amer. J. Bot.*, 1937, **24**, 407-412; quoted from Meyer and Anderson. *Plant physiology.* New York: D. Van Nostrand, 1939. P. 580) suggests that "roots, buds, and stems all react in a comparable way to auxin, their growth being inhibited by relatively high and promoted by relatively low auxin concentrations, (and that this) is a possible explanation of the contrasting effects of auxins upon elongation in roots and aerial organs. Elongation of roots is favored only at very low concentrations; at all higher concentrations their growth is checked. Stems and coleoptiles show a similar behavior except that the optimum range of concentrations for elongation is much higher than for roots. The same concentrations of auxins which favor stem elongation result in a retardation of root elongation.... Briefly, therefore, whether auxin will exert an accelerating or an inhibiting effect upon growth seems to depend in part upon its concentration and in part upon the specific tissue involved."

Engard and Nakata (*Science*, May 30, pp. 577-580) present evidence for the presence in sugar cane of both a growth inhibitor and a growth promotor. In view of the above findings by Thimann and the more recent work by Eyster (*Plant Physiol.*, 1946, **21**, 68-74) it seems very likely that the growth inhibitor and growth promotor in sugar cane are one and the same substance, producing differences in growth reactions because of differences in concentration. It is expected that acid will extract the growth substance more completely and more rapidly than water. The "acid fraction" may also owe some, or a dominant part, of its activity to the tartaric acid which was used for extraction purposes.

For comparative reasons it would be well to have a control using tartaric acid without any extract and another control using water without any extract. It would also be well to determine the *Avena* curvature produced by dilutions of the acid fraction. Dilutions of 10×, 100×, 1,000×, and 10,000× are suggested. Controls of these dilutions should also be run, and curvature determinations should be made. When this is done, there is a reasonable feeling of confidence that these isolated bits of evidence on auxins can be brought into agreement and perhaps result in a somewhat more complete picture of their true activity. (H C. EYSTER, *Charles F. Ketering Foundation, Yellow Springs, Ohio.*)

Description of centrifuge operations in terms of duration and speed is indeed inadequate, as Costello points out (*Science*, May 2, p. 474). It is unfortunate that correspondence directed toward correction of an incomplete system of description should contain a looseness of terminology which beclouds the issue.

The formula, $c' = \frac{4\pi^2 n^2 r}{g}$, attributed by Costello to Heilbrunn, has been a part of the ordinary college course in general physics for decades, c' representing *not* "the centrifugal force in terms of gravity" but the ratio of the central acceleration (accompanying uniform circular motion) to the standard value of the acceleration due to gravity. More concisely, c' is the "centripetal acceleration in g's." It is not a force. (n is the number of revolutions per second; g, the standard acceleration due to gravity, in cm./sec.^{2}; and r, the distance, in centimeters, from the center of rotation to the material.)

The distinction between acceleration and force is far from trivial in centrifuging, for the separation of materials of different densities results from the difference in force. However, at a given speed and given radius from the axis of rotation, the acceleration is the same for all materials; the separation is produced by unbalance of forces arising from nonuniformity of density. It is therefore appropriate to describe the centrifuging in terms of c', but this is *centripetal acceleration*, not centrifugal force.

The emphasis given by Costello to the importance of estimating r with great care should be balanced by the remark that the percentage uncertainty in r may reasonably be twice that in n, since r occurs in the first power, while n occurs in the second power (Eshbach's *Handbook of engineering fundamentals.* New York: John Wiley, 1936). In this connection there would be considerable value in following the practice of specifying the percentage uncertainty in r and n in reporting centrifuge operations.

Finally, the formula should be reduced for convenience to the form

$$c' = 4.029 \times 10^{-2} n^2 r,$$

which is obtained by substituting numerical values for $4\pi^2$ and for the standard value of g. (HOMER C. KNAUSS, *Raytheon Manufacturing Company, Waltham, Massachusetts.*)

In regard to the results of creatinine, hippurate, and inulin clearance estimations in rats by M. Friedman, Dicker and Heller (*Science*, August 8, p. 127) point out the possible inhibition by pain and anesthesia of urine flow in rats. We have recently conducted experiments on humans employing prolonged exposure (15 minutes) of one limb in an ice-water bath. Our results show a pronounced inhibition of urine excretion during, but particularly following, this experience. This phenomenon was associated with an increase in specific gravity of the urine and, in some instances, a change in protein excretion per minute. Experiments conducted under anesthesia (ethylene, cyclopropane, and various levels of spinal anesthesia) indicate that this pain stimulates the liberation of an antidiuretic hormone. The site of liberation is probably not within the immersed limb or within the kidney (since it was not present in high levels of spinal anesthesia if the lower extremity was used). Evidence supports its origin as being above the level of cervical 4. It was also our impression that the site of liberation was the posterior pituitary gland, although we were unable to show conclusively by bioassay on rats that the serum concentration of antidiuretic hormone increased in the patients so tested. (L. D. ODELL and G. T. ARAGON, *Department of Obstetrics and Gynecology, University of Chicago.*)