sation of the growth of sarcoma 37. This phenomenon is striking; whether or not the concomitant tumor necrosis was the result of a specific action of the drugs used cannot now be answered. The effects noted may also be explained as the result of the prolonged depressed state with accompanying inanition, dehydration, changes in metabolism, lowering of body temperature, and a drop in blood pressure with consequent hypoxia. All these are factors which by themselves can produce marked tumor damage and can slow tumor growth.

The appearance of fat granules in the ascitic cells similarly may be the result of the depressed state of the host. Unlike the controls in which the ascites daily increased in volume, the ascitic fluid in treated mice was very scanty, thick and viscous, but rich in cells. As a result of the progressive dehydration and other changes, the metabolic state of the ascitic cells could well have been affected, and the fat granules (which many would call "degeneration" granules) could be the consequence of the changes.

Whether the action of these drugs is specific or is mediated through the host, it is suggested that these drugs provide an additional means for study of the host-tumor relationship, particularly in conjunction with other tumor-necrotizing drugs.

MORRIS BELKIN
WALTER G. HARDY
Laboratory of Chemical Pharmacology, National Cancer Institute, Bethesda, Maryland

References and Notes

1. A. Goldin *et al.*, *Science* 125, 156 (1957).
2. We wish to thank Ira Kline for preparation of the material that was treated with the special stains used in this investigation.
3. Serpasil (Ciba).
4. Thorazine (Smith, Kline and French).

26 November 1957

Effect of Gibberellic Acid on Growth of Maize Roots

Gibberellic acid has been shown to stimulate markedly stem and leaf elongation in a number of plants (*1–4*). The specific genetic constitution of a strain or variety appears to determine whether or not it will respond to applied gibberellic acid by increased shoot growth. So far the most notable responses have been observed in dwarf types. Phinney (*2*) has reported that applications of gibberellic acid to five single-gene, dwarf mutants in maize so enhanced growth that the treated plants were almost indistinguishable from plants carrying the normal alleles of the mutant genes. One other dwarf mutant made only a slight response, and another made no response. Such differential responses of shoot growth have also been reported in varieties of *Pisum, Phaseolus,* and *Vicia* containing dwarfism alleles (*1*). To date, the only experiments on root growth reported are those of Brian, Hemming, and Radley (*3*), who found that gibberellic acid had no significant effect on the growth of roots of cress seedlings.

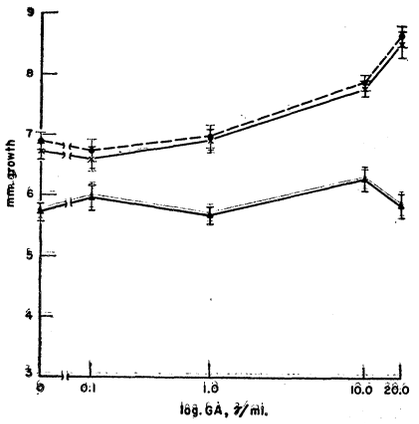

Fig. 1. Growth of excised, apical, 10-mm segments of primary roots of two maize inbreds and their hybrid as affected by gibberellic acid. The limits indicated at each graph point represent ± 2 times the standard error; ×, hybrid; ●, line 854, ▲, line 857.

In the work reported here, gibberellic acid (*5*) was added to White's supplemented solution (*6*) in which excised, apical, 10-mm segments of maize roots were grown for the 24-hour period representing the sixth to seventh day after the beginning of germination. Apical segments of both primary and adventitious seminal roots of two inbred lines of maize and their distinctly heterotic hybrid, bearing our laboratory numbers 854, 857, and 854 × 857, were used. Neither inbred line contains any dwarfism alleles, and other studies have shown that the growth rates of the inbreds beyond the very early seedling stage are comparable to the growth rate of the hybrid. The effects of gibberellic acid on growth of excised apical segments of primary roots are shown in Fig. 1. The points on the graph for 0.1, 1.0, and 10.0 μg/ml represent means of three or four replicates of at least ten roots each. The smallest number of roots represented is 35, the largest 93. The points for 20.0 μg/ml represent only single tests with 16 to 40 roots. The supply of gibberellic acid was too limited to permit repetition of the 20 μg/ml tests. The primary roots of line 857 were not affected by gibberellic acid over the range of concentrations used. Those of line 854 were significantly stimulated by concentrations of 10 μg/ml and further stimulated by 20 μg/ml. At 20 μg/ml, growth was increased on the order of 24 percent. The effect on the primary roots of the hybrid appears to be identical with that upon the roots of 854. The curves suggest that the primary roots of 854 and the hybrid might be further stimulated by higher concentrations.

The growth of the adventitious seminal roots was affected by gibberellic acid in the same manner as the growth of the primary roots, but the amount of stimulation of 854 and the hybrid was proportionately less than that in the primary roots, about 12 percent at 20 μg/ml. The adventitious seminal roots are of later origin than the primary roots, and they normally grow somewhat less than the primary roots under the conditions and during the experimental period used here.

More extensive experiments with the effects of gibberellic acid have been carried out (*7*), and it may be noted that all our results indicate that the root growth in certain genotypes of maize is significantly stimulated by gibberellic acid. The results presented in this preliminary note, showing a positive growth response of one inbred, no response by the other inbred, and a hybrid response essentially parallel to that of the first inbred, suggest direct inheritance of a growth system which can be affected by gibberellic acid.

W. GORDON WHALEY
JOYCE KEPHART
Plant Research Institute, University of Texas, Austin, and *Clayton Foundation for Research*

References and Notes

1. P. W. Brian and H. G. Hemming, *Physiol. Plantarum* 8, 669 (1955).
2. B. O. Phinney, *Proc. Natl. Acad. Sci. U.S.* 42, 185 (1956).
3. P. W. Brian, H. G. Hemming, M. Radley, *Physiol. Plantarum* 8, 899 (1955).
4. B. O. Phinney, abstr., *Plant Physiol.* 31, Suppl. 20 (1956).
5. The gibberellic acid was kindly supplied by Curt Leben, Eli Lilly and Co., through Irwin Spear.
6. P. R. White, *A Handbook of Plant Tissue Culture* (Cattell, Lancaster, Pa., 1943).
7. A paper describing our more extensive experiments is in preparation.

5 November 1956

Radiocarbon Dates from Sandia Cave, Correction

Frank C. Hibben has reported in *Science* (*1*) that in 1948 the late Kirk Bryan submitted two samples of charcoal from Sandia Cave for radiocarbon age determination to W. F. Libby, who was then at the University of Chicago. Hibben reported that these samples came from fire hearths located in the Sandia level of the cave and that "From these two samples, tentative dates of 17,000-plus years ago and 20,000-plus years ago, respectively, were derived." There is no proof that these alleged dates were ever determined by radiocarbon analysis or that Bryan ever submitted any samples from Sandia Cave to any laboratory.