greatly stimulated with the acid. However, it was found that gibberellic acid treatments had little or no effect on the dry weight of Emerald zoysia roots. One hundred Kentucky bluegrass seeds were seeded in individual 6-inch clay pots containing sterile sand in January 1958. A randomized block design with six replications was used. Treatments included: a) optimum fertility plus gibberellic acid; b) optimum fertility, no gibberellic acid; c) low fertility plus gibberellic acid; and d) low fertility, no gibberellic acid. The optimum fertility level cultures received daily applications of a three-salt solution plus trace elements. Low fertility cultures received weekly applications of a measured amount of fertilizer solution plus trace elements. Water was applied to all cultures as needed. After the seedlings had reached a height of approximately 4 inches, 3 applications of gibberellic acid were applied as Giberel aerosol 50 ppm, February 3, March 3, and March 26. The cultures were harvested in April, at which time the top growth was removed and the sand washed from the roots. Data are presented as oven dry weight of both top growth and roots.

Figure 1 illustrates the influence of both fertilizer and gibberellic acid treatments on the top and root production after harvest. Gibberellic acid increased the length and weight of top growth over the 'no treatment' under both optimum and low fertility treatments; however, a reduction in the weight of roots was obtained from the gibberellic acid-treated cultures.

Table 1 gives the mean weight in grams of the top and root growth for all treatments and the shoot-root ratio. In comparing the effect of treatments on the root production of Kentucky bluegrass, optimum fertility plus gibberellic acid gave the lowest percentage (35.2%) of roots to top growth, followed by low fertility plus gibberellic acid (44.2%). The percentage of roots to top growth was largest (63.4%) for the low fertility and no gibberellic acid treatments. Similar results were obtained when the shoot-root ratio was used.

The shoot-root ratio is influenced by many factors. The kind and magnitude of these effects depend largely upon the environmental conditions to which the plant is exposed. The influence of gibberellic acid on root production may, perhaps, be compared to that produced by excess nitrogen.

When the supply of fertilizer, particularly nitrogen is increased, a larger percentage is translocated into the aerial portion of the plant, thus increasing vegetative development. Because of the rapid vegetative development of the aerial portion of the plant, the proportion of carbohydrate foods which are translocated to the roots may be relatively small. The net result is a higher shoot-root ratio than when the plant is grown in soil which is deficient in nitrates.

It may be concluded that repeated applications of gibberellic acid reduce the quantity of roots produced by Kentucky bluegrass at both fertility levels used for this study. Additional research is needed to determine whether root production is reduced under field conditions with repeated applications of gibberellic acid. The additional top growth or spread of grasses obtained with repeated applications of gibberellic acid may be offset by such root reduction.

WEATHER RECORDS AND WINTER HARDINESS

The severity of a winter is ordinarily established by reference to U.S. Weather Bureau records for the area in question. Investigators studying hardiness frequently use these records in interpreting the spring survival of a crop. Recent observations, however, indicate that official temperature records may have limited usefulness to the investigator who is attempting to determine the causes of differential spring survival.

Continuous field records of temperature at ground level and at 5 inches above the soil were recorded with a 2-pin thermograph for 2 years. These were compared with the 4½-foot-level temperatures recorded by U.S. Weather Bureau Station located at a nearby field. The comparisons illustrated the vast differences in temperature which may exist at different heights above ground level at any given time. For example, on January 15, 1957, the official air temperature at Ithaca, New York, was -24.5°F. This temperature would indicate conditions of extreme cold stress to winter oats plants under study in the field nearby. Such was not the case, however, for the temperature at ground level, under an 8-inch blanket of snow, dropped only 2 degrees, from 32 to 30°F. Again, in 1958, the insulating effect of snow maintained a continuous ground level temperature between 30 and 32°F. For 83 consecutive days. During this period the 4½-foot temperature records reported temperatures as low as -14.2°F.

Even in the absence of snow cover, temperature readings at ground level may vary markedly from those at the stand-

![Figure 1—Effect of gibberellic acid on top and root production of Kentucky bluegrass under two levels of fertility. A—high fertility plus GA; B—high fertility, no GA; C—low fertility plus GA; D—low fertility, no GA.](image-url)