

The Effect of Gibberellic Acid, Indole-3-Acetic Acid, and Adenine Sulfate on the Emergence and Seedling Growth of Pecans¹

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A number of plant growth regulators, both synthetic and naturally occurring, are known which will promote various types of plant growth (Leopold, 1962; Tukey, 1954; Weintraub and Norman, 1949). Certain of these chemicals, including several auxin and antiauxin type compounds, are effective in increasing the rate of seed germination, root initiation, stem elongation, leaf growth, flowering fruit set, maturation, and ripening. Gibberellin (GA) also has been found to be effective in promoting various types of plant growth (Hayashi, 1940; Wittwer and Bukovak, 1957).

Recently it was reported that soaking pecan seeds in up to 5,000 ppm GA resulted in earlier germination and subsequently higher germination percentages than non-treated seeds during a 120-day growing period in the greenhouse (Wiggans and Martin, 1961). In order to determine whether this same effect held true in field plantings a study was conducted at Stillwater, Oklahoma in 1961 and 1962. The results are reported herein.

Materials and Methods

Mature 'Western' and 'Riverside' pecan seeds, with specific gravities ranging from 0.80 to 0.85 (Sitton, 1944), were selected and soaked at room temperature, 70 ± 3 F, for 48 hours in various concentrations of gibberellic acid (GA), indole-3-acetic acid (IAA), and adenine sulfate (AdS) just prior to planting. A non-soaked check and a 48-hour water soaked check were used as control treatments. Two drops of Tween "20" wetting agent were added to each 100 ml of soaking solution. There were ten seeds per treatment with six replications. The first planting was on February 13, 1961 and a second one on March 12, 1962. Seeds were planted from three to four inches deep in a Port silt loam soil in the Horticultural Department nursery at Stillwater and were irrigated as needed.

The number of seeds which germinated and emerged from the first planting were counted every 12 days, from May 7 to June 24, and again on October 18, 1961. The height of each plant, from ground level to the tip of the growing point, was measured on July 24, 1961.

The number of seeds which germinated and emerged from the second planting were counted at monthly intervals beginning on May 14. The height of each plant, from ground level to the tip of the growing point was measured on October 14, 1962.

Results and Discussion

The average percent emergence of the non-soaked check, the 48-hour water soaked check, the 100 ppm GA, the 100 ppm IAA, and the 100 ppm ADS soaking treatments of 'Western' and 'Riverside' pecans at various times allowing the February 13, 1961 planting date are shown in Figures 1 and 2, respectively. The GA treated 'Western' pecans (Fig. 1) germinated and emerged somewhat earlier than did either the check treatments or the IAA and the AdS treatments. Neither GA, IAA, nor AdS had any

effect on the speed and percent emergence of 'Riverside' pecans. Concentrations of GA, IAA, and AdS higher or lower than 100 ppm reduced the percent emergence of 'Western' pecans.

The average percent emergence of the non-treated check, the 48-hour water soaked check, the 100 ppm GA, the 100 ppm IAA, and the 100 ppm AdS soaking treatments of 'Western' and 'Riverside' pecans at various times following the March 12, 1962 planting date are shown in Figures 3 and 4, respectively. Again, the 100 ppm GA treatment resulted in somewhat earlier germination and emergence than did either the check treatments or the IAA and AdS soaking treatments with 'Western' pecans (Fig. 3). The treatments had no apparent effect on the speed and percent emergence of 'Riverside' pecans. Concentrations of GA, IAA, and AdS higher or lower than 100 ppm caused slower germination and reduced the percent seedling emergence.

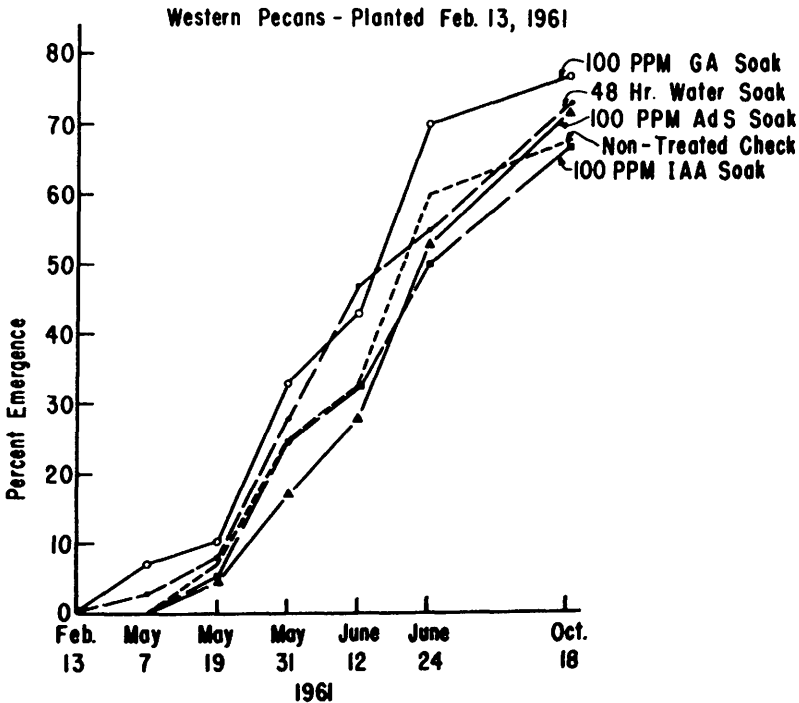


Figure 1. Average emergence of seedlings of 'Western' pecans soaked in 100 ppm gibberellic acid (GA), indole-3-acetic acid (IAA), or adenine sulfate (AdS) at various times after planting, 1961.

Figures 5 and 6 show the average plant height on July 24, 1961 and October 14, 1962 of 'Western and Riverside' pecans, respectively, which were planted on February 13, 1961 and March 12, 1962. There were no marked differences in plant height with any of the treatments in either 1961 or 1962. 'Riverside' seedling pecans, however, were slightly taller than seedlings of 'Western' pecans on comparable dates. There was some difference in plant height between the two years, particularly with 'Riverside.' This probably was due primarily to the difference in the interval between planting time and the date of measurement in each of the two years.

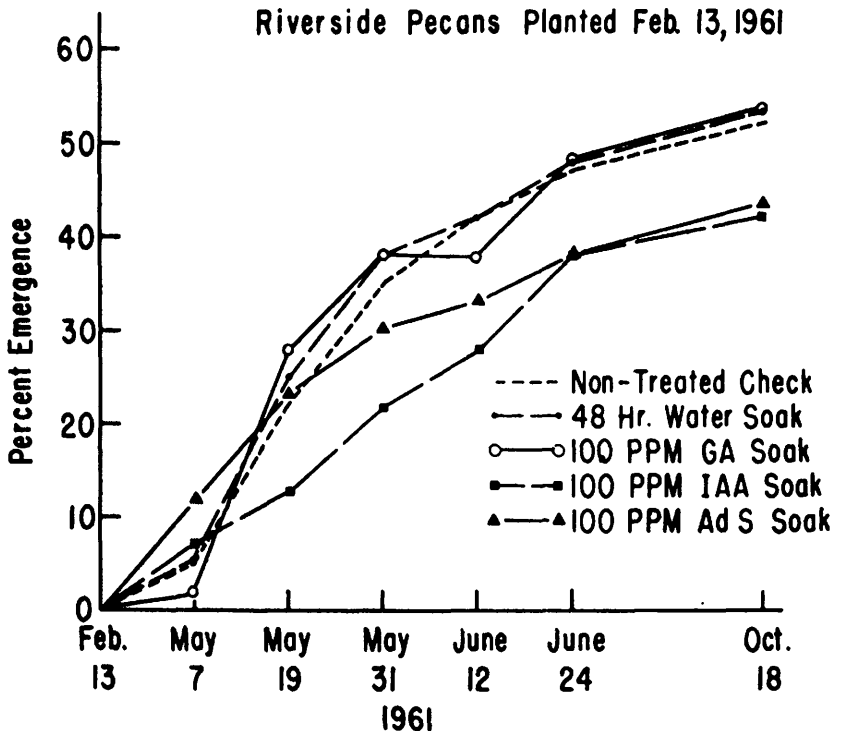


Figure 2. Average percent emergence of seedlings of 'Riverside' pecans soaked in 100 ppm gibberellic acid (GA), indole-3-acetic acid (IAA), or adenine sulfate (AdS) at various times after planting, 1961.

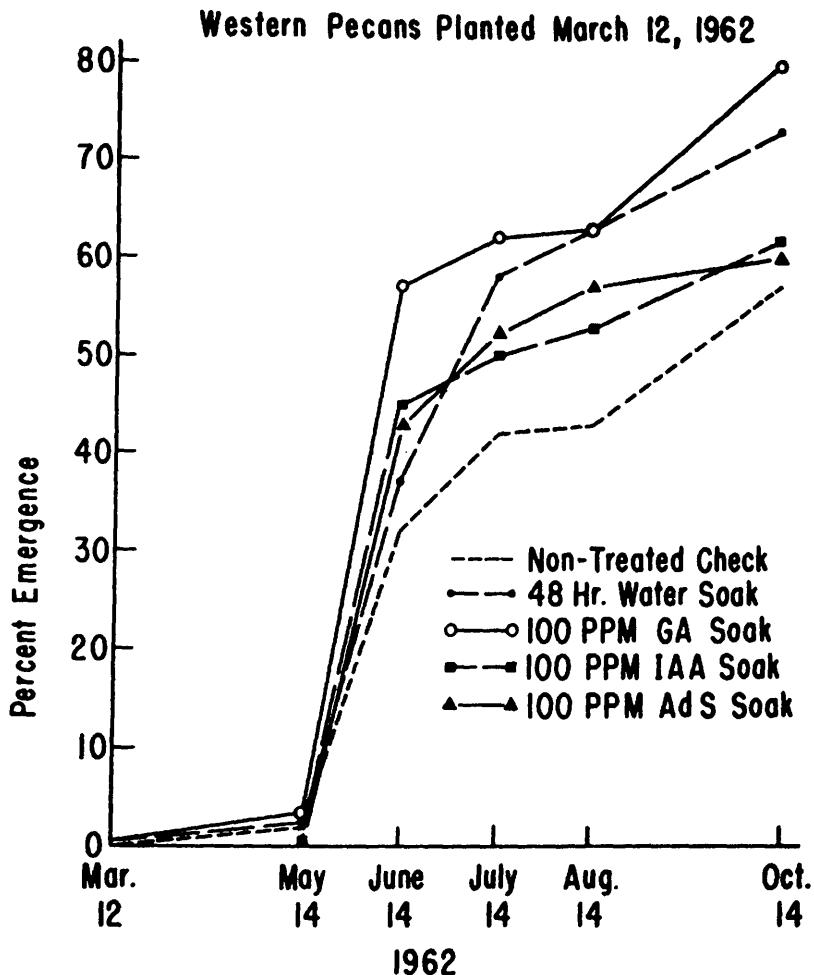


Figure 3. Average percent emergence of seedlings of 'Western' pecans soaked in 100 ppm gibberellic acid (GA), indole-3-acetic acid (IAA), or adenine sulfate (AdS) at various times after planting, 1962.

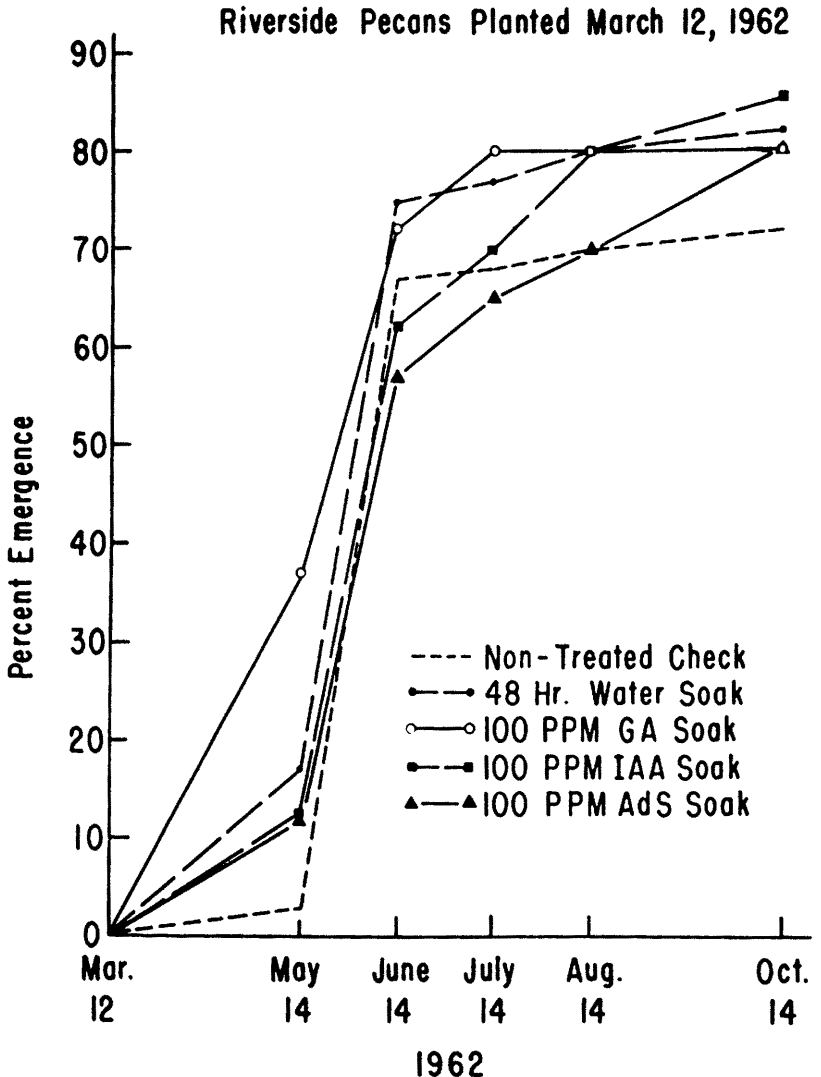


Figure 4. Average percent emergence of seedlings of 'Riverside' pecans soaked in 100 ppm gibberellic acid (GA), indole-3-acetic acid (IAA), or adenine sulfate (AdS) at various times after planting, 1962.

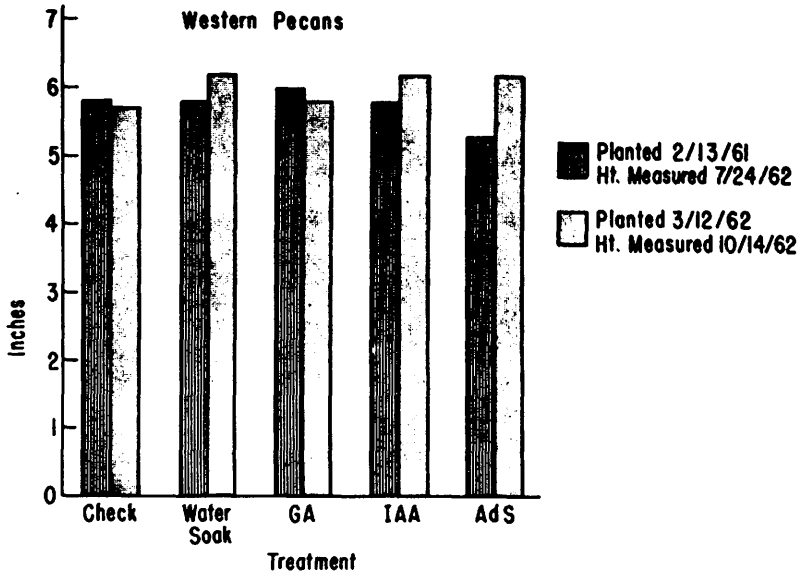


Figure 5. Average plant height of seedlings of 'Western' pecans soaked in 100 ppm gibberellic acid (GA), indole-3-acetic acid (IAA), or adenine sulfate (AdS) on July 24, 1961 and October 14, 1962.

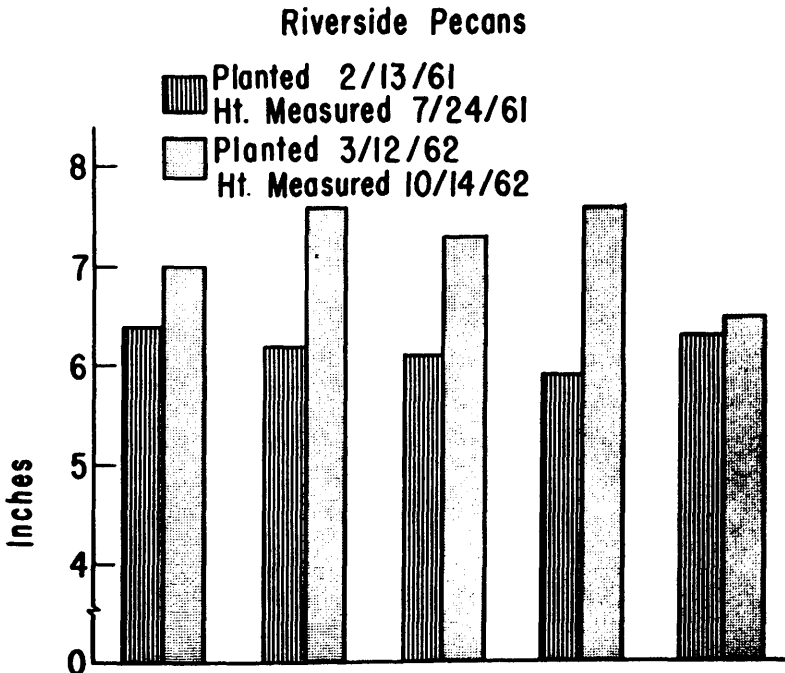


Figure 6. Average plant height of seedlings of 'Riverside' pecans soaked in 100 ppm gibberellic acid (GA), indole-3-acetic acid (IAA), or adenine sulfate (AdS) on July 24, 1961 and October 14, 1962.

Conclusions

Gibberellic acid (GA) soaking tended to cause earlier germination and seedling emergence of 'Western' pecan seedlings than did the check treatments of indole-3-acetic acid (IAA) or adenine sulfate (AdS) treatments. Although there were no symptoms of toxicity present, concentrations of GA higher than 100 ppm reduced both the percent germination and emergence of each variety. Soaking in various concentrations of IAA and AdS produced variable results, however, there was little evidence that they either promoted or retarded germination and seedling emergence and growth. None of the treatments had any marked effect on plant height.

Summary

'Western' and 'Riverside' pecans were treated with various concentrations of gibberellic acid (GA), indole-3-acetic acid (IAA), and adenine sulfate (AdS) prior to planting. The 100 ppm treatment with GA tended to promote earlier germination and seedling emergence of 'Western' pecans, however, it had little or no effect on 'Riverside.' IAA and AdS apparently had no effect on germination and seedling emergence of either variety. Neither GA, IAA, nor AdS had any effect on plant height at the end of the growing season. High concentrations of GA and IAA retarded emergence and seedling growth of pecans. 'Riverside' germinated more rapidly and produced taller seedlings than 'Western' in the same period of time.

LITERATURE CITED

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