

A PRELIMINARY INVESTIGATION OF THE EFFECTS OF NAPHTHALENE ACETIC ACID UPON THE GROWTH AND COMPOSITION OF OATS

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Previous experiments (1) have indicated that the substance naphthalene acetic acid may have an effect on the morphology and yield of some plants grown in pot culture when it is supplied in the nutrient medium. Other experiments have shown that this substance is active in growth correlation (2). The preliminary investigation described here is an attempt to observe in somewhat more detail the effects of naphthalene acetic acid on the growth and composition of young oat plants, (Ill. variety 30-2088).

The plants were grown in crushed quartz gravel in 6½ inch glazed pots. They were supplied nutrient by a sub-irrigation system from three gallon bottles. Each bottle supplied two pots. By means of an automatic time clock, the system was irrigated and drained eight times daily. The nutrient solution was renewed every two weeks. There were eight groups of nutrient supply: the control or plain salts medium, and seven dilutions of naphthalene acetic acid in this medium, 0.005, .01, .05, 0.1, 0.5, 1.0, and 2.0 mg. per liter. There were twelve pots

with sixteen plants per pot of each dilution and the control. These plants were harvested at the end of six weeks before the development of the first node. The pots were immersed in a large tub of water and the plants were gently extricated from the gravel to preserve as much of the roots as possible. The roots and tops were separated and rapidly dried in a moving current of hot air (85° C.). They were then pulverized in a Wiley mill and the material analyzed for its total nitrogen content.

The total nitrogen was determined by the Kjeldahl-Gunning method (with CuSO_4 catalyst) with micro-digestion and distillation equipment. The average sample weight was 50 milligrams. Determinations were made in triplicate. Results are shown in Fig. 1. The inverse relationship of the graph suggests that some influence of naphthalene acetic acid on transport might be involved.

A difference in appearance of the plants was noted while they were growing. Those in concentrations of naphthalene acetic acid above .5 mg. per liter were much darker in color than any of the others and their leaves did not fall aside from the stems as in normal growth. The chlorophyll content of the dried tops was compared colorimetrically in acetone extracts with the results shown in Fig. 2.

Ascorbic acid determinations were made on 5 gram samples of fresh tissue at the time the plants were harvested. The amount found in all samples was unusually constant, having extreme values of 25-29 mg. per cent ascorbic acid. 2-6 dichlorophenolindophenol was used to titrate the metaphosphoric-trichloroacetic acid extract of ascorbic acid.

The dry weight yield of both tops and roots generally was lowered as the concentration of naphthalene acetic acid increased, except that a slight increase over the control occurred in the lowest concentration, 0.005 mg. per liter.

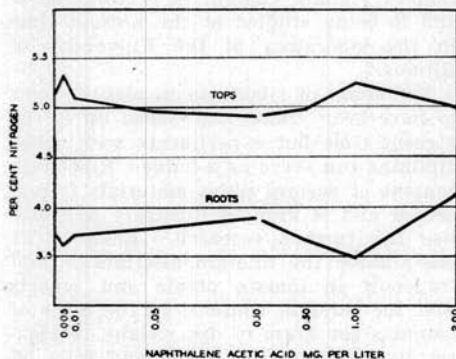


Fig. 1.—The effect of various concentrations of naphthalene acetic acid on the per cent total nitrogen in the tops and roots of young oat plants. Note the inverse relationship.

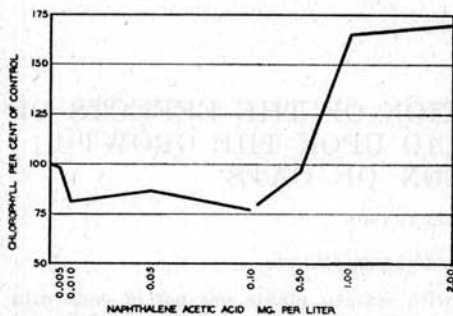


Fig. 2.—The effect of various concentrations of naphthalene acetic acid on the chlorophyll content of the tops of young oat plants.

The data obtained in this preliminary study show that naphthalene acetic acid supplied in nutrient solutions affects the total growth of oat plants and the amount of chlorophyll in the leaves. It also affects inversely the amount of nitrogen in tops and roots. It has no apparent effect on the ascorbic acid content of the tops.

REFERENCES

1. Stephenson, Richard B. Effect of growth regulating substances on development of seedlings and excised parts in culture. M.S. thesis, University of Maryland, 1940.
2. ——— The effects of certain growth regulating substances on growth correlation in lettuce seedlings. *Plant Physiology*, 1942 (in press).