Escherichia coli, and *Salmonella typhi* (*4*). Apparently *E. histolytica* does not become carbomycin dependent, although in lower concentrations it enhances growth. There is no suppression of the accompanying bacterial flora in these cultures. Probably in very small quantities carbomycin appears to act as a growth-promoting or vitaminlike factor to *E. histolytica* cultures, or in subinhibitory concentrations, it inhibits or neutralizes some enzyme system or systems that induce autolysis of amebas.

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Benzotriazole, a Plant-Growth Regulator

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Benzotriazole causes distinctive morphological modifications in the tomato plant. The changes are characterized by breaking of apical dominance, reductions in the number of leaflets per leaf, elimination of leaf serrations, cupping of the leaflets, and extensive elongation of the petioles which are unable to support the weight of their own leaves (Fig. 1). The morphological changes are limited to the leaves that developed after the initiation of treatment. Denny (*1*) has previously reported that benzotriazole hastens the sprouting of dormant potatoes.

A formative effect was produced in tomatoes only when bezotriazole was applied to the roots. The Bonny Best variety of tomatoes (*Lycopersicon esculentum* Mill.) were grown in sand culture, supplemented with inorganic nutrient. When the plants were at the 6-leaf stage 50 ml of 50 ppm benzotriazole was applied daily for 10 consecutive days to the sand surrounding the roots. Within 2 to 3 wk after the final application of benzotriazole, formative effects developed. In contrast, concentrations as high as 1000 ppm benzotriazole applied to the foliage were without effect on tomato.

The similarity in structure between benzotriazole and indole or the purine bases suggests that benzotriazole may be a competitive antagonist of either of these organic nuclei vital in biological systems. Galston and Hand (*2*) have, in fact, demonstrated that adenine enhances the response of etiolated pea epicotyls to indoleacetic acid (IAA) and that benzimidazole, a

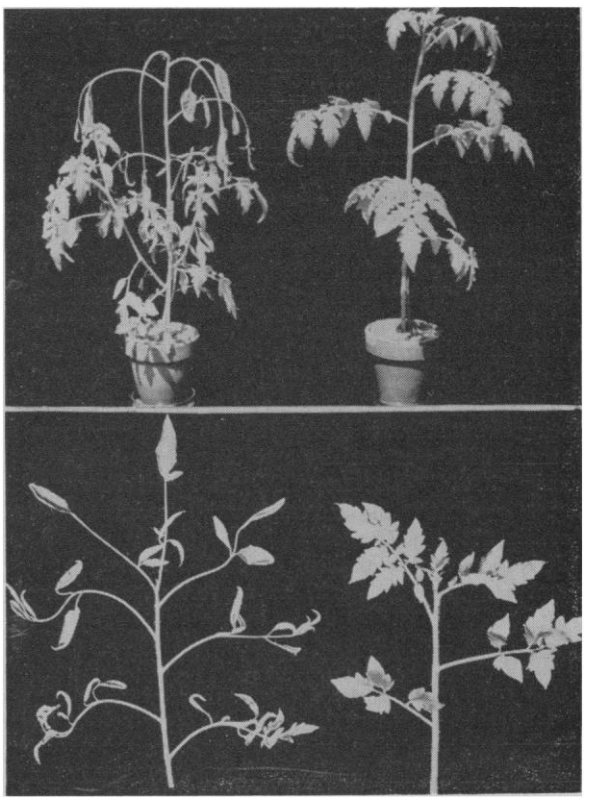

Fig. 1. (Top) Plants treated with benzotriazole (left), untreated (right). (Bottom) Stem of treated plant (left), untreated (right).

metabolic antagonist of adenine (*3*), partially inhibits the response to both IAA or adenine (*4*).

Attempts to reverse the effects of benzotriazole with daily applications of 50 ml of either 0.5 to 50 ppm of IAA or 250 ppm adenine sulfate were unsuccessful. IAA was applied in conjunction with benzotriazole, whereas adenine sulfate applications were started 10 days prior to, and continued until 8 days after, benzotriazole applications had ceased. Although adenine did not reverse the action of benzotriazole, other purine bases or some of their ribosides would be worthy of further investigation as benzotriazole antagonists.

A number of other unsubstituted 5-membered heterocycles, both free and condensed with benzene, were applied to the roots of tomato. With the exception of benzothiazole (*5*), neither indole, benzimidazole, benzoxazole, benzothiophene, benzothiadiazole, thiophene, pyrolle, thiazole, imidazole, nor 1,2,4-triazole caused a formative effect on tomato.

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