the experimental and the control animals was highly significant statistically. This degree of suppression of radioiodine uptake was in the same range as that reported by Rawson *et al.* (*4*) when thiouracil was administered as 0.1% of the diet for 16 days to rats maintained on the same diet used here.

Since this drug is widely used as an anthelmintic for livestock and occasionally as such for man, this effect upon the thyroid should be investigated further. It has not as yet been determined whether its action follows that of a typical antithyroid drug, nor is it known what effect the impurities of the commercial preparation have on this action. It also remains to be seen whether other animals, particularly livestock, react as does the rat.

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Albinism Resulting from Certain Carbonic and Thiocarbonic Acid Derivatives of Hydrazine

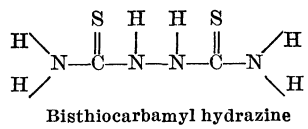
Charles L. Rhykerd, Harold W. Gausman, Earle S. Scott, and L. F. Audrieth

Departments of Agronomy and *Chemistry, University of Illinois, Urbana*

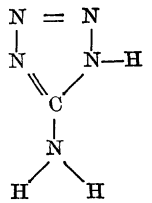
During the course of a research program designed to study the biological activity of various hydrazine derivatives of the carbonic and the thiocarbonic acids and related compounds of high nitrogen content it was discovered that three of these substances, 5-aminotetrazole, bisthiocarbamyl hydrazine, and 1,2-diacetyl-3,5-diamino-1,2,3,5-tetrahydro-1,2,4-thiadiazole induce albinism in plants. This effect is similar to that described by Hamner and Tukey (*1*), and by Ready *et al.* (*2*) who found that albinism is induced by treatment with 3-(α-imino-ethyl)-5-methyltetronic acid and 3-nitro-4-hydroxybenzoic acid, respectively.

Three series of experiments were conducted to evaluate this unusual phenomenon further. In the first series of tests the three compounds were applied to 400 g of soil in unglazed pots at rates approximately equivalent to 60, 25, and 10 lb/acre. Seeds of corn and soybeans were planted simultaneously. A randomized block design with four replications was used. The second group of experiments was designed to test the persistence of these substances in the soil. When the plants in the first test were 45 days old, they were removed from the pots and the pots were replanted without any further addition of chemical. In a third series of experiments, plant species consisting of both crops and weeds growing in greenhouse flats were sprayed with concentrations of 4000 ppm, 2000 ppm, and 1000 ppm until runoff was obtained.

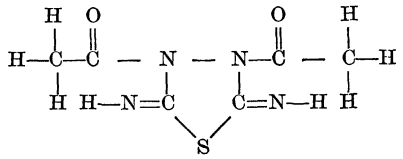
The structural formulas of the three compounds which induced albinism in plants are given as follows:



Bisthiocarbamyl hydrazine



5-Aminotetrazole



1,2-Diacetyl-3,5-diamino-1,2,3,5-tetrahydro-1,2,4-thiadiazole

The blanching effect produced by bisthiocarbamyl hydrazine and 1,2-diacetyl-3,5-diamino-1,2,3,5-tetrahydro-1,2,4-thiadiazole started at the base of the lower leaves and advanced toward the tips. The chlorophyll was gradually removed from the leaves resulting in the death of the entire plant. 1,2-Diacetyl-3,5-diamino-1,2,3,5-tetrahydro-1,2,4-thiadiazole was slower in producing the effect than bisthiocarbamyl hydrazine. Approximately 14 days after treatment with concentrations of 1000 ppm and 4000 ppm of bisthiocarbamyl hydrazine, the corn plants started turning white at the base of the leaves. Plants growing in soil treated with a concentration of 4000 ppm of 1,2-diacetyl-3,5-diamino-1,2,3,5-tetrahydro-1,2,4-thiadiazole started to show a blanching effect approximately 20 days after treatment; the 1000 ppm concentration had very little effect. However, a concentration of 1000 ppm of bisthiocarbamyl hydrazine turned the plants completely white and finally killed them.

Application of bisthiocarbamyl hydrazine to fresh chlorophyll extractions in light resulted in the disappearance of the green color. The addition of an excess of copper sulfate restored the green color. Since bisthiocarbamyl hydrazine complexes metallic ions very effectively, it is believed that the restoration of green color may be due to the removal of the hydrazine derivative as a stable copper complex or to the formation of a copper chlorophyll complex or to both.

Bisthiocarbamyl hydrazine also affects plastid development. Electron microscopic examinations are being carried on at present to study further the mode of action.

5-Aminotetrazole also caused blanching but to a much lesser degree than either bisthiocarbamyl hydrazine or 1,2-diacetyl-3,5-diamino-1,2,3,5-tetrahydro-1,2,4-thiadiazole. The effect of 5-aminotetrazole was found to be temporary, whereas that of bisthiocarbamyl hydrazine and 1,2-diacetyl-3,5-diamino-1,2,3,5-

tetrahydro-1,2,4-thiadiazole was found to be permanent.

Albinism was also induced in plants grown from replantings made 45 days after the initial treatment with 4000 ppm concentrations of bisthiocarbamyl hydrazine and 1,2-diacetyl-3,5-diamino-1,2,3,5-tetrahydro-1,2,4-thiadiazole without any further addition of chemical. This fact demonstrates the strong persistence of the active agent in soil.

Spraying plants with solutions of the three compounds was found much less effective than applying the chemicals directly to the soil. The compounds are apparently systemic in their mode of action in that they are taken up from the soil through the root system with subsequent development of albinism.

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Anterior Choroidal Artery Ligation for Involuntary Movements

Irving S. Cooper

Department of Neurosurgery, New York University-Bellevue Medical Center, New York

A new procedure for the investigative surgical treatment of involuntary movement disorders has been in use for the past 7 months. Certain significant clinical and physiological consequences of the operation appear to be worthy of note at this time. The procedure consists of an attempt to affect involuntary movement disorders and disorders of muscular tonus by ligation of the anterior choroidal artery. The rationale of this procedure lies in the fact that this blood vessel supplies most of the structures which have been attacked surgically in the attempt to relieve intractable involuntary movements (*1–4*). Among the structures irrigated by this vessel are the globus pallidus, ansa lenticularies, red nucleus, retrolenticular portion of the internal capsule, corpus luysii, substantia nigra, optic tract, and cerebral peduncle (*5*).

We should like to point out that the anterior choroidal artery has been ligated 8 times in 6 patients; the ligations were performed bilaterally in 2 of the cases. In our early studies, we have noted striking alleviations of Parkinsonian tremor at rest in the contralateral extremities. The procedure has been invariably followed by disappearance of most of the rigidity and cogwheelism from the contralateral extremities. There has been no instance of contralateral hemiplegia or hemianesthesia which was previously reported to be invariable following occlusion of this vessel (*6*). Tremor at rest has been relieved in the first patient of this series, since the operation was performed 7 months ago. This technique is believed to be of considerable significance for the future investigative surgery of involuntary movement disorders.

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Effect of Maleic Hydrazide on Auxin-Induced Water Uptake by Pea Stem Segments[1]

Paul Ts'o and G. P. Steinbauer

Michigan State College, Lansing

One of the most typical responses of plants to subherbicidal dosages of maleic hydrazide is the repression of terminal growth of stems and roots (*1–7*). Since growth in length is the resultant of meristematic activity and cell enlargement, inhibition of either or both processes will lead to a retardation of apical growth. The experiments of Greulach and Atchison (*2*) with root tips indicate that maleic hydrazide may, in fact, retard either cell division or enlargement, or both, depending upon the concentration of the chemical applied. In some instances, however, cell enlargement seems to be increased by applications of maleic hydrazide, e.g., Struckmeyer (*6*) observed that stems of treated Croft Easter lilies may be shorter but of larger diameter than the controls. In cross section the cells of treated stems appear larger than those of untreated stems, suggesting a change in shape along with possible changes in cell volume. Similar results have been reported by McIlrath (*4*) for the mesophyll cells of treated cotton leaves. Moore (*8*) has shown that maleic hydrazide sprays often have a dehydrating effect on the plant as a whole. Auxin, on the other hand, tends to promote water uptake, in a manner thought to be largely nonosmotic (*9*).

The present study was to elucidate the effect of maleic hydrazide[2] on auxin-induced water uptake in tissues relatively free of meristematic activity. For this purpose, stem segments of pea were chosen as test material, such having been used successfully by Christiansen and Thimann (*10*) in studies on the effect of various inhibitors on growth and water uptake. The techniques of preparing the seedlings were essentially similar to those described by Went and Thimann (*11*) for the split pea stem test for auxin. Seeds of *Pisum sativum* L., var. Alaska, were ger-

[1] Contribution No. 53–6 from the Department of Botany and Plant Pathology, Michigan State College.

[2] The maleic hydrazide used in this work was supplied as the diethanolamine salt by the Naugatuck Chemical Division, U. S. Rubber Co.