blood thromboplastin (the thrombocytic). Estrapenia connotes a depression of the hemopoietic marrow, which is usually inclusive; not only erythropoiesis but mature granulopoiesis and thrombopoiesis are concomitantly depressed. Thromboplastin deficiency may be related to the estrapenia only in the sense that the latter usually signifies panmyelophthisis, the marrow being unable to elaborate thromboplastin because it can elaborate few, if any, of its peripheropetal products.

If in light of the foregoing points the further assumption be permitted that heparin is the agent that evokes and regulates the rate and extent of thromboplastin production by the hemopoietic marrow (heparin having, in turn, its own antithrombic activity curtailed by the elaborate), there is forthcoming an explanation not only of the dynamic equilibrium maintaining normal intravascular fluidity but also one of the origin of hyperheparinemia in marrow failure. The blood heparin concentration will rise when blood thromboplastin is not available for its neutralization, a situation extant in the myelophthises. The teleologic possibility that heparinemia is augmented under these circumstances by cholinergic activation of mast cell function remains to be explored.

Addendum: The actuality of cholinergic mast cell proliferation has been indicated by the recent finding of coincident basophilic myelocytosis, absolute hyperheparinemia, and estrapenia in three patients with purpura (*3*).

References

1. ALLEN, J. G., and JACOBSON, L. O. Science, 1947, **105**,
2. BARNARD, R. D. *Urol. cutan. Rev.*, 1947, **51**, 46.
3. BARNARD, R. D. Unpublished data.
4. BARNARD, R. D., and REIN, C. R. *J. lab. clin. Med.*, 1944, **29**, 1287.
5. MACKOWIAK, E. J., and BARNARD, R. D. *J. Amer. pharm. Ass.*, 1947, **36**, 383.
6. QUICK, A. J. *Amer. J. Physiol.*, 1938, **123**, 712.
7. QUICK, A. J. *The hemorrhagic diseases*. Springfield, Ill: Charles C. Thomas, 1942.
8. SABINE, J. C. *J. clin. Invest.*, 1940, **19**, 833.
9. VOLKERT, M., and HERTEL, E. *Ugesk. Laeger*, 1943, **105**, **781**.

Use of a Plastic Material to Increase the Action of the Sodium Salt of 2,4-D[1]

C. L. HAMNER and KIANG CHI-KIEN

Department of Horticulture, Michigan State College

The effect of various compounds in increasing the action of the sodium salt of 2,4-D has been reported (*1, 2*). It was demonstrated that the herbicidal action of the sodium salt of 2,4-D can be greatly increased either by acidification of the solution or by the use of certain onion extracts in combination with 2,4-D.

Materials or methods which are able to modify the action of 2,4-D may provide additional clues to explain the mechanism of metabolic processes in plants. This paper reports some very striking effects produced on bean plants when the sodium salt of 2,4-D was combined with a plastic material formulated from polyvinyl chloride, which is nontoxic to plants and is called Geon 31X latex.[2]

Experiment I. Seeds of red kidney bean, selected for uniformity, were planted in 4″ pots in the greenhouse. Each pot contained two plants that were treated when the first trifoliate leaf was expanding. Ten pots were used for each treatment.

Application of 2,4-D was made by dipping one of the primary leaves of each treated plant into solutions containing the sodium salt of 2,4-D in varying concentrations of 0, 5, 50, 250, and 500 ppm. After the solutions had dried, the treated leaves of half of the plants were sprayed with a dispersion of 5% Geon 31X latex.

Within 48 hrs after treatment, marked differences were noted between the plastic- and nonplastic-treated lots. Curvature of the first internode and epinasty of the leaves were much more pronounced in the plants which had received a plastic coating in addition to the 2,4-D treatment. Nine days after treatment, all the plants that had been treated with 500 ppm of 2,4-D were dead. In the group treated with 250 ppm, death occurred in all the plants which had received, in addition to the 2,4-D, the 5% plastic coating. Those plants that received only 2,4-D were beginning to resume new growth. Although the stems were swollen and the leaves and petioles somewhat twisted, the plants were definitely recovering from the treatment (Fig. 1). In the group treated with 50 ppm of 2,4-D, only those plants that had received, in addition, a 5% spray of Geon 31X latex were severely affected; some of the plants were dead, and those not killed by the treatment showed no new growth and no sign of recovery. Where 5 ppm of 2,4-D was used, the addition of the plastic did not increase the response of the plants.

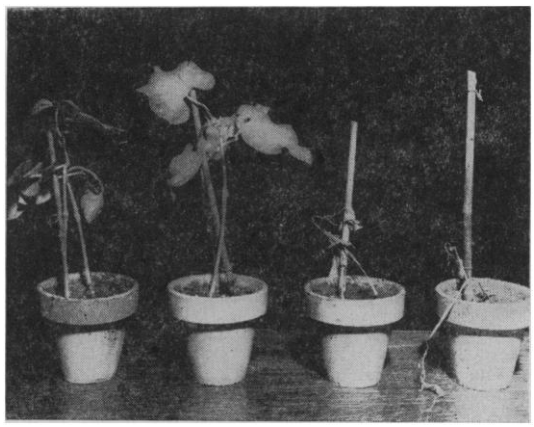

FIG. 1. Effect of Geon 31X in increasing the action of 2,4-D. Plants on the left were treated with 250 ppm of 2,4-D salt by dipping one of the primary leaves in the solution of 2,4-D. Plants on the right received the same concentration of 2,4-D, but, in addition, the treated leaves were sprayed with 5% of Geon 31X plastic.

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[2] The material was obtained through the courtesy of the B. F. Goodrich Chemical Company, Cleveland, Ohio.

Experiment II. In this experiment the plastic material was added directly to the solution of 2,4-D. Ten-day-old red kidney bean plants were used as the experimental material, and applications were made by placing a single drop of the solution on the base of one of the primary leaf blades. Pipettes which released 0.05 ml of solution were used for applying the drops. The amount of 2,4-D used in all the solutions remained constant at 1,000 ppm; the amount of plastic material added to the 2,4-D, however, ranged from 0% to 1, 5, and 10%. The plants were harvested 2 weeks after treatment, and the average fresh weight of growth above the primary leaves was recorded for each treatment.

Differences between treatments were noted a few hours after application. It was evident that the response of the bean plants was directly proportional to the concentration of the plastic in the solution. The plants treated with 2,4-D plus a 10% concentration of the plastic showed the greatest degree of inhibition. Those treated with 2,4-D and a 1% concentration of the plastic, although not so severely inhibited as those with the 10% plastic, were nonetheless much more affected than were those receiving only 2,4-D (Table 1). No inhibiting effect was noticed

TABLE 1

FRESH WEIGHT OF BEAN SHOOTS DETERMINED 14 DAYS AFTER TREATMENT WITH 2,4-D SALT AND GEON 31X LATEX*

Treatment (2,4-D at 1,000 ppm)	Average weight of shoot/plant (gm)	Average weight of shoots on per cent basis 2,4-D = 100
Control (untreated)	2.45	144
2,4-D salt	1.70	100
" " + 1% Geon 31X latex ..	.39	23
" " + 5% " " " ..	.25	14
" " +10% " " " ..	.23	13

* The weights represent all growth above the primary leaves.

when the entire plant was sprayed only with the Geon 31X latex in concentrations of 1, 5, and 10%.

Experiment III. Since the addition of Geon 31X to a 2,4-D salt solution increased the action of 2,4-D, an experiment was devised to test this combination upon a monocotyledonous plant which ordinarily would be resistant to 2,4-D.

Young oat seedlings approximately 4″ tall were treated with sprays containing 1,000 and 3,000 ppm of 2,4-D. In addition to 2,4-D, some of the sprays contained Geon 31X at 6, 12, and 25%. Plants treated with 2,4-D solutions alone showed no visible effect. Those treated with 2,4-D at 3,000 ppm together with Geon 31X at 25% were severely injured, and almost all the plants died. Plants treated with 2,4-D at 1,000 ppm together with Geon 31X at 25% were also injured, but not as severely; a few of these plants died. Plants treated with 2,4-D at 1,000 and 3,000 ppm together with Geon 31X at 6% were not injured.

The results indicate quite clearly that when Geon 31X latex, a water-dispersible, nontoxic plastic material, is added to 2,4-D either directly in solution or as a coating over plants previously treated with 2,4-D, the effect of the 2,4-D is greatly increased.

The manner in which the plastic material acts to increase the effectiveness of 2,4-D is not known. It is quite possible, however, that the plastic material, which has a low moisture vapor transmission coefficient may seal in the vapors of 2,4-D and hence increase its action because of a more intimate contact with the vapors. It is also possible that the carbon dioxide and oxygen relationships are changed as a result of the coating and hence affect the physiology of the cells, making them more susceptible to 2,4-D injury. The plastic coating may also increase moisture on the cell surface beneath the coating, thus permitting better penetration of the 2,4-D into the plant.

References

1. HAMNER, C. L., LUCAS, E. H., and SELL, HAROLD M. *Mich. agric. exp. Sta. Quart. Bull.*, 1947, **29**, 337–342.
2. LUCAS, E. H., and HAMNER, C L. *Mich. agric. exp. Sta. Quart. Bull.*, 1947, **29**, 256–262.

Application of Chromatography to Segregation Studies of the Agent of Chicken Tumor I (Rous Sarcoma Virus)[1]

VERNON T. RILEY

National Cancer Institute,
National Institute of Health, Bethesda, Maryland

Separation of the virus-like agent of chicken tumor I from the morphologically similar normal constituents of the extract has been attempted by various methods, including flask adsorption, chemical precipitation, selective extraction, and differential centrifugation. The differences in behavior of the tumor agent and some of the nonvirus substances of the extract in the various purification techniques employed was, however, so slight as to make complete separation difficult (*1, 4, 6, 7*).

The achievements of chromatography in the separation of closely related chemical substances (*8, 9*) suggested an exploration of the applicability of the method to the problem of separating morphologically similar subcellular particulates.

Exploratory experiments had indicated that the tumor agent was strongly, but reversibly, adsorbed on diatomaceous silicon dioxide (Celite) in the presence of physiological concentrations of sodium chloride. This combination of relatively inert substances provided the basis for a nondenaturating chromatographic system.

A partially purified chicken tumor extract (*4*) was prepared in 0.9% saline (−0.8 log molar), and equal quantities (50 ml) were adsorbed on identical micro-columns, 8 × 35 mm, consisting of 0.5 gm of Celite as adsorbent.

Seven columns containing the adsorbed agent were developed with 10 ml of 0.9% saline, and each was then eluted with 10 ml of a sodium chloride solution ranging in log molarity from −2 through −5 and terminating

[1] A detailed report will appear in an early issue of the *Journal of the National Cancer Institute.*