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Phytopharmacology: Effect of Ricin, Capsicum and Cantharides on Growth of *Lupinus Albus*.

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The author has called attention in numerous papers to the fact that living plant protoplasm may be a useful pharmacological test object and that indeed such phytopharmacological preparations may respond with greater sensitiveness to certain poisons than do living animal tissues.¹ He has also shown that plant pharmacological preparations may be especially sensitive to the effects of poisons of animal origin, possibly because such products are more foreign to plants than are the metabolic products of plant life.² In order to test this hypothesis the present experiments were undertaken and the results obtained are unequivocal. The author selected for study the effect on the growth of seedlings of *Lupinus Albus* 2 substances known as extremely poisonous, one of plant origin and the other of animal origin, namely, *Ricin* and *Cantharadin*. *Ricin* is well known to pharmacologists and toxicologists as one of the most deadly poisons, a few milligrams sufficing to produce death of a large animal. This substance sometimes spoken of as a toxalbumin is obtained from the castor oil bean. *Cantharadin* is a crystalline body also of a very poisonous nature obtained from the Spanish fly (*Cantharis Vesicatoria*). Very dilute solutions of these 2 drugs were made and the effects of such solutions on the growth of *Lupinus Albus* seedlings were studied according to the methods already described. To prepare a solution or suspension of *Ricin*, in some experiments the drug was rubbed up in a mortar with cold saline, in other experiments a suspension or solution of the same was prepared by heating this substance in a large volume of distilled water. A solution of *Cantharidin* was prepared in a similar way. The results obtained are shown in the subjoined table. It will be noted that *Ricin* produced but very little inhibition in the growth of the roots and indeed was less toxic even than normal blood serum. A suspension made with cold water by trituration in a mortar produced no toxic effect at all. A solution prepared by heating *Ricin* with water for subsequent dilutions with Shive solution gave a growth

¹ Macht, D. I., and Livingston, M. B., *J. Gen. Physiol.*, 1922, iv, 573.

² Macht, D. I., *J. Am. Med. Assn.*, 1927, lxxxix, 753.

of 91%. The action of *Cantharidin* even after great dilution was very different. Solutions of 1:50,000 practically killed the plants, giving an index of growth of only about 3%. The action of *Cantharides* in the form of tincture was also compared with the tincture of another drug exhibiting somewhat similar irritant properties in animals, namely, *Tincture of Capsicum*. Here again a marked difference was noted between *Capsicum*, the drug of plant origin, and *Tincture of Cantharides*, the drug of animal origin. Taking into consideration the alcohol content of each tincture and making proper controls for the same it was found that tincture of *Cantharides* was at least twice as toxic for the growth of *Lupinus Albus* as tincture of *Capsicum*.

It is, therefore, evident that so far as the above drugs are concerned, the ones of animal origin are very much more poisonous for plants than the 2 of plant origin. This statement, however, does not hold good for all drugs or chemicals obtained from animals, especially those which are normal physiological products of animal metabolism. The author has found that neither Epinephrin, nor Pituitary Extracts, nor Histamine, nor Insulin are very toxic for the growth of *Lupinus Albus* seedlings.

TABLE I.

Drug	Dosage	Phytotoxic Index
Ricin	1:50,000	100%
Cantharidin	Prepared cold 1:50,000	4%
Ricin	1:25,000	91%
Cantharidin	Prepared by heating 1:50,000	3%
Alcohol 95%	1% control	70%
Tinctura Capsici	1% solution	27%
Tinctura Cantharidis	1% solution	54%