The Effect of Some Adsorbents, Precipitants and Oxidants upon the Resin of Rhus Toxicodendron

*By Ole Gisvold**

It is common practice of the layman to treat ivy poisoning with the fresh juice of certain plants, more especially that of *Impatiens biflora*. The active substance present in *Rhus Toxicodendron* is phenolic in character. If the plant juices in question are actually effective *in vivo*, it seemed desirable to study their effect *in vitro*. All the experimental work presented in this paper is qualitative in character.

EXPERIMENTAL

The active principle of *Rhus toxicodendron* was prepared in the following manner. The petioles of the leaves were cut with a sharp instrument and the milky exudate was absorbed by small pieces of filter paper which in turn were immediately placed in alcohol to prevent a darkening of the latex. The alcoholic extract was used for the subsequent experimental work. This alcoholic solution gave a deep purple color with ferric chloride and color tests were used to trace the course of the qualitative tests. A portion of the extract was evaporated to dryness and the residue extracted with petroleum ether which removed an oily, extremely active substance.

The juice of *Impatiens biflora* gave a blue color with guaiac, a deep purple with α-naphthol and a positive deep red-brown precipitate (purpurogallin) with pyrogallol and hydrogen peroxide. The possible presence of an oxidase and a peroxidase was thus indicated. A hydro alcoholic solution of the active ivy principle was mixed with the fresh juice of *Impatiens biflora* and allowed to stand. It was tested from time to time with ferric chloride. A diminution in the intensity of the purple color obtained with ferric chloride was observed which persisted even after standing over night. If the active ivy principle was in sufficiently dilute concentration when mixed with the juice in question, a negative test with ferric chloride was obtained upon allowing the mixture to stand for several hours. It cannot be concluded from the above scanty test work that the active phenol present in *Rhus toxicodendron* can be oxidized by the oxidases present in the juice of *Impatiens biflora*. Perhaps in sufficiently dilute enough solutions, an oxidation may take place. Because the active ivy principle is quite insoluble in water, this line of investigation was temporarily discontinued to be supplanted by the subsequent chemical tests.

Precipitation with Lead Acetate.—A 2 to 3 per cent solution of lead acetate in 60 to 70 per cent alcohol completely precipitated the active ivy principle from a 70 per cent alcoholic extract of the ivy phenol. Upon standing, this precipitate soon turned a dirty blue. This precipitate was washed by repeatedly suspending it in 70 per cent alcohol and recovering the precipitate by means of a centrifuge. This precipitate when rubbed on the skin appeared to be fully as active as the original ivy principle. The same results were obtained with basic lead acetate.

Precipitation with Barium Hydroxide.—A 1 per cent solution of barium hydroxide in 60 to 70 per cent alcohol was added to a 70 per cent alcoholic extract of the ivy phenol. The mixture turned from a blue to a green color, which was immediately followed by a precipitate which was dark green. The supernatent liquid gave no color test with ferric chloride.

Precipitation with Aluminum Subacetate.—A 1 to 2 per cent solution of aluminum subacetate in 70 per cent alcohol gave no color change or precipitate. However, upon standing over night, a small amount of a flocculent green precipitate was obtained.

Precipitation with Aluminum Acetate.—No precipitate could be obtained with a 1 to 2 per cent solution of aluminum acetate in 70 per cent alcohol.

Precipitation with Magnesium Acetate.—A 1 to 2 per cent solution of magnesium acetate in 70 per cent alcohol gave no immediate precipitate with a 70 per cent alcoholic solution of the ivy phenol. However, after standing thirty minutes, the mixture darkened and a small amount of a precipitate appeared which settled after three hours. The mixture was still opaque.

Precipitation with Ferric Chloride.—Ferric chloride test solution was added to a 60 to 70 per cent alcoholic solution of the ivy phenol. A deep purple color was immediately obtained followed very quickly by a blue-black flocculent precipitate. This precipitate when rubbed on the skin appeared to be fully as active as the original ivy phenol.

Precipitation with Cupric Acetate—A 1 to 2 per cent solution of cupric acetate in 70 per cent alcohol was added to a 70 per cent alcoholic solution of the ivy phenol. A bluish black flocculent precipitate soon settled out. This precipitate was washed by repeatedly suspending it in 70 per cent alcohol and recovering it by means of a centrifuge. This precipitate when rubbed on the skin appeared to be fully as active as the original ivy phenol.

Adsorption by Aluminum Oxide.—A highly activated aluminum oxide was added to a 70 per cent alcoholic solution of the ivy phenol. The mixture was shaken for one minute and the mixture centrifuged. The supernatant liquid gave a positive test for ivy phenol and the intensity of the color indicated that little if any ivy phenol was adsorbed.

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Adsorption by Prepared Calamine.—The same technique described above was used with approximately the same results.

Adsorption by Magnesium Oxide.—The same technique described above was used. It was found that 0.1 Gm. of activated magnesium oxide completely absorbed the ivy phenol whereas 0.5 Gm. each of aluminum oxide or prepared calamine adsorbed little if any ivy phenol from an equal quantity of alcoholic solution. Glycerol up to 6 per cent does not inhibit the adsorption of ivy phenol on magnesium oxide. The magnesium oxide adsorbate of the ivy phenol was held in contact with the skin for twenty-four hours by means of gauze and tape. The results indicated that most if not all of the adsorbed ivy phenol became effective.

Oxidation with Alkaline Peroxide.—A 3 to 5 per cent alcoholic solution of hydrogen peroxide was added to a 70 per cent alcoholic 0.5 per cent sodium hydroxide solution of the ivy phenol. The solution immediately assumed a light pink color. The alkali was neutralized and the resulting mixture gave no color when tested with ferric chloride. The ivy phenol forms a water-soluble green salt with sodium hydroxide. It gradually darkens at the surface and upon exposure to air slowly assumes a pinkish color. Aqueous sodium carbonate does not dissolve the ivy phenol; however, this mixture upon standing assumes a pinkish color.

The author of this paper was the test subject. Alkaline peroxide was used which proved quite effective in the treatment of ivy poisoning. The alkali was sponged over the affected areas followed by the peroxide applied in the same manner. After a few minutes, the alkali was neutralized with a weak solution of acetic acid. Two or three such treatments, once daily, appeared quite sufficient to destroy the ivy phenol that was not too deep seated and prevented it from spreading. Where the lesions were quite deep, the treatment was somewhat painful, but of short duration.

SUMMARY

A preliminary qualitative study has been made upon the effect of some adsorbents, precipitants and oxidants upon the physiologically active phenols found in the milky exudate obtained from *Rhus Toxicodendron.* Calamine and aluminum oxide were found to be extremely poor adsorbents for these phenols. Magnesium oxide was very active as an adsorbent; however, the adsorbate of the ivy phenol when used as such was physiologically very active as a vesicant. Lead acetate and basic lead acetate were the best precipitants found; however, the precipitates were also very active. Oxidants such as ferric chloride and cupric acetate gave precipitates which were also very active. The only successful method studied of rendering the active phenols inactive, involved their oxidation with alkaline peroxide.

The Chemistry of Burbot Liver Oil—I*

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The Burbot fish, a fresh water cod, is commonly found in all of our large inland lakes and streams. It is not usually used as food, but has some worth as fertilizer. The average weight of the Burbot is about 5 pounds. The liver is a good deal larger than that of any other fish in the same waters. One such liver used in experimental work weighed 900 Gm. The liver contains from 10% to 56% of oil, the exact amount probably depending somewhat on the age of the fish as well as the water from which it was taken.

Glow and Marlatt (1) have reported the antirachitic potency of Burbot Liver Oil (hereafter abbreviated B. L. O.) as eight times that of cod liver oil, and classed it as an excellent source of vitamin D.

Myers (2) treated fifty infants 1 to 2 months old over a period of 6 to 12 months, and reported the B. L. O. to be a good antirachitic agent having a vitamin D potency approximately 8 times that of cod liver oil.

Branion (3) reported that B. L. O. to be a good anti-rachitic agent and that its activity in treating xeropthalmia was greater than that of cod liver oil.

The above is all more or less recent work on B. L. O. vitamin potency; preliminary study on B. L. O. dates back to the work of McCollum and co-workers (4) who found vitamin D in the oil as early as 1922.

The chemistry of this oil, however, has not been given the attention it deserves for the

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