

## AMERICAN MISTLETOE.\*

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Mistletoe has been used in medicine to a limited extent since prehistoric times. Indeed, superstition has lent to its legendary powers, not only in fields other than therapy, but also for curing all sorts of ailments, a list of which would be rather long. Although opinions to-day are somewhat divided as to its merit in any one disease, it is still employed occasionally.

Only in recent times, however, have scientists found a basis for any application as a drug. Extracts of the dried plant have been reported as more or less effective agents for the reduction of high blood-pressure. Whether this property can be successfully utilized in practical therapy remains a debatable point, although some clinicians make very high claims for its remedial value.

In most chemical and pharmacological investigations on mistletoe little distinction is made between various species designated by that name. It is assumed, however, that these belong to the genus, *Viscum*, and that members of this genus share the property of reducing high blood-pressure.

The extension of this assumption to the American variety of mistletoe, *Phoradendron flavescens*, was naturally to be expected. In fact, the latter has been employed indiscriminately in medicine when mistletoe was called for. The few pharmacological studies which have been made on it are entirely inconclusive, since it has been claimed to give both a rise and a fall in blood-pressure.

On the chemical side very little has been reported about American mistletoe. Crawford, in 1911, isolated an unidentified base and concluded that it is closely related to phenylethylamine. He also stated that another more active base may probably be present and expressed the opinion that it might be acetylcholine. Hanzlik and French, in a report on physiological action, suggested that a compound like tyramine or acetylcholine is responsible. It is also interesting to note that acyl derivatives have been isolated from the European mistletoe.

The American mistletoe used in the present study was bought in the market and nothing is known of its origin. It was first submitted to a proximate analysis which gave the following results:

		Successive Extractions.	
Moisture	6.44	Pentosans	3.80
Ash	10.68	Benzin, volatile	0.08
Crude fiber	26.59	non-volatile	3.47
Tannin	3.87	Ether, volatile	0.03
Protein	15.14	non-volatile	1.62
Reducing sugars	4.48	Alcohol	16.53
Starch by acid	9.51	Water	22.46
By diastase	1.23		

In order to test for alkaloids, two pounds of the powdered material was extracted with very dilute hydrochloric acid. The solution was then made alkaline with ammonia and exhausted with ether and the ethereal solution was shaken with diluted acid. This purification process was repeated several times, finally ending

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with an acidified solution. This was treated with tannic acid, Mayer's reagent, picric acid and phosphotungstic acid. Since in no case was a precipitate observed, it may be concluded that ether-soluble alkaloids can be present only in minute quantity.

In spite of extensive experiments for the purpose, no crystalline glucosides could be isolated. As is well known, there is no certain method of establishing the presence or absence of such substances, since they exhibit no uniform properties as a general rule. After rendering any enzyme inert by boiling water and purifying the resulting solution by normal and basic lead acetate, the filtrate was freed from lead and concentrated. Since nothing was obtained in this way, the residue was extracted by ethyl acetate and by other immiscible solvents, but without result. It was found, however, that the aqueous solution contained notable quantities of saponin which was not strongly hemolytic.

Attempts were also made to isolate any choline derivatives. Two pounds of the powdered plant were extracted with boiling, acidified alcohol and the resulting solution was evaporated to dryness under reduced pressure. The residue was purified by exhausting with ether and again dissolved in boiling, absolute alcohol. From this solution any bases were precipitated by treating with alcoholic mercuric chloride. The dark-colored product was then suspended in water and decomposed by hydrogen sulfide. The mixture was then evaporated to dryness, taken up with water and filtered. After evaporating the liquid to a small volume, it was treated with a solution of gold chloride, giving considerable reduction to metallic gold which was removed by filtration. The solution gradually deposited yellow crystals of a compound which answered the description of choline gold chloride, but the amount was too small to purify for analysis.

#### SUMMARY.

1. A proximate analysis of American mistletoe was made and a table of results is given.

2. Tannin, starch pentosans and saponins are present, probably also some derivatives of choline, but alkaloids were not found.

#### REFERENCES.

- (1) Crawford, *J. Am. Med. Assoc.*, 57, 865 (1911).
- (2) Hanzlik and French, *J. Pharmacol.*, 23, 269-306 (1924).

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## DRUG EXTRACTION. XII. THE EFFECT OF VARIATION IN PROPORTION OF MOISTENING LIQUID ON THE PERCOLATION OF JALAP.<sup>1,2</sup>

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Experiments were carried out to determine the effect of varying the proportion of liquid used in moistening jalap on the efficiency of extraction.

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<sup>2</sup> This paper is based on part of a dissertation presented to the Graduate Council of the University of Florida by Paul Fehder, in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

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