XLVII. A QUALITATIVE TANNIN TEST.

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TANNING consists in the fixation of the tannins by animal fibre. A reliable tannin test must therefore demonstrate this specific property and it is remarkable that no such test has so far been devised. The reactions which are generally used for the identification of the tannins, such as the colorations produced by iron salts or the precipitations which are given by potassium dichromate and gelatin [compare, for example, Onslow, 1920], obviously only indicate some incidental properties of the tannins. These reactions are also shared by other organic substances, thus phenols and hydroxybenzoic acids are known to give colorations with iron salts, whilst both gallic acid and gallotannin are precipitated by potassium dichromate [Drabble and Nierenstein, 1907]. Similarly gelatin is not only precipitated by tannins, but also by gum arabic [Pelletier, 1813], starch [Tollens, 1914], inulin [Tollens, 1914], methyl gallate [Nierenstein, 1905, 1912; Fischer, 1919; Freudenberg, 1920] and other substances. The want of a specific tannin test was therefore felt for many years in this laboratory, with the result that the following method has been devised by us at the suggestion of Dr Nierenstein.

A small piece of gold-beater's skin¹, about $\frac{1}{2}$ inch long and $\frac{3}{4}$ inch wide, is pinned on a flat surface of paraffin-wax, which is prepared by pouring melted paraffin-wax into a watch-glass. The skin is covered with a few cc. of water, in which it is left soaking for five minutes so as to make it better permeable to the tannins. The water is then poured off and the skin tanned by covering it with 1 cc. of a tannin solution, which is prepared by extracting for half-an-hour on a boiling-water bath 1 g. of the material to be tested with 50 cc. of water. After many experiments we have come to the conclusion that half-an-hour's tanning suffices even for the weakest tannin solution, but that solutions of usual strength (about 1-2 %) tan in a few minutes. It is, however, advisable to tan not less than 15 minutes. The tanned skin is washed for two minutes at a constant drip of two drops per second and then stained for five

¹ Gold-beater's skin is the outside membrane of the large intestine of the ox. It has many advantages over other animal tissues. It is easily obtainable (the material used by us was supplied by the British Drug Houses) and it is very thin (1 yard $\times$ 6 inches weighs only about 3 g.). It consequently tans rapidly and requires only little tannin, which should make this test of use not only for chemical, but also for botanical work.

minutes with 1 cc. of a 1 % solution of ferric chloride. It is then again washed, dried and mounted for reference.

We find that only tanned gold-beater's skin is stained by ferric chloride. By this method we have been able to demonstrate the presence of tannins in the following plant products¹, all of which are known to contain tannins:

Aleppo galls, Chinese galls, Chinese plum galls, blue Basra galls, white Basra galls, Knopper galls, Sumac, Mangrove bark, Mimosa bark, Myrobalams, Valonia, Oak bark, Quebracho wood, Hemlock bark, Divi-Divi, Algarobilla, Canaigre, *Pistacia Lentiscus*, Golden Wattle, *Acacia Arabica*, Larch bark, Tea, Coffee, and Cocoa.

Gallotannin behaves exactly in the same manner, whereas gallic acid and pyrogallol, both of which are known not to possess tanning properties, are not fixed by gold-beater's skin, which is consequently not stained by ferric chloride. Identical results were also given by the following substances, all of which are known not to possess tanning properties:

Phenol, catechol, quinol, resorcinol, phloroglucinol, salicylic acid, protocatechuic acid and β -resorcylic acid.

The combination between the tannins and the gold-beater's skin is of a very permanent character. This is evident from the fact that the tanned and subsequently stained gold-beater's skin may be decolorised with dilute hydrochloric acid and again re-stained with ferric chloride. This process of decolorising and re-staining may be repeated several times without the slightest effect on the colour of the re-stained material.

In conclusion we would like to suggest that this test be referred to as the "gold-beater's skin test for tannins." We also wish to thank Prof. McCandlish of the University of Leeds and Mr M. C. Lamb of the Leathersellers' Technical College at London for the different tanning materials used in this investigation. Our thanks are also due to the Research Fund Committee of the Chemical Society for a grant allocated to Dr Nierenstein for his work on gallotannin, from which the expenses of the present investigation were defrayed.

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¹ We refrain from giving the Latin names of the plants we have used, since they are well-known tanning materials, which can be found in any book which deals with them [compare for example, Dekker, 1913].