

The process is now carried out as follows: 50 cc. of the tannin-salt filtrate are transferred to a Kjeldahl digestion flask, and a few drops of sulphuric acid are added. The flask is placed in the steam-bath and connected with the vacuum and the solution is evaporated to dryness. In the digestion process about 30 cc. of sulphuric acid are added, but no potassium sulphate. The large amount of sodium chloride used in the process forms sufficient sodium sulphate, which acts similarly to the potassium sulphate.

The rest of the process is carried out in the usual manner.

With the above modifications the Tannin-salt method gives no trouble in the Kjeldahl process.

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Note: The Occurrence of Coumarin in Achlys Triphylla. *Achlys triphylla* is a Pacific Coast representative of the Berberis family, and like the Oregon Grape, *Berberis Aquifolium*, is found abundantly in the fir forests west of the Cascade Mountains, from British Columbia to California. It thrives especially in the shady slopes of the Coast Range, where its ample leaves form a continuous carpet of green over large areas. Howell in his Flora of Northwestern America describes the plant as follows: "Root stalk creeping, clothed with glumaceous scales. Leaves ample, long petioled, a foot or more high from a scaly base. Leaflets broadly cuneate 3-5 inches long, the outer margin irregularly and coarsely sinuate. Very fragrant when drying. Scape solitary, equalling or surpassing the leaf."

The plant is sometimes called "elk weed," but more commonly "wild vanilla," on account of its fragrant odor when drying. Its clusters are frequently hung in the kitchen or linen closet for the sake of this sweet perfume which it imparts.

The young plants begin to come out about the first of April, and when still very young the leaves have a fragrant odor when warmed in the hand. The odor is also noticeable in the woods among mature plants before they are plucked. The stalk and root of the plant have a fiery taste, which is quite persistent when chewed.

It was at first thought that the fragrance of the plant was probably due to a volatile oil, but distilling with steam failed to yield an oil, showing the odoriferous principle to be non-volatile. A small quantity of the fresh leaves was next shaken with ether and the ether allowed to slowly evaporate. After a few hours, minute, needle-like crystals were seen growing out of the greenish residue. These crystals had the odor of Coumarin and were insoluble in cold water, but soluble in warm water, alcohol and chloroform.

About five pounds of the air-dried plant were digested 24 hours with warm water and the brownish colored extract evaporated to a small bulk. The tannins were precipitated with basic lead acetate and the filtrate shaken out with chloroform in a separatory funnel. The chloroform extract was allowed to slowly evaporate and a gummy residue was obtained which, on standing, crystallized in a cell-like structure, crystallization beginning at a number of points and proceeding radially until intersecting. On melting, the mass recrystallized into a fibrous form. The crystals were colorless, had a very strong odor of coumarin and honey and melted at 65°. Ferric chloride gave no color to their water solution, showing the absence of vanillin. Fusion of the crystals with caustic potash gave acetic and salicylic acids.

The crystals of coumarin were purified by dissolving in ether and shaking out with 2% ammonia water in a separatory funnel. A small amount of a fragrant, low-melting, uncrystallizable substance was obtained on acidifying the ammoniacal extract and shaking out with chloroform. The ether solution, after the treatment with ammonia water, was allowed to slowly evaporate and the beautiful, characteristic rhombic crystals of coumarin were obtained having a melting point of 67°. By shaking out the water extract of the plant with ether according to Reinsch¹ a yield of 0.20% was obtained on the air-dried plant. Mature plants yield best and a large proportion of the coumarin exists in the leaf stalks. Among the several plants which have been found to contain coumarin², *Hierochloa borealis* is the only Western species noted. This plant is found growing along streams of the Northwest.

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REVIEW.

THE TESTING OF COPPER AND ITS BY-PRODUCTS IN AMERICAN REFINERIES.

BY GEORGE L. HEATH.

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A proper control of refining is attained by the determination of the quality of all supplies and fluxes, and by mechanical, chemical, and electrical tests of the metal from the ore, or concentrate, to the finished condition of commercial purity.

In an electrolytic plant, we have, also, working tests of vat solutions, slimes, blue vitriol, anodes, and bullion.

In the treatment of copper, your attention is called to a special factor, unimportant to the iron and steel metallurgist. I refer to the quality of high electrical conductivity, which makes the metal a necessity in the

¹J. 1867, 439.

²Parry "Essential Oils," p. 354.