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COMPOSITION OF NECTANDRA COTO, RUSBY NOV.
PRELIMINARY REPORT.

BY HARVEY A. SEIL.

Previous investigators have shown¹ that true coto bark contains cotoin, cotoin methyl ethers, phenyl coumalin, protocotoin, methyl-protocotoin, ethereal oil and tannin. The chemical constitution of cotoin and its derivatives has been carefully studied and can be briefly outlined as follows:

Cotoin— $C_6H_5.CO.C_6H_2(OH)_2.OCH_3$. Melting point, 130° C.

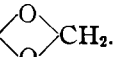
Hydrocotoin

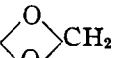
(Cotoin monomethyl ether)— $C_6H_5.CO.C_6H_2(OH)(OCH_3)_2$. Melting point, 98° C.

Methyl-hydrocotoin

(Cotoin dimethyl ether)— $C_6H_5.CO.C_6H_2(O.CH_3)_3$. Melting point, 113° C.


These are all methyl ethers of a substituted benzophenone, or better, of benzoyl-phloroglucin.

Protocotoin— $(CH_3O)_2HO.C_6H_2.CO.C_6H_3$  CH_2 . Melting point, 141–2° C.

Methyl-protocotoin— $(CH_3O)_3.C_6H_2.CO.C_6H_3$  CH_2 . Melting point, 134–5° C.

Protocotoin and methyl-protocotoin are derivatives of 1,3,5-trioxybenzoproto-catechone and are the methylene ethers of hydrocotoin and methyl-hydrocotoin.

Phenyl coumalin— $C_6H_5-C : C H . C H$.

$O - CO - CH$


Melting point, 68° C.

Cotoin, the main constituent of the bark, occurs in pale yellow prisms or plates melting at 130° C. It is sparingly soluble in cold water, more readily in hot. It is easily soluble in the ordinary organic solvents but difficultly soluble in petroleum ether. It dissolves readily in alkali, with a yellow color. It reduces silver solution in the cold and Fehling's solution hot. Ferric chloride added to an alcoholic solution gives a brown-black coloration. A drop of concentrated nitric acid to a solution of cotoin in glacial acetic acid gives a blood-red color.

Nectandra Coto RUSBY.

The sample of coto under investigation was kindly furnished by Dr. Henry H. Rusby who personally collected the bark in his recent exploration with the H. K. Mulford expedition. The bark was ground to about 20 mesh with considerable difficulty since it was very resinous and continually clogged the mill.

¹ Ciamician and Silber, *Ber.*, 24, 2977; 26, 2340; 27, 419; 28, 1549. *Pollak-Monatsch.*, 22, 996. Jobst and Hesse, *Annalen*, 199, 17.

ANALYSIS.

Ten grams of the bark were placed in an extraction thimble and extracted with light-boiling petroleum ether for about 20 hours. The solvent was then carefully evaporated, the residue dried in a desiccator and weighed at frequent intervals until the weight losses became constant. It was then heated at 110° C. to constant weight, with the following results:

Total petroleum ether extract.....	12.69%
Ethereal oil.....	1.89%

The thimble from the petroleum ether extract was dried and extracted with U. S. P. ether until exhausted.

Ether extract (after petroleum ether extraction).....	10.25%
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The thimble was again dried and extracted with 95% alcohol until exhausted.

Alcohol extract (after petroleum ether and ether extraction)	8.02%
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The petroleum ether extract contained most of the cotoin. The alcohol extract contained tannin and alkaloid.

Ash.....	1.67%
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Alkaloids.—Ten grams of the bark were placed in a 250-cc bottle and 200 cc of ether-chloroform mixture (2-1) added and thoroughly shaken, then made alkaline with ammonia and shaken at intervals, then allowed to stand over night. One hundred and seventy-five cc of the clear supernatant liquid were then drawn off into a cylinder and filtered, washing both cylinder and filter paper with ether. The alkaloids were repeatedly extracted with 2 per cent sulphuric acid until 2 cc of the acid gave no turbidity with iodine solution. The acid solution was then made ammoniacal and extracted with several portions of chloroform until all the alkaloids had been removed, as shown by test. Each chloroform extract was washed successively in two separatory funnels, each containing 15 cc of *N*/2 sodium hydroxide. The chloroform solutions were washed in a third separatory funnel with 10 cc of water and finally filtered into a tared flask. The chloroform was evaporated and the flask with contents dried to constant weight at 100° C. The alkali wash waters, containing any phenolic alkaloids, were added to the water in the third separatory funnel and acidified with hydrochloric acid. The alkaloidal acid solution was then made alkaline with ammonia and extracted with chloroform and treated as above. This method yielded two alkaloids or groups of alkaloids, one non-phenolic and the other phenolic as follows:

Total non-phenolic alkaloids.....	0.78%
Total phenolic alkaloids.....	0.60%
Total alkaloidal content of the drug.....	1.38%

At the suggestion of Dr. Rusby, the name *parostemine* is given to the non-phenolic alkaloid and *parosteminine* to the phenolic alkaloid. Both names are derived from *Parostema*, the sub-genus of *Nectandra* to which coto belongs.

Parostemine, the non-phenolic alkaloid, and *parosteminine*, the phenolic alkaloid, give no characteristic color reactions with the usual alkaloidal color reagents. Both precipitate with the usual alkaloidal precipitants. *Parosteminine*, being a phenol, as is shown by the fact that it is not extracted from a fixed alkali solution by chloroform, gives a purple-red color with ferric chloride in alcoholic solution. Mayer's reagent gives a well-crystallized precipitate with *parostemine* which in itself is characteristic since this is not the case with any of the common alkaloids. With *parosteminine*, the precipitate formed by Mayer's reagent is the usual curdy, amorphous mass. Wagner's reagent yields with *parostemine* a precipitate which rapidly becomes crystalline and sharply defined. *Parosteminine* with this reagent forms a precipitate which remains amorphous and shows no tendency to assume a crystalline form such as is exhibited by *parostemine*.

Cotoin.—About 10 grams of the bark were extracted with 200 cc of ether, the ether evaporated to about 15 cc and then 100 cc of light-boiling petroleum ether were added in four portions, stirring thoroughly after each addition. The mixture was then brought to the boiling point and again stirred, filtered and the sol-

vent evaporated. The residue was dissolved in boiling water and crystallized. The slightly yellow crystals so obtained melted at 127–128° C. uncorrected. The alcoholic solution gave a brown-black coloration with ferric chloride. A few crystals dissolved in glacial acetic acid, on the addition of a few drops of concentrated nitric acid, gave a blood-red color. These reactions prove that the crystalline substance is cotoin.

SUMMARY.

Nectandra Coto Rusby is a true coto, since it contains cotoin. The total ether extract is 24.83%, volatile oil 1.89%, and ash 1.67%. Two new alkaloids, parostemine and parosteminine, were found in the drug. Further work is in progress and will be reported later in the JOURNAL OF THE AMERICAN PHARMACEUTICAL ASSOCIATION.

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THE HISTOLOGY OF VILCA BARK.

BY FANCHON HART.

Piptadenia macrocarpa Benthams is the botanical source of Vilca bark, one of the many medicinal barks brought here from South America by Dr. H. H. Rusby. This bark was collected by him during his recent exploration in the Amazon region.

The tree is a member of the family *Mimosaceae*. It was found growing in Bolivia where the natives make an aqueous extract of the bark. This extract is added to cane juice to hasten fermentation, the process being brought to completion in much less time than is otherwise required and resulting in an increased yield.

The tree has a wide range in central South America. Dr. Rusby encountered it on the central slopes of the eastern Bolivian Andes, at an elevation of from 3000 to 5000 feet, where the trees are abundant, growing on the slopes, but not in the river bottoms. The usual height of the trees is from 40 to 80 feet, and the trunk diameter from one to two feet. The tree is instantly recognized by its conspicuously warty bark, the warts so densely placed as to be freely confluent or superposed. The leaves are bipinnate, with innumerable very small leaflets, imparting a fine and graceful appearance to the foliage. The flowers are of the usual mimosaceous type and the pods like narrow flattened bean pods, with strongly thickened margins, brown in color and of a woody texture. The wood is extremely hard and very durable, and largely used as lumber.

It is noteworthy that this is one of the several trees of tropical America to which the name "quebracho" has been applied, so that there has been some confusion of it with the quebrachos of Argentina and Paraguay. It has also been called "Zumaque," doubtless because of its large content of tannin, showing a confusion with the several plants known in different regions as "sumac."

The bark is easily collected, peeling readily from the wood, and has been used for tanning, as well as for the fermentation of cane juice.