

**ANALYSES OF THE CINCHONA BARKS ON EXHIBITION IN THE  
MATERIA MEDICA SECTION. U. S. NATIONAL MUSEUM.**

**BY GEORGE E. DOERING, PHAR. D.**

The collection of cinchona barks now on exhibition in the materia medica section of this museum represents about all the varieties that are to be found in commerce. They were received mostly from the Government plantations of India, Government plantations of Jamaica, Messrs. Howard & Sons, London, Messrs. W. H. Schieffelin & Co., New York, and the U. S. Centennial Exhibition, 1876.

The collection comprises nearly all the natural barks of South America, and almost every variety of the cultivated product from the plantations in India, Java, Ceylon, Mexico, and Jamaica. They number in all over a hundred specimens.

With such a large and varied collection the question naturally arose, what is the comparative value of these barks? To answer this it was simply necessary to assay them, which was accordingly undertaken at the suggestion of the present curator, Dr. H. G. Beyer, U. S. N. (Some specimens existed in such a limited quantity that even the small amount of 5 grams could not be spared, and thus had to be omitted from the list given below.)

Through the courtesy of Prof. F. W. Clarke I was allowed to do the work in the laboratory of the U. S. Geological Survey.

Many of the methods described in the books for determining the amount of cinchona alkaloids were tried, with the view of obtaining one which would give the smoothest results. The following is a description of the method employed :

(1) Five grams of the finely powdered bark are first digested for several hours with 100<sup>cc</sup> of a 1 per cent. solution of sodium hydrate, filtered, and the contents of the filter washed with an additional 50<sup>cc</sup> of alkaline solution. (This preliminary operation is to remove tannin, coloring, and other objectionable substances, which greatly interfere with the subsequent removal of alkaloids by chloroform.) This solution is then made acid, filtered from the precipitated cinchona red, the filtrate rendered alkaline, and such alkaloids as may have been dissolved are removed with chloroform, the chloroformic solution evaporated, and the residue weighed. This weight is to be added to the final result.

(2) The bark so prepared is now transferred to a flask, with 100<sup>cc</sup> of a 2½ per cent. solution of sulphuric acid, and digested for several hours on a water-bath; filter and repeat the operation, washing the filter until the filtrate ceases to become turbid upon the addition of sodium hydrate. (The bark that has so far as possible been exhausted of

alkaloids is still capable of yielding an acid infusion, which is decidedly fluorescent, but does not reveal the presence of alkaloids by the addition of alkali.)

(3) Sodium hydrate is now added to the acid liquor until distinctly alkaline, 15<sup>cc</sup> chloroform next added, and the contents of the flask thoroughly agitated. After the chloroform has all settled to the bottom, the supernatant liquid is decanted and the chloroformic solution of the alkaloids transferred to a filter wetted with water. The decanted liquid is again treated twice with chloroform, using 10<sup>cc</sup> each time, and the resulting alkaloidal solutions added to the above filter. As soon as all the aqueous fluid has filtered through, the filter is broken and its contents allowed to filter through a filter wetted with chloroform into a tarred flask; this is placed on a water-bath and the contents evaporated until the flask ceases to lose weight. This weight, plus the weight of the alkaloids obtained from the alkaline washings of No. 1, multiplied by 20, gives the percentage of total alkaloids.

(4) The amount of ether soluble alkaloids is obtained by treating these two residues with 30 times their weight of ether, filtering, evaporating, and multiplying the weight of the residue by 20.

No.	Name.	Locality.	Description.	Ash.	Alkaloids.		Remarks.
					Total.	Ether sol.	
52920	<i>Cinchona anglica</i> .....	Madras	Blackish quills fissured transversely.....	<i>Pr. et.</i> 2.505	<i>Pr. et.</i> 3.934	2.150	Natural bark.
52921	do.....	do	Curved, warty pieces of a chocolate color.....	1.980	4.818	3.744	Renewed bark.
52922	do.....	do	Thick, dark gray pieces fissured transversely.....	1.980	6.908	4.352	Mossed bark.
51009	<i>Cinchona javanica</i> .....	Java	Thick quills covered with lichens.....	1.700	0.588	0.200	
52000	do.....	do	do.....	1.820	1.668	1.010	
52000	do.....	do	Large quills.....	1.720	2.597	0.900	
52007	<i>Cinchona Harskarihana</i> .....	do	Very thin quills.....	1.820	0.578	0.190	
52911	<i>Cinchona Pahudiana</i> .....	Madras	Thin quills covered with lichens.....	2.541	1.008	0.663	Natural bark.
52912	do.....	do	Smooth, chocolate-colored quills.....	1.651	0.755	0.360	Mossed bark.
52928	<i>Cinchona Pelletierana</i> .....	South America	Thin quills.....	1.800	1.128	0.180	
52909	<i>Cinchona Schubkraft</i> .....	Java	Quills.....	2.340	4.966	2.770	Root bark.
53231	<i>Cinchona hybrid</i> .....	Jamaica	Large quills wrinkled longitudinally.....	2.340	4.790	3.089	
53205	do.....	India	Dark quills marked with grayish spots.....	1.910	3.468	2.160	
53230	do.....	do	Quills covered with lichens.....	3.180	4.744	2.752	Natural bark.
52909	<i>Cinchona Pitayensis</i> .....	Jamaica	Thin, rough quills.....	4.565	6.250	0.510	Do.
51651	<i>Cinchona meridionalis</i> .....	Madras	Small quills covered with lichens.....	3.280	4.800	3.360	Var. rotundifolia.
51692	<i>Cinchona carabayensis</i> .....	Venezuela	Thin twisted pieces.....	2.081	0.588	0.200	
50052	<i>Cinchona officinalis</i> .....	Brazil	Large, thick pieces and thin quills.....	2.700	0.989	0.250	
52024	do.....	do	Thin quills.....	2.220	2.388	2.000	Var. Crispa.
52015	do.....	Madras	Curved thick pieces fissured transversely.....	2.660	1.906	1.520	Var. Uritusingsa.
52800	do.....	do	Very thin quills.....	3.920	2.424	2.040	Do.
52905	do.....	Madras	Thin quills, natural bark.....	3.600	1.350	1.000	Do.
52891	do.....	do	Blackish, curved pieces; mossed bark.....	3.540	0.968	0.968	Do.
52899	do.....	do	do.....	3.420	4.386	3.080	Do.
52902	do.....	do	Dark, brown, warty pieces, renewed bark.....	3.720	3.820	3.446	Do.
52021	do.....	South America	Long, black quills, natural bark.....	1.800	0.958	0.670	
52032	do.....	do	Long, thin, fibrous quills.....	1.000	0.122	0.000	
52016	do.....	Madras	Long, curved pieces.....	3.020	1.177	0.890	
52005	do.....	Java	Gray quills.....	2.581	1.306	0.610	
52026	do.....	Ceylon	Very thin quills.....	3.040	1.186	0.806	
52029	do.....	do	Large quills of very thin bark.....	2.480	2.260	1.000	Knotty bark of Jussieu.
52805	do.....	do	Large quills covered with thick knotty rings.....	3.320	3.848	3.480	Renewed after shaving.
52929	do.....	Madras	Thin, wrinkled pieces, glossy chocolate color.....	3.540	4.965	4.580	
52929	do.....	do	Blackish quills covered with lichens.....	2.780	2.260	1.700	
52918	do.....	India	Quills very much wrinkled.....	3.000	2.983	2.103	
53207	do.....	do	Thick, gray quills.....	2.900	2.790	1.280	
53206	do.....	do	Dark colored quills covered with lichens.....	2.340	3.488	3.000	Mossed bark.
52906	do.....	Madras	Thin, grayish-black quills.....	2.660	4.560	4.180	Renewed bark.
52908	do.....	do	Curved pieces.....				

52907	do	Grayish black, wrinkled pieces	3.600	5.500	4.700	Mossed bark.
52897	do	Thin curved pieces	2.060	4.565	4.180	Renewed bark.
52893	Cinchona officinalis condaminea	Dark brown, curved somewhat warty pieces	2.380	1.463	1.392	
52892	do	Curved brown pieces	1.640	1.528	1.140	
52898	do	Slender, chocolate-colored pieces	1.962	3.620	3.100	
52904	Cinchona officinalis angustifolia	Curved pieces covered with lichens	2.480	1.090	0.710	Natural bark.
52901	do	Curved pieces	3.760	7.200	6.000	Renewed bark.
52900	do	Curved, wrinkled pieces	2.990	6.388	7.430	Mossed bark.
52941	do	Small, wrinkled pieces	2.270	5.526	6.900	Renewed bark.
52940	Cinchona pubescens	Curved, warty pieces	3.960	4.280	3.892	Natural bark.
52925	do	Small quills covered with lichens	2.040	4.388	4.030	Natural bark.
53926	do	Curved, warty pieces	* 2.740	4.880	4.430	Natural bark.
52923	do	Small quills	2.200	5.613	5.230	Renewed bark.
52924	do	Curved, warty pieces	3.020	3.648	3.260	Do.
52938	do	Twisted quills	2.855	4.127	2.330	Natural bark.
52927	do	Small quills	2.901	6.548	6.160	Do.
52930	do	Twisted quills fissured transversely	2.780	3.566	3.000	Mossed bark.
52931	do	Black, curved pieces	3.940	2.846	2.300	Do.
52929	do	Black quills	2.480	3.080	4.600	Do.
52896	do	Curved, thick wrinkled pieces	3.560	1.638	0.250	Corky bark.
52914	do	do	2.501	1.857	1.470	
52915	do	do	2.400	4.672	4.292	
52928	do	Curved, thin pieces fissured longitudinally	2.860	4.448	2.990	
50431	Cinchona succirubra	Thin quills	4.640	3.007	1.760	Rubingosa bark.
52379	do	Thin, fibrous pieces	1.761	2.708	1.281	
52013	Mexico	Dark gray quills and partly covered with lichens	2.926	5.010	2.760	
do	do	Chocolate-colored quills	2.743	4.928	2.594	
do	do	Thin quills; epidermis easily detached	2.599	5.180	2.370	
do	Madras	Small fibrous pieces	3.100	3.090	3.500	
do	do	Warty quills	2.740	3.248	2.352	
52003	do	Thick quills	2.500	3.940	1.780	
do	Ceylon	do	2.840	4.129	2.811	
52001	do	do	2.400	5.027	3.240	
52030	Java	Black quills	4.081	5.341	2.531	
52935	do	Thin quills	3.220	4.360	2.020	
52934	do	Dark, thin curved pieces	3.182	4.466	2.003	
52962	do	Dark, warty curved pieces	2.560	4.536	2.097	
52936	do	Curved pieces, very much wrinkled	2.446	4.268	1.930	
52933	do	Gray quills	3.570	5.888	3.000	
do	do	Brown, wrinkled pieces	2.580	9.240	3.343	
52910	India	Thick quills	2.070	4.905	3.690	
do	do	Large quills	2.213	4.130	2.200	
52900	do	Very thin, wrinkled pieces	2.766	1.822	1.520	
52902	do	Large quills, brown, thin, wrinkled longitudinally	2.561	3.940	1.402	
52345	do	Thin pieces	2.722	5.280	3.000	
52346	do	Smooth, gray quills	2.640	5.537	2.470	
52337	do	Thick quills	1.462	2.808	2.420	
52337	Jamaica	Thick, flat pieces	4.000	1.607	0.710	
50129	Cinchona callisaya	Thick, flat pieces, very fibrous	1.380	1.600	1.600	
50077	do	Dark brown, curved pieces	1.880	4.501	1.600	
52380	do	do	1.880	4.501	1.600	

## Analyses of cinchona barks—Continued.

No.	Name.	Locality.	Description.	Ash.	Alkaloids.		Remarks.
					Total.	Ether sol.	
52918	Cinchona callisaya.....	India.....	Thick, curved pieces covered with lichens.....	<i>Pr. ct.</i> 1.982	<i>Pr. ct.</i> 2.199	<i>Pr. ct.</i> 1.810	
52919	do.....	do.....	Dark, curved pieces covered with lichens.....	2.100	3.473	1.440	
53639	do.....	do.....	Dark, thin quills.....	2.240	0.240	0.240	Var. Josephiana.
53233	do.....	do.....	Small quills covered with lichens.....	3.000	2.688	1.870	Var. Ledgeriana.
53203	do.....	do.....	Thin quills.....	2.243	7.227	6.840	
53234	do.....	Jamaca.....	Dark brown quills and pieces.....	7.800	5.348	3.000	
53209	do.....	India.....	Thick quills.....	2.480	6.368	6.192	Do.
52904	do.....	Java.....	Large quills covered with lichens.....	1.980	4.580	4.200	Do.