

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

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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^{cc} of a 1 per cent. solution of sodium hydrate, filtered, and the contents of the filter washed with an additional 50^{cc} 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^{cc} 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^{cc} 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^{cc} 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>	<i>Pr. et.</i>	<i>Pr. et.</i>	Natural bark.
52921	do	do	Curved, warty pieces of a chocolate color	2.505	3.934	2.150	Renewed bark.
52922	do	do	Thick, dark gray pieces fissured transversely	1.980	4.818	3.744	Mossed bark.
51999	<i>Cinchona javanica</i>	Java	Thick quills covered with lichens	1.980	6.908	4.352	
52000	do	do	do	1.700	0.588	0.200	
52001	do	do	Large quills	1.820	1.668	1.010	
52002	<i>Cinchona Harskariana</i>	do	Very thin quills	1.780	2.597	0.900	
52007	<i>Cinchona Pehudiana</i>	do	Thin quills covered with lichens	1.920	0.578	0.190	
52911	do	Madras	Smooth, chocolate-colored quills	3.520	0.906	0.906	Natural bark.
52912	do	do	Large, thick flat pieces	2.541	1.008	0.669	Mossed bark.
52028	<i>Cinchona Pelletierana</i>	South America	Thin quills	1.651	0.755	0.360	
52009	<i>Cinchona Schuhkraft</i>	Java	Quills	1.800	1.128	0.180	
52231	<i>Cinchona hybrid</i>	Jamaica	Large quills wrinkled longitudinally	2.540	6.364	4.400	Root bark.
53205	do	India	Dark quills marked with grayish spots	2.344	4.966	2.770	
53204	do	do	Quills covered with lichens	2.340	4.790	3.089	
53230	do	Jamaica	Thin, rough quills	1.900	3.468	2.160	
52909	<i>Cinchona Pitayensis</i>	Madras	Small quills covered with lichens	3.180	4.744	2.752	Natural bark.
52916	<i>Cinchona micrantha</i>	do	Thin twisted pieces	4.565	6.250	6.510	Do.
51651	<i>Cinchona cordifolia</i>	Venezuela	Large, thick pieces and thin quills	3.280	4.800	3.360	Var. rotundifolia.
51692	<i>Cinchona carabayensis</i>	Brazil	Thin quills	2.081	0.588	0.200	
50052	<i>Cinchona officinalis</i>	do	Curved, thick pieces fissured transversely	2.700	0.989	6.250	
52024	do	Madras	Very thin quills	2.220	2.388	2.000	
52015	do	do	Thin quills, natural bark	2.660	1.906	1.520	Var. Crispa.
52800	do	Madras	Blackish, curved pieces; mossed bark	3.920	2.424	2.040	Var. Uritusinga.
52905	do	do	do	3.600	1.380	1.090	Do.
52891	do	do	Dark, brown, warty pieces, renewed bark	3.540	0.968	0.968	Do.
52899	do	do	Long, black quills, natural bark	3.420	4.386	3.080	Do.
52902	do	do	Long, thin, fibrous quills	3.720	3.820	3.446	Do.
52021	do	South America	Long, curved pieces	1.800	0.938	0.670	
52032	do	Madras	Gray quills	1.000	9.122	4.000	
52016	do	Java	Very thin quills	3.020	1.177	0.890	
52005	do	Ceylon	Large quills of very thin bark	2.581	1.306	0.610	
52026	do	do	Large quills covered with thick knotty rings	3.040	1.186	0.806	
52029	do	do	Thin, wrinkled pieces, glossy chocolate color	3.480	2.260	1.106	Knotty bark of Jussien.
52805	do	Madras	Blackish quills covered with lichens	3.320	3.818	3.480	Renewed after shaving.
53229	do	India	Quills very much wrinkled	3.540	4.905	4.580	
53208	do	do	Thick, gray quills	2.780	2.260	1.700	
53207	do	India	Dark colored quills covered with lichens	3.000	2.383	2.103	
53206	do	do	Thin, grayish-black quills	2.900	2.790	1.280	
52906	do	Madras	Curved pieces	2.340	3.388	3.000	Mossed bark.
52908	do	do		2.660	4.560	4.180	Renewed bark.

52907	do	do	Grayish black, wrinkled pieces	3. 600	5. 500	4. 700	Mossed bark.
52907	do	do	Thin curved pieces	2. 060	4. 555	4. 180	Renewed bark.
52893	Cinchona officinalis condaminea	do	Dark brown, curved somewhat warty pieces	2. 380	1. 463	1. 392	
52892	do	do	Curved brown pieces	1. 640	1. 528	1. 140	
52898	do	do	Slender, chocolate-colored pieces	1. 962	3. 620	3. 100	
52904	Cinchona officinalis angustifolia	do	Curved pieces covered with lichens	2. 480	1. 090	0. 710	Natural bark.
52901	do	do	Curved pieces	2. 540	7. 200	6. 000	Renewed bark.
52900	do	do	Curved, wrinkled pieces	3. 760	7. 430	7. 050	Mossed bark.
52941	do	do	Small, wrinkled pieces	2. 900	6. 388	6. 000	Renewed bark.
52940	Cinchona pubescens	do	Curved, warty pieces	2. 270	5. 526	2. 771	Do.
52925	do	do	Small quills covered with lichens	3. 960	4. 280	3. 892	Natural bark.
52926	do	do	Curved, warty pieces	2. 040	4. 030	4. 030	Renewed bark.
52923	do	do	Small quills	2. 740	4. 880	4. 430	Natural bark.
52924	do	do	Curved, warty pieces	2. 200	5. 613	5. 230	Renewed bark.
52938	do	do	Twisted pieces	3. 020	3. 648	3. 260	Do.
52927	do	do	Small quills	2. 855	4. 127	2. 330	Natural bark.
52930	do	do	Twisted quills fissured transversely	2. 901	6. 548	6. 160	Do.
52931	do	do	Black, curved pieces	2. 780	3. 566	3. 000	Mossed bark.
52929	do	do	Black quills	3. 940	2. 846	2. 300	Do.
52896	do	do	Curved, thick wrinkled pieces	2. 480	5. 080	4. 600	Corky bark.
52914	do	do	Corky bark	3. 560	1. 638	0. 250	
52915	do	do	do	2. 501	1. 857	1. 470	
52928	do	do	Curved, thin pieces fissured longitudinally	2. 400	4. 672	4. 292	
50431	Cinchona succirubra	do	Thin quills	2. 860	4. 448	2. 990	
50731	do	do	Thin, fibrous pieces	4. 640	3. 007	1. 760	Rubingosa bark.
52379	do	Mexico	Dark gray quills and partly covered with lichens	1. 761	2. 708	1. 281	
52013	do	South America.	Chocolate-colored quills	2. 926	5. 010	2. 760	
52023	do	do	Thin quills; epidermis easily detached	2. 743	4. 928	2. 594	
52018	do	Madras	Small, fibrous pieces	2. 599	5. 189	2. 370	
52012	do	do	Large quills and curved pieces	3. 100	5. 050	3. 500	
52003	do	do	Warty quills	2. 740	5. 248	2. 332	
52001	do	Ceylon	Thick quills	2. 500	3. 940	1. 780	
53030	do	Java	do	2. 840	4. 129	2. 811	
52935	do	Madras	Black quills	2. 400	5. 027	3. 240	
52934	do	do	Thin quills	4. 081	5. 341	2. 531	
52932	do	do	Dark, thin curved pieces	3. 220	4. 360	2. 020	
52936	do	do	Dark, warty curved pieces	3. 182	4. 466	2. 003	
52939	do	do	Curved pieces, very much wrinkled	2. 560	4. 536	2. 097	
52933	do	do	Gray quills	2. 446	4. 268	1. 930	
52937	do	do	Brown, wrinkled pieces	2. 580	5. 888	3. 000	
52910	do	India	Thick quills	3. 370	9. 249	3. 343	
53201	do	do	Large quills	2. 070	4. 905	3. 600	
53200	do	do	Very thin, wrinkled pieces	2. 213	4. 130	2. 260	
53202	do	do	Large quills, brown, thin, wrinkled longitudinally	2. 766	1. 822	1. 520	
53235	do	do	Thin pieces	2. 561	3. 940	1. 402	
53659	do	do	Smooth, gray quills	2. 722	5. 280	3. 000	
53237	do	Jamaica	Thick quills	2. 640	5. 537	2. 470	
50129	Cinchona calisaya	do	Thick, flat pieces	1. 462	2. 808	2. 420	
50077	do	do	Thick, flat pieces, very fibrous	4. 000	1. 607	0. 710	
52380	do	Mexico	Dark brown, curved pieces	1. 380	4. 501	1. 600	

Analyses of cinchona barks—Continued.

No.	Name.	Locality.	Description.	Ash.	Alkaloids.		Remarks.
					Total.	Ether sol.	
52918	Cinchona calisaya	India	Thick, curved pieces covered with lichens	<i>Pr. et.</i>	<i>Pr. et.</i>	<i>Pr. et.</i>	Var. Josephiana. Var. Ledgeriana.
52919	do	do	Dark, curved pieces covered with lichens	1.982	2.199	1.810	
53639	do	do	Dark, thin quills	2.160	3.473	1.440	
53233	do	do	Small quills covered with lichens	2.240	0.240	0.240	Do.
53203	do	do	Thick quills	3.000	2.688	1.970	
53234	do	Jamaica	Dark brown quills and pieces	2.243	7.227	6.840	
53209	do	India	Thick quills	7.300	5.348	3.000	Do.
52004	do	Java	Large quills covered with lichens	2.480	6.588	6.192	
				1.980	4.580	4.200	



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