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Botanical Medicine Monographs and Sundry

ANALYSIS OF CASSIA NICTITANS

By CHARLES S. GALLAHER, PH. G.

From an Inaugural Essay.

This plant is known as wild sensitive plant, and grows abundantly in the neighborhood of Philadelphia where it was collected for analysis, then dried and reduced to powder No. 80. The air-dry powder on being heated to between 100º and 110ºC., lost 3.7 per cent. of moisture, and yielded 4.8 per cent. of ash.

Petroleum benzin extracted a minute quantity of volatile oil, and 0.08 per cent. of waxy matter melting at 58ºC. Ether took up from the powder 5.6 per cent. of resinous matter and chlorophyll, tests for glucosides and alkaloids giving negative results. The alcoholic extract on being treated with water, left 5.78 per cent. of resinous matter undissolved; the aqueous solution yielded nothing to petroleum spirit, benzol and chloroform; tested with gelatin and ferric salt, the presence of tannin was revealed and this was estimated by precipitation with copper acetate and ignition, the result being 7.44 per cent. of tannin. The aqueous extract weighed 17.28 per cent.; this was found to be free from glucose, but contained another sugar, dextrin, and gum.; cathartic acid could not be prepared from it, but the powder was ascertained to have a laxative effect and to produce griping. Tests applied for starch gave negative results; albumin, pararabin, calcium oxalate, lignin and cellulose were present.

A larger quantity of the fresh plant was distilled with water in the presence of lime, but no volatile alkaloid was obtained. Another portion distilled with dilute sulphuric acid yielded a distillate having merely a faint acid reaction.

ANCIENT MATERIALS FOR PAPER MAKING.

It has been generally believed that linen rags have been used in the manufacture of paper only since the fourteenth century, and that previously to that the writing materials of the East were chiefly made from unmanufactured materials. This view must be considerably modified in consequence of a careful microscopical examination made by Dr. Julius Wiesner, of the paper from El-Faijûm preserved in the Austrian Museum at Vienna in the collection known as “Papyrias Erzherzog Rainer.” Many of these papers extend to the ninth, and some are even as old as the eighth century. The papers are all “clayed” like modern papers.

Dr. Wiesner's examination gave the unexpected result that these papers were all manufactured from rags. The fibre is mainly linen among which are traces of cotton,

hemp and of some animal fibre; well-preserved yarn threads are of very frequent occurrence. The manufacture of paper out of rags is not, therefore, as has hitherto been supposed, either a German or an Italian invention, but is an Eastern one. In addition to the Faijûm papers, he examined also more than five hundred Oriental and Eastern specimens from the ninth to the fifteenth century, not a single one of which was a raw-cotton paper; all were manufactured from rags, the chief ingredient being linen.

The examination of the substance used for "claying" gave equally unexpected results. In all the Faijûm papers this was found to be starch-paste, a substance which bad been supposed not to have been used for this purpose before the present century; animal substances do not appear to have been employed for "claying" before the fourteenth or fifteenth century. In some instances well-preserved starch-grains were mingled with the paste; these agreed, in form and size of the grains, with wheat starch, and were evidently prepared starch separated from the meal. In two papers, belonging to the tenth and eleventh centuries, buckwheat-starch was found, and the cultivation of this substance must, therefore, be dated back to the tenth century. The object of the "claying" was apparently to increase the whiteness of the paper.—*Phar. Jour. and Trans.*, April 14, 1888.

GHATTI, AND OTHER INDIAN SUBSTITUTES FOR GUM ARABIC.[1]

By A. MANDER.

A short time ago Mr. E. M. Holmes gave me some samples of Indian gums which have recently been imported in large quantities, and suggested an examination. The results I have obtained will perhaps not be altogether uninteresting to the members of this Association.

The packages were named "Glassy Amrad," "East India Amrad," "Pale Amrad," "Oomra Whatti," and "Ghatti," which will be briefly noticed *seriatim*.

Glassy amrad is a dark gum consisting of more or less rounded, and some stalactitic pieces, with smooth shining surface and free from internal cracks. Color varying from dark-brown to pale yellow.

With the proportion of distilled water directed for mucil. acaciae, B. P. it completely dissolved, forming a tasteless mucilage of a dark yellowish-brown color, not gelatinous, but very viscid. By passing given volumes through a burette, and comparing the times required, the viscosity was found to be 2 (muc. acac. =1). This mucilage was strongly adhesive and readily emulsified oils, but the products were of a pale fawn color. A solution of borax gelatinized the mucilage; basic lead acetate caused a slight non-gelatinous precipitate, and dense white precipitates were formed on the addition of ammonium oxalate or alcohol; ferric chloride gave a brownish coloration.

1 From a paper read before the School of Pharmacy Students' Association reprinted from Pharm. Jour. and Trans., April 14, 1888, p. 876.

East India Amrad.—A dark brittle gum of a reddish tint, composed chiefly of transparent angular fragments with a few rounded masses having a conchoidal fracture. When dissolved it gave a taste less mucilage, in color similar to that from glassy amrad, but viscosity only .51 (mucil. acaciae=1). Very adhesive, and formed a tinted emulsion with olive oil.

A brownish, opaque thick jelly was produced by basic lead acetate; there was no gelatinization by borax, and only slight cloudiness with ammonium oxalate; alcohol readily precipitated a diluted solution and ferric chloride slightly darkened another portion.

"Pale amrad" somewhat resembles "gum acacia sorts" being in broken angular pieces or small tears, and these more or less cracked internally-some pieces may be noticed having an opaline surface.

It forms a pale yellowish brown, slightly gelatinous, very fluid mucilage, viscosity being .156. This is adhesive and emulsifies olive oil like the two previous gums, but with a product not quite so colored. A thick, curdy, opaque precipitate was given with basic lead acetate; slight precipitates were formed witb neutral lead acetate and mercuric chloride; dense white with ammonium oxalate, and curdy white with both ferric chloride and alcohol.

Oomra Whatti.—A dark gum, in irregularly shaped and stalactiform pieces, clear internally but dull surface; color from reddish to pale yellow.

This gave a mucilage somewhat darker than glassy amrad, but of similar properties. Viscosity 1.8, adhesive, and emulsified oils easily. No precipitates were given with neutral or basic lead acetates, but white with ammonium oxalate or alcohol; borax gelatinized it, and ferric chloride caused darkish coloration.

Ghatti.—A pale gum consisting of' rounded or vermiform pieces of varying size, clear internally, but dull and roughened on the surface, apparently caused by shrinkage in drying; from brownish-yellow to perfectly colorless and transparent. More carelessly picked than previous specimens, with woody and other foreign matter adhering.

With the same proportion of water as the other gums it formed a pale yellowish-brown semi-solid mass, very powerfully adhesive.

When diluted, the solution gave a translucent slightly gelatinous precipitate with basic lead acetate, was precipitated by alcohol, gelatinized by borax, but only a slight opalescence was produced with ammonium oxalate. By incineration, the gum yielded 2.55 per cent. of an ash consisting chiefly of potassium and calcium carbonates and traces of sulphate.

The behavior with chemical reagents is summarized in the following table:

	Glassy Amrad.	East India Amrad.	Pale Amrad.	Oomra Whatti.	Ghatti.
Basic lead acetate . . .	Slight ppt., not gelatinous.	Brownish opaque thick jelly.	Curdy opaque ppt.	No ppt.	Translucent gelatinous ppt.
Neutral lead acetate . .	. . . . .	. . . . .	Slight ppt.	. . . . .	
Ammonium oxalate . .	White ppt.	Slightly colored ppt.	White ppt.	White ppt.	Slight ppt.
Borax	Gelatinized	. . . . .	. . . . .	Gelatinized.	Gelatinized.
Ferric chloride	Brownish color.	Slight darkening.	Curdy white ppt.	Slight darkening.	
Mercuric chloride . . .	. . . . .	. . . . .	Slight ppt.	Slight ppt.	
Alcohol.	Ppt.	Ppt.	Ppt.	Ppt.	Ppt.

The oomra whatti and amrad gums cannot be said to have much value in practical pharmacy, though they may be well adapted for the chief uses to which the inferior qualities of gum arabic were formerly exclusively put. They contain little or no astringent principles to affect the mordants in calico printing, and for strong adhesive mucilages where color is immaterial "glassy amrad" and "oomra" seem to be very suitable. Concerning "ghatti" a little more must be said.

Another supply of mucilage was made according to the formula:

Gum ghatti.....1 ounce.
Distilled water.....3 fluid ounces.

On straining, a few grains were separated which had swollen to a translucent jelly, and these remained undissolved when treated with more water. The mucilage thus obtained is scarcely as bright as that from picked gum arabic, but quite equal to that given by ordinary good samples as to color, and at the same time more viscid. It is tasteless, inodorous, and of superior adhesive properties to mucil. acaciae.

The emulsifying power was tried with olive oil, this being selected in preference to almond or castor oils as a more crucial test. Several emulsions were made with varying proportions of oil and ghatti mucilage as above, and some of these are open to comparison this evening with others made with the same amounts of oil and acacia mucilage prepared from selected gum.

No. 1.—Ghatti mucilage 1, olive oil 1, distilled water 62.
No. 2.—Acacia " 1, " 1, " " 62.
No. 3.—Ghatti " 1, " 2, " " 61.
No. 4.—Acacia " 1, " 2, " " 61.

It will be noted that the emulsions afforded by ghatti mucilage are, as regards consistence, etc., quite equal to those by acacia, but preferable as to color, being of almost pure snowy whiteness. On microscopical examination the oil particles in the emulsion made with ghatti and two parts of oil appear as nearly as possible identical in size with those given by acacia and one part, or half the quantity, of oil.

After standing fifteen days the "ghatti" emulsions showed no separation of oil, and since the mucilage was made with double the proportion of water used for acacia it

must be acknowledged that the emulsive power of the gum is very remarkable.

The prevention, or long delaying, of the chemical reaction between mercuric chloride and calcium hydrate in the presence of acacia mucilage is well known, and experiments were made to ascertain if ghatti also possessed this power. That it does so in a very striking degree is evident from the mixtures before you. A is quite clear, without any trace of precipitate, being made by adding a little diluted ghatti mucilage before the lime water; while B contains the same proportions of ingredients, but has the characteristic appearance of lotio hydrargyri flava, the mucilage being added after reaction had taken place.

I regret not having had opportunity to continue testing the properties of this gum, but from these facts it is evident that there is an article commercially obtainable at a low price which, though differing considerably in appearance from the Acaciae Gummi of the Pharmacopoeia, possesses in a marked degree many characters which have been supposed to be peculiar to it. If more care were taken in the gathering and selection there seems to be little doubt that picked qualities would speedily rise to considerable commercial value and pharmaceutical interest.

CINCHONA CULTIVATION IN BOLIVIA.

By DR. H. H. RUSBY.

From a Lecture delivered at the Philadelphia College of Pharmacy December 1, 1887, stenographically reported by Dr. C. H. Morgan.

At about the time that the plants exported to India had begun to produce seeds, the native supply of South America had become exhausted, and those whose business had thus failed were obliged to invest their capital in the planting and culture of the trees. So it happens that at the present time no bark, except an occasional bale, reaches the market, which is not the product of cultivated trees. All the barks I show you here, with about three exceptions, are the product of cultivated trees. I had men out for two months, searching the forests for wild trees, and so scarce is it that I assure you I succeeded in obtaining only three.

This brings me to the subject of its cultivation. Regarding the selection of a site for the plantation, I have already covered the subject in speaking of the conditions of its growth. After a suitable place has been selected the land must be cleared. This is done by felling the trees, and cutting away the undergrowth and burning it during the season of dryness, which occurs in quite different months, in localities even quite near to one another. The clearing process is not so difficult here as upon the level ground, owing to the ease with which the trees can be made to fall. It often happens that these trees in falling will carry down immense tracts of forest with them. The place where the trees are planted is very steep. On such a place I have seen a tree weighted down with water, go crashing down to a point so far below us, that to reach that point by the road it would occupy an entire day, whereas the tree reached the bottom in a single instant, carrying with it, not only all the trees and vines in its way, but immense masses of rock and earth, an avalanche of vegetation blocking up the

stream below. These trees will contain a very great amount of water. You will readily understand this when I explain to you that you seldom see a portion of the trunk, or larger branches of the tree as large as the palm of my hand. It is so completely covered by parasites. Upon a single tree you may count sometimes from fifty to one hundred different species of plants growing as parasites, so that the trunk of a tree, which might be three feet in diameter, becomes five feet in diameter. The branches which themselves are about as thick as a man's leg, become so large with the mass of vines and mosses by which they are covered, that a person could very easily make his bed upon one of them, and sleep without danger of falling.

Among this vegetation you will see that a great deal of moisture could be held, and when one of these trees gets loaded down with the rain it often falls with its own weight. The burning process is never complete owing to the only partial degree of dryness which can be secured, and the labor is performed amid great dangers due to the steepness of the land. A level loamy spot is selected for the nursery and here the seeds are planted. When the plants have from three to seven leaves they are transplanted, the varieties being selected with great care. The ground between the rows is kept very clean, the weeding being performed twice annually. The planting is usually done by contract, the contractor agreeing to charge for none but valuable varieties brought to a certain age. The mode of counting the trees is as follows: commissioners, mutually appointed, walk between the rows of trees, plucking a leaf from each one, which leaves are carried to the house and counted during the evening, those of worthless varieties being rejected, the surface and venation of the leaf constituting the crucial mark. The trees are then carefully attended to until the bark matures. So freely has the pollen been transported from tree to tree, that however fine the tree may be from which you gather your seeds you will obtain from those seeds trees of almost every variety known to that section; so freely do they hybridize with one another, Similar trees of the same age, growing together may mature several years apart, the difference of maturity being indicated by the peculiar scaliness of the bark. The markings are very simple and can be readily observed when I pass around these two specimens. I ask you in passing them to take both of them in your hands at once, for the sake of comparison. You will see the large specimen which I hold in my left band has not only longitudinal fissures, but transverse cracks, this dividing of the bark resembling the tarsus of a fowl, and hence called by the natives by a term which signifies “chicken-legs.” This which I hold in my right hand, which is in every respect as good a variety of bark as the other is younger, and you will see that instead of cracking transversely it wrinkles longitudinally. This mark can be seen in a young tree of good variety, or it may indicate an old tree of a worthless variety; the difference being that the worthless variety, however old, still preserves its smooth character, while the good variety takes on this roughness.

While you are looking at these two specimens, more or less of the same quality, you may look at this specimen from an old tree, of a worthless variety, which is perfectly smooth, and of a light color. This is a spurious bark. An experienced hand goes through the plantation as a marker, and indicates the trees to be cut. The cutter follows, makes an incision through the bark about three inches above the root, and another one two feet higher, connecting them by a longitudinal incision. The bark is then removed in quills, which reduce very greatly in size and about sixty per cent. in weight, in drying. The sections of bark that I show you are four feet in length. The

bark of commerce is about one half the length of this. We will take the two barks which I show you here, and you can all see the thickness of the first specimen. That specimen is still left upon the wood, so it has not shrunk in drying. If it had been, removed from the wood, and allowed to dry in the quill form it would have contracted in size so much as to have been as small as that which I show you here, if not smaller. After this first quill of bark is taken from the tree, it is felled, and similar quills cut from above, the smaller portions being shaved. Two or three shoots are allowed to grow from the stump, and when these are cut five or six more may be allowed to grow for the next crop, after which the ground is replanted. The cutting is done by contract, the price paid being from fifteen to thirty-five cents for one hundred pounds of green bark. Arrived at the drying sheds, it is spread upon long narrow stretchers and exposed to the sun. In a week or ten days it is dry, and is tied with Strips of raw-hide into bales of from sixty to sixty-five pounds each. This is the shape in which they are transported. Sixty-five pounds is a load for a man, and two of these bales is a load for a mule. Men however, usually carry them over the worst stages because mules are not able to endure the journey. At the repacking centre it is closely packed to go over the summit of the mountains. Men are rarely used upon this stage of the journey. The entire transit of these mountains requires about eight or ten days, and covers an actual distance of two hundred and twenty-five miles, costing from fifteen to twenty cents per pound Bolivian currency. So you see these men, loaded down as they are by sixty five pounds weight, accomplish for a period of ten days about twenty-two miles per day, and this is up and down mountains whose steepness surpasses anything which we have in this country. It is perhaps pertinent to remark just at this point that the Indians themselves believe it would be impossible to accomplish these journeys but for the use of coca. I must say that from my own experience I believe such to be the case.

From here it has nearly three hundred miles to go before it can be shipped. On this part of the journey there is comparatively level ground and three hundred pounds is a load for a mule, and five cents per pound the cost. The entire cost of collecting, drying, and transporting to London, the bark under the most favorable circumstances is estimated at about twenty-five cents per pound, United States currency, leaving the balance of fifteen to twenty cents of the ordinary selling price to go towards the expenses of cultivation. I can say too, that from my own estimate I do not see how people can buy bark from Bolivia, bring it to this country and get from it an amount of quinine which would not pay for the actual cost of the bark laid down in New York, leaving out of account the entire cost of manufacture. I do not see how they can get enough alkaloid from it to pay the cost of the bark itself. It has led me often to wonder whether it is not true that quinine is gradually being manufactured synthetically. I know nothing about it, but otherwise I am unable to explain the cheapness of quinine at the present time.

You are all aware that in India the custom prevails of taking bark from one side of the Cinchona tree, and then mossing. Mossing is, as you know, practiced to keep out the rays of the sun. The result is that new bark grows under the moss. This bark is not only greater in weight than the bark originally taken from that place, but it is very often much richer in alkaloid. This has been tried in Bolivia, and it has been found to be impossible on account of the great cost, owing to the comparatively high price of labor. The cultivation of Cinchona in this region is somewhat easier than in foreign

lands. The product is slightly richer, but the expense is much greater than in India, the transportation charges not only eating up all the profits, but actually leaving a deficit on shipments disposed of at forced sale.

Cinchona trees were formerly met with two or three times the thickness of a man's body and tall in proportion. The age of such trees must have been very great, for wild trees at twelve or fifteen years are scarcely as thick as the wrist. Cultivated trees, on the contrary, at six to nine years, are six to eight inches in diameter, and yield from three to six pounds of bark. The appearance of a cinchona plantation is always handsome, owing to the peculiar satiny lustre of the leaves on many of the trees, of a rich purple red. When in flower its appearance is perfectly enchanting. At such times these groves are the resort of myriads of humming birds of which many species are to be found. I collected eight species of humming birds from a single tree in an hour's time. The air is at times filled with the hum of these birds just as it would be here with a swarm of bees. I collected altogether thirty-five species ,of hummingbirds.

The bark at present exported from Bolivia. is almost wholly the Cinchona Calisaya, or yellow bark.

I pass on to say the yield from these barks is very variable. The pure Calisaya yields about eight per cent. of total alkaloids. The cocola, a spurious bark, gives only a small fraction of one per cent. Between these extremes you have every grade of excellence.

Besides the bark the natives use the leaves and flowers. The leaves are said to be nearly inert, but infusions of the flowers produce excellent results. They also use the buds, from which they make a gelatinous mass and apply it to fresh wounds, which heal up by first intention.