

Botanical Medicine Monographs and Sundry

**SOME FURTHER OBSERVATIONS ON THE  
STRUCTURE OF SANGUINARIA CANADENSIS.**

BY EDSON S. BASTIN.

In *The Pharmacist* for July, 1885, the author published an article on this plant, in which he described the secretion cells and laticiferous tissue of the rhizome.

The following language was used:

"The laticiferous tissue is an interesting subject of study from the morphological standpoint, as in the rhizome it shows every gradation of development from simple, isolated resin- or secretion-cells, through those that are clustered in rows of two or three and those that form an irregular and long chain, but still have a distinct cellular character, to those which form distinct tubes."

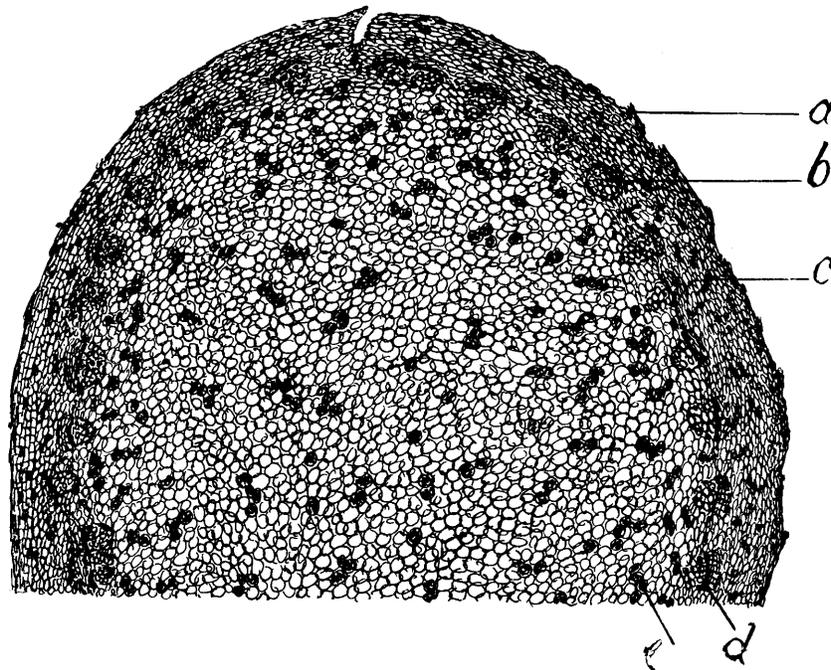
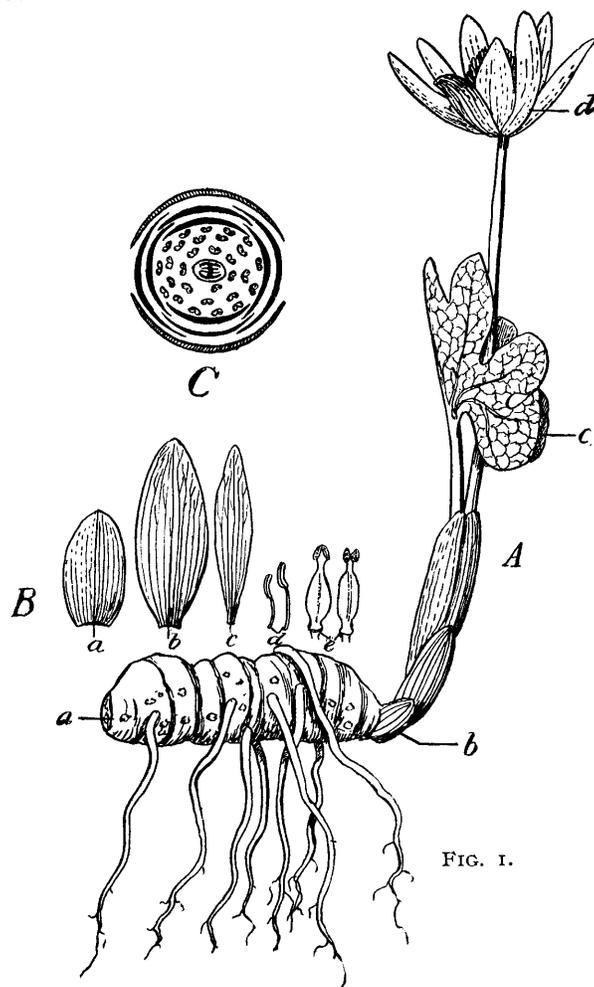


FIG. 2.

A remark of De Bary in which he states that *Sanguinaria* contains no proper laticiferous tissue, but only secretion cells, led to this re-investigation of the subject. Fresh materials were procured and a large number of sections, longitudinal and transverse, of the rhizome were made and carefully studied with the view of ascertaining with certainty whether or not milk-tissue, in the proper sense of the term, really does exist in the rhizome.



The red or orange-colored secretion is without doubt chiefly contained in distinct cells, which are either isolated or connected into irregular chains and distributed among the parenchymatous tissues of the middle bark and large pith. But in the inner portion of the middle bark, and in the inner bark, occur chains of cells which are longer, more regular and contain a yellow rather than an orange-red secretion. The cells composing the chains are also much narrower and more elongated than are the ordinary secretion cells. Among these rows it is impossible in most instances to demonstrate any communication between the cells.

The transverse partitions between the cells are in fact imperforate. In a few instances, however, particularly in the inner layer of the bark, there is demonstrable connection between the secretion cells of the chains, which thus form a true laticiferous tissue, essentially like that occurring in many other of the Papaveraceae, though of course much less complex in its development. It is seldom the case that these milk-tubes are more than a dozen cells long, and they are seldom branching. In fact we find in this plant the form of laticiferous tissue called "complex," or "reticulate," only in the most rudimentary stages of its development. It plays a very subordinate part in holding the secretions of the plant; but still, to the morphologist it is highly significant, as showing the relationship existing between secretion cells and complex laticiferous tissue.

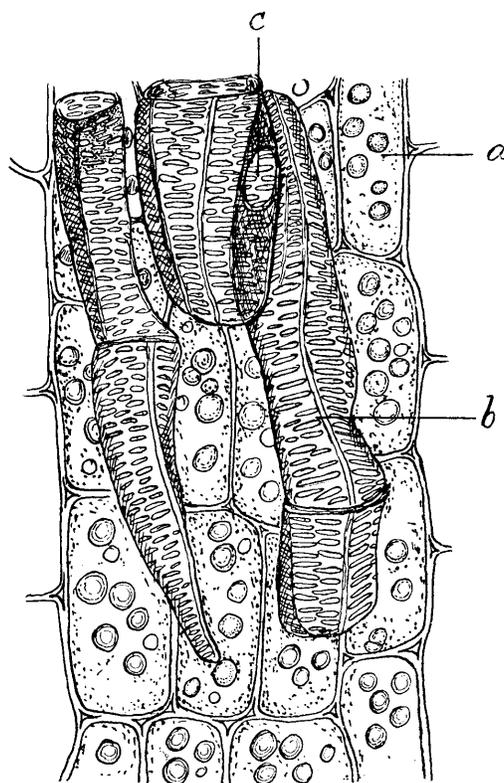


FIG. 3.

That the secretion cells contain resins beside the alkaloidal principles present in the drug, is clearly evidenced by tests. Moreover, it seems probable that the salts of sanguinarine are more abundant in the large orange-red secretion cells of the pith and outer portion of the middle bark, while those of the closely related alkaloid, chelerythrine, are more abundant in the smaller yellow cells and laticiferous tubes of the inner bark and inner part of the middle bark.

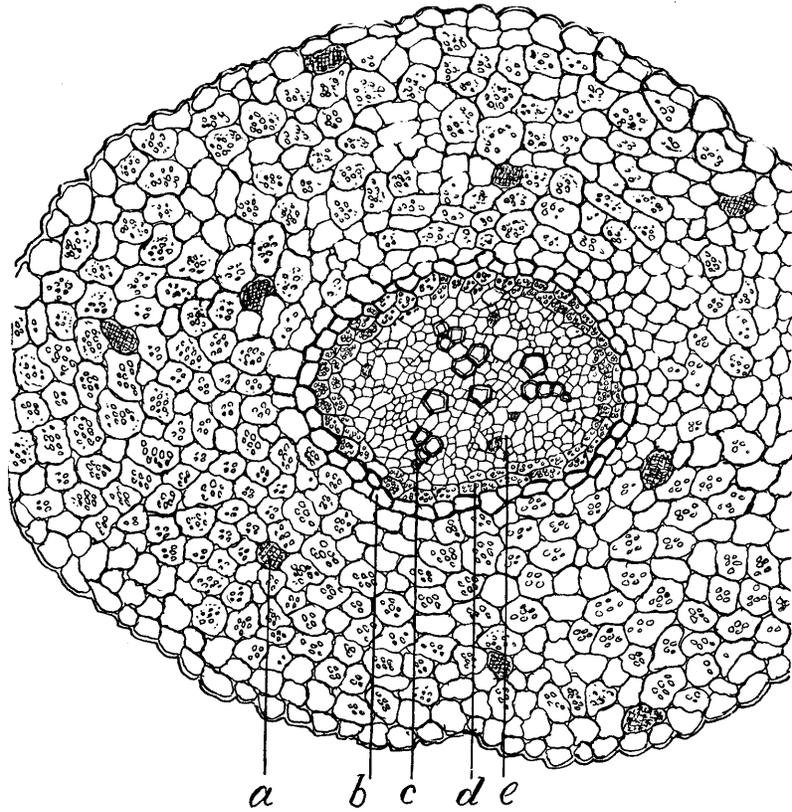


FIG. 4.

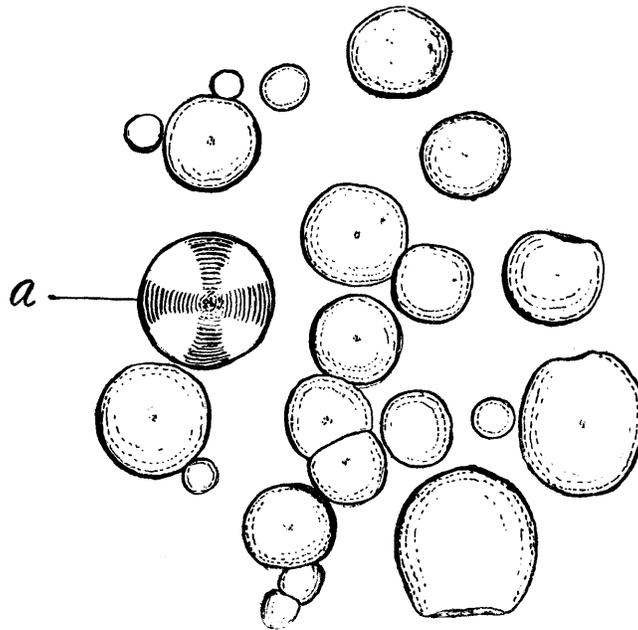


FIG. 5.

Sections treated for twenty-four hours or more with strong glycerin showed deposits in the secretion cells of stellate masses of yellowish-brown crystals, with a decided diminution of the intensity of color in the liquid contents of the cells. The crystals polarize beautifully, but for lack of time their chemical nature has not been investigated.

A number of drawings were made in the course of the study, illustrating further the structure of the rhizome and root. These drawings, together with one from the author's Laboratory Exercises, giving a view of the plant and illustrating its floral structure, are reproduced herewith.

#### DESCRIPTION OF FIGURES.

Fig. 1.—**A**, Entire plant of *Sanguinaria Canadensis* in its flowering stage. *a*, rhizome and rootlets ; *b*, one of the outer bud-scales; *c*, young leaf; *d*, flower complete, except that the caducous sepals have fallen away. 1/4 natural size.

**B**, Different floral organs separated, *a*, a sepal; *b* and *c*, different petals ; *d*, stamens ; *e*, pistil in different views.

**C**, Ground plan of flower.

Fig. 2.—Part of cross-section of rhizome magnified 15 diameters, *a*, cork; *b*, vasal bundle; *c*, cluster of secretion-cells in middle bark; *d*, cambium ; *e*, secretion-cells in pith.

Fig. 3.—Small portion of longitudinal section through xylem of a bundle, showing the reticulate ducts composed of short, irregular cells, *a*, parenchyma cell containing starch ; *b*, one of the cells of a duct; *c*, aperture communicating with next cell of the series, forming a duct. Magnification 330 diameters.

Fig. 4.—Portion of the cross-section of a young root of *Sanguinaria*, showing the central radial bundle before any important secondary changes have occurred. The root-bundles are usually triarch or tetrarch, but in older roots the number of rays is much obscured by secondary formations so that the number of rays is difficult to determine, *a*, a secretion-cell; *b*, cell of endo-dermis; *c*, small duct at end of xylem-ray; *d*, pericambium layer, the cells of which contain much fine-grained starch; *e* phloem mass, in which occur some secretion-cells. Magnification, about 112 diameters.

Fig. 5.—Starch of *Sanguinaria* magnified 1,200 diameters. The grains are spherical or spheroidal, mostly simple, sometimes double; hilum central and usually inconspicuous and unfissured; grains smooth and with no obvious stratification lines ; polarization cross faint, equal-armed.

## FLESH IN PHARMACY.

BY WILLIAM B. THOMPSON.

Gland extract, and its utility as a therapeutic agent, is just now a debatable subject in medical circles. When experiment, observation, and experience establish something definite, and this is favorable, the pharmacist may prepare for an era in animal products. We do however have some connecting links with this series of actual body parts as internal remedies—in musk, castor and fel bovis—to which might be added cod liver oil; but a revival such as is discussed would almost seem like a return to the cauldron contents of Macbeth's weird witches' stew! and, seriously, the idea of the substance of a gland from an animal in health being used to effect a cure of a disease supposed to be due to the interrupted function of a similar gland in another body, has something about it of the *similia similibus* certainly. Animal physiology (human) divides the glands into two groups—the secreting, or those having ducts, and the non-secreting, or ductless. The secreting glands all have outlets to the surface of the body. These diversified secretions can be collected and an analysis determine their character; but how is it with the ductless glands? These are none the less component parts of the physical structure, and perform certain wise and benign functions in the human economy. They do give to the body sustenance and support in some appreciable way, but not in a manner of which we have exact knowledge. In this they differ essentially from the former class of glands. An analysis of their substance gives only the usual flesh constituents. We can discover in them no special or unusual element. How then can we intelligently apply and use them? Such application would seem to be quite similar to taking the "hair of the dog that bit you" to heal the bite. The attention which this subject has already elicited will arouse a yet stronger interest, and the evidence of "things seen" will be eagerly sought; then, possibly, the pharmacist may place side by side with his jars, "ungenta," a flesh-pot or two labeled "Extractum carnis humanae," or "animalis" !

One merit, however, there will be in the gland treatment for the apothecary, and it is this, that, to maintain repair, the remedy must be maintained, and the original prescription will be necessarily renewed ad infinitum.

# **THE FLORIDA SPONGE INDUSTRY.**

BY WILLIAM B. BURK.

Sponge is a substance with which almost everyone is familiar, as there are but few living in civilized communities who do not find occasion to use it for a great variety of purposes. The article is so very useful that a large number of inconveniences would arise if it could not be obtained. Without it, what would the surgeon, the traveler or the housekeeper do? And yet, most of those who use sponges in an infinite variety of ways all their lives, never stop to consider how they are formed; that is, whether they are plants or animals, or what their history or habits may have been.

Sponges consist of a framework or skeleton, coated with gelatinous matter and forming a non-irritable mass, which is connected internally with canals of various sizes. The ova are very numerous, and present in appearance the form of irregular shaped granules derived from the gelatinous matter which grow into ciliated germs, and, falling at maturity into small canals, are then expelled through the orifices. When alive, the body is covered by a gelatinous film, which, being provided with cilia, causes a current of water to pass in at the smaller pores and out at the larger apertures, the sponge probably assimilating the nutritive principles contained in the water.

Sponges are found abundantly in tropical waters, generally. They gradually decrease in numbers towards the colder latitudes, till they become entirely extinct. They vary much in shape. Some are shaped like a vase, others are semi-cylindrical, others flat like an open fan, and some are round.

The commerce in sponges is of considerable importance. The great difficulty which is experienced in any attempt to distinguish species, results from the extreme susceptibility of all keratose sponges to any change in external conditions. They appear to require, for the production of the forms in abundance, tropical or sub-tropical seas, and attain by far their greatest development in the number of the forms and species in the Gulf of Mexico and West Indian seas. The typical forms, the commercial sponges, are essentially confined to the waters of the Bahaman Archipelago, and the southern and western coasts of Florida in the Western Hemisphere, and to the Mediterranean and Red Seas in

the other.

The Florida sponge grounds form three separate and elongated stretches along the southern and western coasts of the State. The first includes nearly all of the Florida reefs, the second extends from Anclote Keys to Cedar Keys, and the third from just north of Cedar Keys to Saint Mark's. The Florida grounds have a linear extent of about 120 miles, beginning at Key Biscayne, in the northeast, and ending in the south at northwest channel, just west of Key West. The northwestern half of the grounds is very narrow, having an average width of only about five miles, and being limited to the outer side of the reefs. At about the Matacumbo Reefs the grounds broaden out so as to cover the entire width of the reefs, which are much broader here than at the north. The entire southern half of the grounds has more or less of the same breadth, which is about 13 or 14 miles. The second sponging ground begins just south of Anclote Keys, with a breadth of 7 or 8 miles, which it maintains from a point opposite Bat Fort to Sea Horse Reef, just south of Cedar Keys. The total length of this sponging ground is about 60 geographical miles. Its distance from the shore varies somewhat. At the south the inner edge approaches within 4 or 5 miles of the main land, and comes close upon Anclote Keys; but throughout the remainder of its extent it is distant 6 to 8 miles from the shore until it touches the shallow bottom and reefs of Cedar Keys. The depth of water on these grounds, as indicated on the coast survey charts, ranges from 3 to 6 fathoms, but many portions are undoubtedly shallower than this. The northern ground, which maintains a nearly uniform width throughout, is about 70 miles long by about 15 miles broad. It approaches to within about 5 miles of the shore and terminates just off the mouth of Saint Mark's River; the depth of the water is the same as upon the next one to the south, *i. e.*, from 3 to 6 fathoms. The total area of the Florida sponging grounds, which are now being worked, including also those that were formerly fished upon but have since been more or less abandoned, may be roughly stated at about 3,000 square geographical miles. This probably does not include all of the sponging grounds occurring in Florida waters, for the fact that new areas are being constantly discovered would indicate that there might still be more to find, and it is certain that no strenuous efforts have yet been made to extend the grounds already known, the discovery of new ones having generally been made by accident.

The sponge fishery of the Florida coast differs from that of the

Mediterranean, in that sponges are not obtained by divers, but by means of a long hook fastened to the end of a long pole, and managed from a small boat. In Florida, small vessels, of from 5 to 50 tons measurement, are employed to visit the grounds to afford quarters for the men, and to bring home the catch. These vessels are generally of light draught and schooner rigged, having proportionately large decks on which to carry boats, working gear and the sponges caught. The holds are of considerable size for storing the sponges, and the cabins generally small, indicating a sacrifice of comfort to working room. Each vessel carries, according to its size, from five to fifteen men, one as cook and the remainder as fishermen, and also a small yawl boat to every two fishermen, to be used by them in securing the sponges. In addition to the working tools for taking sponges, they are provided with a sufficient quantity of provisions, wood and water for the trip, lasting from four to ten weeks.

The working outfit for a Florida sponging vessel consists of a few-small yawl boats, called dingies, and a supply of sponge hooks and sponge glasses. The boats used are always made as light as possible. They are from 15 to 20 feet long, and from 4 to 6 feet wide. The idea is to have the boats light enough to enable two men to haul them in and out over the side of the vessel, and yet strong enough to withstand the rough handling, which they are sometimes subjected to, and to carry the heavy loads resulting from a day's catch. While catching sponges it is necessary to scull the small yawl boats (dingies) from the stern, and, for convenience in doing so, this form of sculling notch is used : A piece of oak plank, about 6 inches wide and 1 foot long, is notched at one end to fit the oar and inserted at the other between two guiding strips well fastened to the stern sheet. This sculling notch is placed at one side of the centre of the stern sheet, and is made to be easily removable in order that it may be taken out of the way when not needed. The sponge hooks are made of iron, with three curved prongs, measuring about 5 to 6 inches in width. The entire length of a hook is about 8 inches, the upper end being made into a very strong socket for the insertion of the pole.

The sponge glass is made from an ordinary wooden bucket, the wooden bottom being replaced by one of ordinary window glass, securely fastened by cement. In using a sponge glass it is placed upright on the surface of the water, the handle of the bucket is placed on the back of the neck of the fisherman with his head thrust down in the bucket. In

this way the fisherman can distinctly see very small objects in very deep water, and he can easily distinguish good sponges from those of an inferior grade.

When the sponger discovers a suitable sponge, through the aid of the sponge glass, he hurriedly grasps his hook, and, plunging it directly upon the sponge, he skillfully pulls it from its habitation and brings it up to the surface and places it in the boat. As soon as the fisherman collects a sufficient quantity, he takes them to the vessel, where they are spread carefully on the deck in their natural upright position, so as to allow the slimy matter, called "Gurry," by the sponger, to run off. During the first stages of decomposition they have a very unpleasant odor, something like decayed fishy matter. After the dingies collect sufficient sponges to make a vessel load, they are taken to what are called sponge crawls, which is an enclosure of about 10 to 12 feet, made generally by placing stakes in the beach where the water is from 2 to 3 feet deep.

Sponges, after being kept on the decks of the vessel from one to two days, will generally be sufficiently cured to be taken to the crawls, and then they are kept there for a few days and then thoroughly washed and pounded with a flat stick. They are then placed upon strings of about 6 feet in length and taken to the markets, where they are sold at auction. They are generally sold in lots, and then carefully trimmed and packed in bales weighing from 15 to 100 pounds each, according to quality, the cheaper grades being generally packed in the larger bales.

The principal varieties of sponges found in Florida are the following : Sheep-wool, yellow and grass. The Florida sheep-wool are the best quality, being of very fine texture, soft and very strong and durable. The yellow sponge is of fine quality, but not strong in texture, and not near as soft or durable as the sheep-wool sponges. The grass is very much inferior to the others, not being as strong nor so desirable in shape, and being easily torn.

There are no sponges found in the world to equal the Florida sheep-wool for softness and strength, and no better bath sponge can be found than a good, solid Florida sheep-wool, although they are generally sold for washing carriages, etc. In former years Florida sponges were loaded with lime or sand in order to decrease the price, but of late very few loaded sponges have been placed upon the market.

Sponges in great variety are also found in many places in the West India Islands, also in Cuba. The Cuban sponges are the next best to the Florida. The principal varieties found in Cuba or the West Indies are sheep-wool, reef, yellow and grass, also velvet, which are next best to the sheep-wool.

The finer grades of sponges are found principally in the Mediterranean, such as the fine surgeon's, toilet, bathing and nursery sponges, and they are very much higher in price than any others.

Florida produces nearly double the amount of sponges that are imported from all other countries; that is, in value, not quantity, and the demand for good Florida sponges is considerable greater than the supply. Consequently, the prices must advance from year to year. The prices have more than doubled, within the last twenty years, for Florida sponges.

The fine, soft species of sponges, such as surgeon's, toilet, nursery, bath, etc., are found in great variety in the Mediterranean, and are fished principally by divers, sometimes at great depth. After being brought to the land they are buried in the sand and allowed to decompose, after which they are well washed and beaten with a small stick, and then packed in bags and sent direct to London, and again thoroughly cleaned and packed in cases according to size and quality. The large London dealers have almost complete control of the sponges found in the Mediterranean. There are a great many varieties found there, principally the fine surgeon's, toilet, bathing, potter's, fine thin flat, (called elephant's ears by the native fishermen), fine cups, Zimocca toilet, Zimocca potter's, etc. Some of the finest cup sponges are sold at as high as \$100 per dozen. The Mandruka bath sponges are also very expensive and very rare. Some of the cheaper species are also found in the same waters, but none like those found in Florida or Cuban waters.

## **LABORATORY NOTES.**

BY LYMAN F. KEENER.

### **PURE DELAWARE HONEY.**

It is considered by some that a standard for pure honey is not hard to fix, while others consider the task somewhat more difficult. Theodore Weigle in his report, at the tenth annual meeting of the Independent Association of Bavarian Representatives of Applied Chemistry, stated that there had come to the public notice an artificial honey which so closely approximated the genuine product, both physically and chemically, that it was impossible to distinguish it from the real article. Nor is this an isolated case, but is amply supplemented by every tabulated examination of honey, conspicuous among which are the honeys reported in Bulletin Agr. Dept., Wash., D. C., No. 13, part 6, where we frequently find such appellations as "apparently adulterated," "apparently genuine."

In deciding whether a honey is a natural product or not, we must call into question every recognized qualification a pure honey should possess, and then we are occasionally unable to make an absolute decision.

Pure honey is the nectar of flowers and other saccharin exudations of plants, collected by bees and stored in cells built, in part at least, by the bees themselves. The source from whence the honey is collected is of no small importance.

Honey may vary in color from a water white to a black, is generally levorotatory, rarely exceeding— $20^{\circ}$  at  $20^{\circ}$  C. Contains from 12-20 per cent. of water, from a mere trace 100-30 per cent. of ash, from 60—75 per cent. of reducing sugar, from 0-10 per cent. of sucrose, and a microscopical examination should reveal the presence of pollen grains. The U. S. P. requires a limit of chlorides and sulphates.

Recently there came to my notice a number of samples of honey containing an excess of chlorides. From this it was concluded that the honey had been adulterated with glucose prepared through the agency of hydrochloric acid. During a conversation with the producer I learned that the honey had been accumulated from a "salt marsh." Thinking

that this environment might account for the excessive quantity of chlorides, I made a complete examination with the following results: color light yellow, all were levorotatory ( $-1.85^{\circ}$  to  $-2.82^{\circ}$ ) at the normal temperature; average percentage of water 16-13 per cent.; ash 0.25 per cent.; reducing sugar 68-19 per cent.; an abundance of pollen grains; sulphates, a trace; chlorides excessive; and the honey would not comply with the absolute alcohol test which, in my opinion, is an excessive requirement. I have not found a single honey in over one hundred samples that would comply with this test rigidly. Dextrin is the principal ingredient this test endeavors to eliminate. G. L. Spencer has shown that pure honey may contain as much as 4 per cent. of dextrin, and E. von Raumer has demonstrated that honey dew contains a large percentage of dextrin which frequently finds its way into honey during certain portions of the year.

From these data I was convinced that the above samples represented natural products.

## CORRESPONDENCE

To the Editor of AMERICAN JOURNAL OF PHARMACY.

SIR:—With pleasure I noticed that the question about the presence of an *active principle* in *Cereus grandiflorus*, has been taken up in England. I would like to call your attention to an article in the *Pharm. J. and Transactions* for Nov. 24, 1894, p. 416, by Gordon Sharp.

"A *preliminary analysis of Cactus grandiflorus*" in which the author decides "glucosides and alkaloids are absent" in the plant.

This disposition of a mooted question is effective. Over three years ago I was engaged in a similar investigation. I beg leave to refer you to a *Note on Cactus*, written in August, 1891. A certain Dr. O. D. Deyer stated that he had isolated the active principle of *Cereus grandiflorus*, and employed it in constant and definite quantities, (*New York Medical Journal*, for June 13, 1891). It is not uncommon that substances are found by amateur chemists which do not exist; that could not have been found if their method of investigation was correct, or substances that are of an entirely different nature from the supposed and claimed one. Impurity of reagents, ignorance of the operators, lack of a good scientific foundation, often come together in those discoveries.

To general methods of plant analysis, fluid extract of *Cereus grandiflorus* did not yield to me an alkaloid. These methods included "characteristics for many glucosides," I worked in 1891 on plants obtained here.

Yours truly,

J. B. NAGELVOORT.

DETROIT, December 10, 1894.

### **THE KOLA NUT.**

The following information concerning this drug has just appeared in Consular Report, Vol. 46, No. 171, page 532.

The Department on August 18, 1894, instructed the consuls at Bathurst, Goree-Dakar, Monrovia, Mozambique, Sierra Leone, Tamatave, and Zanzibar to investigate and report upon the kola nut in their respective districts—its cultivation, the trade therein, and its ascertained value as a substitute for ordinary food.

The following reports from the consuls at Sierra Leone, Tamatave, and Zanzibar, are in reply to the foregoing instructions. No replies have been received from the consuls at the other places; when received, they will be published at once.

#### **SIERRA LEONE.**

Referring to instructions from the Department, under date of August 18 last, I have the honor to state that, with the view of obtaining the best and most reliable information on the subject-matter, I immediately addressed the administrator of this colony, and have the honor to inclose his reply, received to-day, which contains all the information at present available, from public sources, on the subject of the growth, output, export, and value of kola nuts, as regards the colony of Sierra Leone.

GOVERNOR GARDEN TO CONSUL POOLEY.

GOVERNMENT HOUSE, FREETOWN, SIERRA LEONE.

October 16, 1894,

SIR: In reply to your letter of the 17th ultimo, asking for certain information respecting kola nuts, I have the honor to forward herewith copies of memoranda by Mr. Spaine, the colonial postmaster, and Mr. Faulkner, the assistant colonial secretary, on the production, output, export, and prices of this article, which, I trust, will meet your requirements.

The "broad leaf," mentioned in the assistant colonial secretary's memorandum, I understand, belongs to the natural order of the malvaceae and is known in the West Indies and South America by the name of "Bal leaf."

I have, etc.,

F. CARDEN,

Administrator.

ASSISTANT SECRETARY FAULKNER TO GOVERNOR GARDEN.

Herewith is a memorandum, made by Mr. Spaiue, the colonial postmaster, respecting the production of kola nuts. The kola tree produces the nuts in pods containing from three to eight nuts. When full, the pod changes from a green to a red-brownish color, and, if not picked in time, dehisces or falls to the ground.

The nuts, when collected, are laid by for a few days to allow the skin to soften, so as to admit an easy removal when washed.

The nuts are exported in two ways, viz.: fresh and dry. To keep it fresh, care should be taken that the nuts are properly washed with clean, fresh water, not a particle of the decayed skin being allowed to remain on them. After the water has drained, the quantity for shipment is put into a cane basket, inlaid with a kind of broad leaf peculiarly adapted to keep the nuts fresh for a considerable time—say, three months and more—and to keep away worms, which are very destructive to the nuts.

To export it in the dry state entails no trouble. After getting off the skin, by washing, the nuts are split into pieces and dried in the sun, after which they are shipped in ordinary packages, and, so long as kept dry, are not subject to deterioration. The fresh nuts are sold in Freetown at from £3 to <£6 (\$14.60 to \$29.20) per measure, equal to 1 1/2 bushels.

The kola nuts are principally exported to the following places, and those exported from Sierra Leone in 1893 were as follows :

Whither Exported.	Quantity.			Value.	
	<i>Cwts.</i> <sup>1</sup>	<i>Qrs.</i>	<i>Lbs.</i>		
Gambia . . . . .	5,552	2	7	£24,130	\$117,416.58
Dakar . . . . .	1,518	0	14	5,921	28,811.59
Gorée . . . . .	694	1	2	3,055	14,865.63
Senegal . . . . .	928	0	18	4,471	21,755.89
Windward Coast . . . . .	291	1	0	1,164	5,664.02
Rufisque . . . . .	221	2	24	896	4,359.94
Other places . . . . .	147	2	0	468	2,277.28
Total . . . . .	9,353	2	9	£40,105	\$195,150.93

<sup>1</sup> 1 cwt. = 112 pounds.

POSTMASTER SPAINE TO ASSISTANT SECRETARY FAULKNER.

The kola nut is grown from the nut itself. It should be planted when the nut is fresh, and not in the dried condition in which it is exported to European markets.

Raw kola nuts should be planted in nursery beds, the same as coffee seeds. They will begin to shoot in about five weeks and produce leaves in a week after. It grows with some rapidity in its early stage, and in less than four months, if regularly watered, the plant will be fit for transportation. Its growth after this is slower, according to the nature of the soil. The kola likes a moist, but not damp, soil and thrives best by the side of running brooks. Lands with a flat-rock formation a few feet below the soil will not do, but a loose, porous soil, with a great depth of earth and a clay or sand formation below, will do very well. With a liberal supply of manure and water, during the dry season, the kola tree will come to maturity and bring forth fruit in five years. Where the conditions are less favorable, the tree, will bear fruit two or three years later.

I may add to the foregoing, from personal knowledge, that the natives here, and at Bathurst, Gambia, eat the nuts in the early morning, as a stay against the wants of ordinary food while travelling, and in the evening to induce sleep. Altogether they consider that a general benefit to the human system is derived from the consumption of the kola—say a single nut morning and evening.

ROBERT P. POOLEY,  
*Consul.*

SIERRA LEONE, *October 16, 1894.*

# THE APOCYNACEÆ: IN MATERIA MEDICA.

BY GEORGE M. BERINGER.

(Continued from Vol. 66, December)

## STROPHANTHUS KOMBE.

*Strophanthus Kombé* Oliv., confounded from the first with *S. hispidus*. The species was created by Oliver from the specimens sent by Dr. Kirk from Zanzibar and those collected by the expedition of Livingstone. The differences which separate this species from *S. hispidus* are, on the whole, small and gradually effaced by the existence of a series of stages in the transit, in such a way that we may admit with Blondel, and with Oliver likewise, that the Kombe is only an oriental form of the *hispidus*, possibly a variety. The form *Kombé* commences to appear in the region of the great lakes, then extends as far as the eastern coast. Among other botanical characters are the form and the less length of the calyx lobes in comparison with the tube of the corolla, the consistence of the calyx and bracts, the scarcity of inflorescence, the pubescence more abundant on the leaves, the size of the fruit, the caducity of the bracts, the considerably much larger seed, the abundance and length of hairs on its surface, the increased length of the awn and of the shaft, the color of the seed more or less green, the great length of the funiculus, the elongated form and the number of the lenticels on the fruit, etc., etc. All these characters which seem clear at first sight, become indefinite when we examine a sufficient number of specimens, permitting the verification of the intermediary stages.

The *S. Kombé* inhabits the basin of the Zambesi and the Shire where it serves as the arrow poison. Indicated as about the Victoria Falls, an equal distance from the two oceans, it extends to near the eastern coast (Mozambique), and to the north in the region of the great lakes of the centre.

The plant is analogous with the *S. hispidus*. It flowers in October and November. The various parts, wood, bark, etc., are strongly bitter. The rough pubescence is very marked upon the leaves, the inflorescences and even the flowers. A specimen of the fruit sent by Dr. Kirk measured 32 centimetres in length. The upper extremity tapering at great length, but broken. It is said to be terminated by a stigmatic disk, greatly

developed. External surface strongly wrinkled longitudinally, color a dark brown, lenticels extremely numerous, transversely elongated and irregular, forming a striation, close, and light brown. The commercial fruit is more or less scraped; bearing at times the remains of the fibres of the mesocarp, appearing as longitudinal striations. More frequently the endocarp alone remains, straight or curved, always fragile and frequently broken, the color yellowish or clear fawn, or a little reddish, often marked by regions more deeply brown, longitudinal and badly limited. The lower extremity is notched, the upper extremity always broken. The internal face is shining, color a little green. It is about 25-35 centimetres in length and 2 centimetres in diameter.

The structure of the pericarp is a little different from that of *S. hispidus* and that of *S. niger*; the parenchyma cells here are sinuous, flattened, or in some regions more open. The sclerotic fibres are nearly constantly associated with a ligneous bundle. The longitudinal fibres are flattened quite regularly.

The seeds are striking at once by their color, generally light, their surface strongly tomentose, their silky changeable lustre. The seeds isolated, as they ordinarily arrive in commerce, are in form lanceolate, at times rounded at the base, at other times much more slender even in the same specimen. The dimensions are 11-22 millimetres in length, 2 1/2-5 millimetres in breadth, and 1—2 millimetres thick. The margin is often sinuate, one face quite plane or even concave. The surface is covered with hairs much longer, much closer, more woolly than in the *S. hispidus*, and quite visible to the naked eye. They vary in color from cream white to nearly a brown, with all the intermediary colors and sometimes even with a little different tint upon the two faces of the seed. But the color ordinarily is a greenish gray or a greenish yellow. From handling the hairs drop off and the color then becomes a little more deep, The raphe is ordinarily well marked, very prominent on one side, and quite long. The fracture is white or grayish ; the odor is specially well marked, but only if we scrape the seed; the taste is atrociously bitter.

The awn which surmounts the seed is very handsome; the color a little grayish in mass, and is borne upon a very long shaft of which the naked part is always much longer than the plumed part, but not three or four times as long, as some one has said. The naked part generally 4-5 centimetres and the plume 3-4 centimetres. The hairs are whitish,

silky, brilliant, often 5 1/2—6 centimetres or more long, always easily broken. They spread quite well without becoming entirely horizontal. The naked part of the shaft is more resistant than that of the *hispidus*. It is sinuous and of a pale yellow color. The albumen and the embryo are very similar to those of *hispidus*. The radicle is quite long and the cotyledons very thick. The hairs retain so much air that the seed floats a long time in water.

We may distinguish three varieties based upon the anatomical structure, and in these may exist yet others. The first variety is the largest and possesses a longitudinal projection on the ventral face, quite sharp, with the thin borders folded and the dorsal face quite convex, turned over at times like a tuft of moss.

The second variety is more attenuated towards the base, the point, ordinarily asymmetrical, shows an abrupt depression upon the dorsal face; the hairs are longer and changeable.

The third variety is less lanceolate, more sharply attenuated at both extremities ; the ventral face much less flat; the tufted part a slender filament that becomes spread about the middle of the ventral face. It seems that the anatomy differentiates these forms not yet referable to definite species. In the external layer the thickenings are quite varied in the forms. The second tegumentary layer with the flattened cells more or less dilated between the depressions of the tegmen ; in the albumen, the cell walls vary in thickness and aspect. In none of these are crystals of calcium oxalate. The action of sulphuric acid is the more remarkable upon this seed so rich in *Strophanthine*: scarcely is the section placed in the reaction than an intense green coloration is revealed in the entire thickness of the albumen; then rapidly likewise, but less, about the tip and its immediate neighborhood; the coloration shows in the embryo, occasionally, with a bluish tint; the color is always less bright than in the albumen. Shortly the aspect changes: the albumen becomes greenish yellow, while the embryo passes to an intense blue. Finally, it gradually assumes a reddish or even greenish tint with here and there a few red streaks.

### **STROPHANTHUS PAROISSEI.**

*S. Paroissei* Franch. an African species, inhabiting French Guinea to south of the Senegal. The plant is but little known, bears the indigenous

name of Bini-bande, and presents branches covered with lenticels and relatively small leaves. The follicle seems quite characteristic, very shrunken and obtuse, rounded about the summit, 18-20 centimetres in length. The naked part of the awn or shaft is nearly 3 1/2 centimetres, Franchet says 4-5 centimetres. The plumed part always quite small, 18-20 millimetres. The hairs of the awn are quite long, nearly 3 centimetres, white, slightly yellowish, fine, brilliant and silky.

The seed is lanceolate, the form occasionally somewhat asymmetric, 10-15 millimetres in length, 3 - 3 1/2 millimetres in breadth, and 1 1/2 millimetres in thickness. The posterior extremity is rounded, the anterior lengthily attenuated into a very fragile shaft. The surface chocolate brown, covered with short, crowded brown hairs easily seen with a lens or even with the naked eye. The ventral line is rarely very clear.

This species is important because it inhabits the same regions as the *S. hispidus* and *S. minor* and the seeds closely resemble those, so that the substitution or admixture becomes very certain. The bitterness of this seed is relatively weak.

The first layer of the seminal tegument shows cells with the lateral thickenings quite small, convex, but not at all hemispherical. The second tegument is composed of cells extremely crowded and compressed, is a deep brown and is very little thickened. On a level with the raphe the second tegument divides into two, the external zone being very dark, the internal much more clear; between these is placed the fascicles.

With sulphuric acid the section is colored at once a yellow with a little greenish (but it is the droplets of oil which becomes colored), then to a rose (tissue of the cotyledons). But the color is never a decided green. This character, in conjunction with the abundance of the macles of calcium oxalate in the embryo and with the taste but slightly bitter, seems to indicate that the seed is quite poor in active principle.

### **THE WOOLLY STROPHANTHUS OF ZAMBESI.**

*Strophanthus asper* Oliv.—Although the botanical information is reduced to a minimum, it is evident from a single inspection of the seed that one is dealing with a distinct species. But, after more than six years, the primitive name given by Blondel, "*Strophanthus lanieux* du

Zambèze," remains a *résumé* of our geographic and botanic knowledge upon this subject.

The awn is greatly developed toward the summit, garnished with hair, relatively short, directed obliquely from base to the summit and a little yellowish. The naked region of the shaft is very short.

Regarding the seed itself, it is at once remarkable for its yellowish-white color, shining, owing to the tomentum, extremely thick and long, with a soft woolly fleece. These hairs are directed from the base toward the summit; detached they form in the drug frequently handled small woolly balls. Their length exceeds 3 or 3 1/2 mm. especially upon the margin of the seed.

Under these hairs the color of the seminal tegument is a bright maroon. The form is vaguely lanceolate, rather oblong, sometimes a little irregular, the larger proportionally quite variable; rounded in the rear and a little tapering in front. The anterior portion covered by the hairs frequently difficult to be seen. The ventral face, a little flattened, presenting a small brownish tuft, a little inflated at its termination, towards the middle of the seed. The surface is longitudinally striated. The dimensions are 10 to 20 mm. in length (ordinarily 14 to 16), 3 to 4 mm. in breadth and 1 1/2 to 2 mm. in thickness.

Macerated in water the seeds alter rapidly, soon exhaling a very disagreeable odor. The albumen is grayish-white, less horny, less cartilaginous than in the other species. The embryo is dull white with thick cotyledons and a radicle infinitely shorter than in the *S. hispidus* or the *S. Kombé*.

The transverse section shows that in the external layer the lateral cell thickenings are very little convex, and gives to the section the aspect of a lenticular fusiform body by coalescence with the corresponding thickening of the neighboring cell. The second layer of the tegument is formed of cells much flattened and nearly indistinct. The cells of the albumen and the thick embryo are relatively small.

With concentrated sulphuric acid, the cotyledons give gradually a bright rose coloration, commencing about the vascular bundles. The color is much less intense in the albumen. In a few sections the red color is preceded by a yellow coloration. After one hour the albumen becomes

red and the embryo violet.

### THE GLABROUS STROPHANTHUS OF GABOON.

*Strophanthus Sp.?* Important as have been the numerous expeditions of M. Vincent, Dr. Bellay, etc., and the physiological studies by Polaillon and Carville and the chemical investigations by Gallois and Hardy, Catillon, Arnaud, etc., these seeds can not yet be referred with certainty to any species botanically determined. According to M. Franchet, it is a fact, however, remarkably interesting: that in all the *Strophanthus* with glabrous seeds (all the Asiatic species are in this class), there exists a constant relation between the absence of all villosity and the length of the point that terminates the anther. Now among the numerous African *Strophanthus*. two only present this character of the anthers, the *S. gratus* Franch. and *S. Tholloni* Franch. which inhabit precisely the region of the origin of *S. glaber*. According to Thollon this second species bears at Gaboon the name of Ondie. It is thus allowable, with Franchet, to attribute this seed to one or the other of these plants, provisionally and the rather to *S. gratus* which is likewise from the Gaboon, while the *S. Tholloni* is from the regions of the rapids of the Ogoway consequently more to the East.

The *S. gratus* Franch. (*Roupellia grata* Wall et Hook., *Nerium guineense* Brongn., etc.) is a small tree, according to Griffon du Bellay, but more probably a liane. The plant inhabits Guinea, the Gaboon and Sierra Leone, whence it was introduced into culture by Whitfield under the name *S. Stanleyanus*.

The *S. Tholloni* Franch is probably the species of which the fruits were sent by Thollon containing seeds very analogous to those of the *S. glaber*. It is a long liane of western Africa inhabiting the French region of the Congo, especially the course of the upper Ogoway and the Cameroon, and its extent may be quite far towards the centre of the continent. The lobes of the corolla are short and sharp in the *S. Tholloni* and nearly round in *S. gratus*.

The *S. glaber* serves for the fabrication of the arrow poison in this district.<sup>1</sup> For a long time the seeds were confounded with those of *S. hispidus*, from which they may be easily distinguished.

Each follicle is 30 to 35 cm: in length, strongly ligneous and very thick. The exterior surface is brown or reddish, with oval lenticels, In its commercial form, it is bound with the leaf of a palm. The •endocarp is fusiform, swollen about the middle 3 to 4 cm. in diameter. The color externally is yellowish to brownish yellow. The surface is quite smooth, dull, non-striated. The interior surface is fawn colored, uniform, shiny, with a brilliant silkiness.

The seeds are much shorter than the other species studied. The shape of the isolated seed is lanceolate with the base ordinarily rounded or truncated and the summit lengthily attenuated with the margins more or less sharp, especially at the base, oftentime somewhat undulated, always somewhat flattened, never cylindrical, the seeds relatively large averaging 13 to 16 mm. in length by 3 to 4 1/2 mm. in breadth and 1 to 1 1/2 mm. in thickness. The dorsal face clearly convex, the ventral flat or even concave. A small keel exists at times near the shaft upon the dorsal face. The surface of this grain is absolutely glabrous and presents only the longitudinal plaitings. The color is an ochre-yellow, fawn, or cinnamon, but often deeper or greyish. The appearance is waxy, dull, tarnished; the fracture is horny, whitish or gray; the odor is especially well marked; the taste extremely bitter. It requires about 35 seeds to

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<sup>1</sup> The bark and leaves are poisonous, but less so than the seeds. To obtain one kilogramme of the seed 150 pods must be collected.

It is this seed which is employed for the *kombé poison*. The seeds deprived of their awn, are beaten between two stones, and the paste worked up with a knife into a creamy consistence by the addition of a little water or certain vegetable juices, and becomes a red color from exposure to air. This paste is applied to the points of the arrows or they are rolled in the substance, to which is previously added some adhesive ingredient (the mucilaginous bark of a Tiliaceae, the latex of a Euphorbium rich in caoutchouc, the juice of the petiole and leaves of two indigenous plants not determined, etc.). The substance dried, the arrow is ready. The effects are very rapid, and the game wounded falls within the limit of one hundred metres. The hunter hastens then, to excise with a knife, all around the wound, or better, forces in the wound the juice from a branch of *Adansonia digitata*. These precautions taken, the game may be eaten with impunity. The act of poisoning their neighbor nourishes among the Gaboonese with all its splendor, and the *Inee* takes the first rank among those numerous powders, the recipes of which these savages religiously transmit as an inheritance.

weigh 1 gm. The naked part of the shaft is very short (about 1 cm.) in comparison with the plume, which often attains 4 cm. The hairs of the same are sometimes nearly 7 cm. in length; they are numerous, silky, brilliant, fine, fragile, white, viewed in mass yellowish or grayish and diverging, describing a graceful curve.

The envelope is relatively very thin; the albumen thick, cartilaginous, transparent; the embryo is not thick, the radicle is long as in the *hispidus* and *Kombé*.

On transverse section the seed shows first the external layer of the tegument with the thickened cells large and short, a little larger toward the internal region. The second seminal zone is strongly compressed especially on the inside and the first layer of the albumen is strongly thickened on the outside. The cells of the embryo are often not distinct in outline; they are rich in oil.

With concentrated sulphuric acid the coloration is effected slowly and is never green. At first yellow, then becomes a bright rose. The rose appearing in the neighborhood of the vascular fascicles, and remaining more deeply so there. Finally, very slowly, a violet color is produced.

### **STROPHANTHUS DIVARICATUS.**

*S. divaricatus* Hook. et Arn., *Pergularia divaricata* Lour.; *S. divergens* Grah.; *S. dichotomus*  $\beta$  *Chinensis* Ker. This species occupies the sea coast of China. The carpels are strongly divergent and make with each other an obtuse angle. The follicle is relatively small, 13-14 cm. in length and nearly 4 cm. in diameter; the fruit is quite slender and the base strongly notched about the insertion of the peduncle. Externally it is blackish brown, strongly striated longitudinally, and here and there a little yellowish or reddish in places. The interior is smooth, greenish yellow and generally dull. The seed is 15-17 mm. in length by 3-3 1/2 mm. in diameter and 1—1 1/2 in thickness, with margins a little undulate. Color a blackish grey to deep brown. The ventral face bears a longitudinal line, brighter in color, and running nearly the entire length. The naked part of the shaft or awn is very short, 4-6 mm., the plume is much longer, 2-3 cm., and brighter in color.

The hairs of the awn are white, in mass grayish, quite long, 3 1/2 to 4 cm., and relatively less fragile and more rigid than in the other

strophanthus. They are directed forward here horizontally, then little by little they return to the rear, passing even beyond the body of the seed. The attitude is inverse to those of the *S. Kombé*. The taste is much less bitter than that of *S. glaber*. With concentrated sulphuric acid the albumen and the embryo give a red, orange coloration.

*Strophanthus Caudatus*, Kurz., *S. dichotomus*. A.—P. DC. This species occurs in Java, India, Tonquin, Singapore, the Malay peninsula, and is cultivated at Reunion.

The variety, *Marckii*, inhabits India and Malacca, and, according to Franchet, the seed greatly resembles that of *S. glaber* of Gaboon. It is feebly bitter.

FALSIFICATIONS.—The substitution of one sort for another is frequent, as well as the admixture of the various products of different species. The admixture of seeds, which had been previously extracted with alcohol, is likewise a fraud, to which attention is directed. The frightfully bitter taste of strophanthus is somewhat reduced by this treatment, and an excellent character for its detection is the appearance of the seed which becomes dull, and of a greenish-brown color, with the hairs agglutinated by the resin which is dissolved by the alcohol. The distinction between the seeds foreign to the genus, is quite easy, a glance of the eye ordinarily suffices. The single falsification of this nature which is really serious, is the substitution of a seed, at first attributed to a *Wrightia*, or to *Holarrhena antidysenterica*, but which E. M. Holmes has proven to be derived from *Kickxia africana*, Benth. This seed is a uniform chocolate-brown color, attenuated at both extremities, inflated spindle-like about the middle, and twisted in an S, and bears on one face a depressed line. The surface examined with a lens, appears longitudinally striated. Dimensions, 9 to 16 mm. long, 2 to 2.5 broad at the middle, and 1.5 to 1.8 thick. The fracture is clear and horny, brownish-white; the odor resembles that of the strophanthus, and the taste is extremely bitter.

The seeds are provided with awns<sup>2</sup>, directed backward in the fruit. These awns are formed of a straight and rigid axis, in the neighborhood of 1 cm. long, cylindrical, and slender, the silky hairs which it bears,

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<sup>2</sup> According to E. M. Holmes, this seed is destitute of an awn, the tuft appearing like a plumose awn, being really the hairy funiculus or stalk, by which the seed is attached to the pod.—G. M. B.

attain 5 cm. in length, and are very delicate, and brilliant; in color, white, slightly yellow.

A transverse-section shows the cotyledons broad and thin, sinuous, and folded upon themselves, very different from those of the strophanthus. The external layer is formed of irregular, large, brown cells, often badly limited, but without the characteristic circular thickenings. The cellular walls of the albumen are very thick, and the cells of the embryo contain numerous macles of calcium oxalate.

The section treated with sulphuric acid gives a yellow coloration in the embryo, which then changes to an orange and then a red wine lees color, which persists for a long time. The liquid likewise becoming strongly colored.

CHEMICAL CONSTITUENTS OF STROPHANTHUS.—In 1865, Pelikan and Vulpian made the first physiological study of strophanthus with a hydro-alcoholic extract of seeds brought from Africa by Griffon du Bellay. In 1869, Fraser published his first work giving the chemistry and therapeutics. He studied in reality, not the *S. hispidus*, but the *S. Kombé*, and applied the name *strophanthin* to a principle which he isolated imperfectly and which he supposed to be an alkaloid. Then Legros made a series of experiments with the poisoned arrows of the Pahouins. In 1872, came the experiments of Palaillon and Carville, who employed the *S. glaber* likewise under the name of *S. hispidus*. In 1877, Gallois and Hardy in their analyses obtained results different from those of Fraser, which now is fully explained, as instead of the *S. Kombé* employed by Fraser, they used *S. glaber*. They isolated two substances: the one *Inéine* extracted from the awns, a body with alkaloidal properties and peculiar physiological action, but of which the existence even was afterwards contested by Elborne and by Gerrard; the other, the strophanthin crystallizable, separated from the seeds alone, and which according to these authors was neither an alkaloid nor a glucoside. Catillon in numerous analyses of the products of various origin obtained different *strophanthins*, some amorphous, others variously crystallized. Fraser, Adrian and Bardet, Catillon etc., showed the glucosidal nature of the principle and admitted the co-existence in the strophanthus of another body, alkaloid according to some, glucoside likewise according to the others. Finally, the magnificent work of Arnaud proved the absence of *strophanthin*, properly named, in the *S. hispidus*, its presence in *S. Kombé*, the replacement of the *strophanthin*

by *ouabain* in the *S. glaber*. He gives the composition of these bodies, and indicates the formulas, and shows finally the relation between these two important substances, of which the one (strophanthin) is a higher homologue of the other (ouabain).

The *strophanthin* from *S. Kombé* is a non-nitrogenized glucoside with all the characters of the glucosides and readily yields with dilute acids glucose and strongly toxic substance, *strophanthidin*, of which the effects are not otherwise the same as those of strophanthine. It crystallizes readily and is neither a glucoside nor an alkaloid. Strophanthine exists in *S. Kombé* in the proportion of 0.4 to 0.9 per cent., while ouabain is furnished by *S. Glaber* to the extent of 4.5 to 5 per cent.

Strophanthin is accompanied in the seed by another glucoside and by a large proportion of a deep green fixed oil (according to Catillon 32 per cent). Fraser has also separated an acid for which he proposed the name of *kombic acid*. In addition there is contained a resin, mucilage and an albumenoid substance.

PHYSIOLOGICAL AND THERAPEUTICAL ACTION.—It was not till about 1885, that physicians following Eraser's experiments commenced to employ strophanthus. For a long time the results were contradictory and confusing. The same cause of errors which were fallen into in the chemical studies, appear here, the mixing of seeds, improperly named or falsified, occasioned differences, and the results were not comparable. On the whole, strophanthus is a muscular poison, acting upon all the striated muscles but more especially upon the heart. The action upon the heart can be obtained with the exclusion of all other action and with neither accumulation nor gastro-intestinal troubles. It seems established that *strophanthin* is not diuretic, nevertheless *strophanthus* is distinctly so. In physiological dose strophanthus augments the force and the amplitude, diminishes and regulates the number of the pulsations. By a toxic dose the paralysis of the heart is accompanied by dyspnoea, nausea, vomiting, weakness and muscular resolution. It is certain that its direct action is rapid and that it is well tolerated.

In answer to the query which strophanthus should be employed? the author favors the adoption of the *Strophanthus Kombé* for pharmaceutical uses for the reasons that it is most frequent in commerce, is very active and quite easily recognized.

## ANDERJOW SEEDS.

The seed properly known under this name is that of the *Holarrhena antidysenterica*. Conessi bark is a product from the same tree. Both of these drugs have been admixed with, or entirely substituted by, inert products obtained from *Wrightia tinctoria*, or other species of *Wrightia*. The products of *Alstonia scholaris* have likewise been confused with these drugs. These substitutions explain the failures that have been obtained in Europe with drugs so universally employed in India.

In the appendix to the Pharmacopoeia of India, by Waring, Wight has established the distinctive characters of these three trees in which the size is the same, the barks latex bearing and scaling off in strips; the flowers are white, and the inflorescences identical, the follicles long and slender and united in twos, the seeds garnished by tufts of white hairs. In *Holarrhena* and in *Wrightia* the leaves are opposite, oval, rounded at the base and attenuated at the apex, while in the *Alstonia* the leaves are verticillate, attenuated at the base and rounded at the summit. In *Holarrhena* the tube of the corolla is two or three times longer than the calyx, twisted to the left in aestivation, with naked throat, without appendages, stamens included and inserted in the dilated part of the tube. In the *Wrightia tinctoria* the tube is relatively shorter, prefloration twisted to the right, the sagittate stamens exerted, forming a cone about the stigma, and a crown of filamentous glands lacinate, velvety. The disposition of the hairs borne by the seed is likewise quite characteristic; in the *Holarrhena* the tuft of delicate silky white hairs is borne at the upper extremity of the seed; in the *Wrightia* it is the lower extremity, and in *Alstonia* both extremities are ornamented.

HOLARRHENA ANTIDYSENTERICA, Rob. Br. (*Nerium antidysenterica*, L. (in part). *Echites antidysenterica*, Roxb. *Chonemorpha antidysenterica*, G. Don. *Holarrhena pubescens*, Wall. *H. Codaga*, G. Don. *H. malaccensis*, Wight). This is a shrub, or at most a small tree, of which certain forms are glabrous and others tomentose, abundant in the mountains and dry forest regions of India.

It is known in the various regions under a multitude of vernacular

names.<sup>3</sup>

[ To be Continued.]

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3 Karra, Kora, Keor, Kuar, Kari, Dhudi, Kogar, La-thou, Inderjaw, Dud-huki-Lakri, Kureya, Kaureya (Hind), Vepali, Veppania, Veppalay, Kulappa-laivirai; Kodoga-pala, Pala-chettu, Giri-mallika, Kalingamus, Kodisa-pala-chettu, Kodisa-pala, Kola-mukki-chakka, Kutajamu, Pedda-ankudu-chettu. Palavarenu, Ankudu, Palla-coodija, Manoopala, Girimallika, Inderjo, Dowla-koora, Koora, Pomdhra-koora, Dood-kora, Conapola, Koorchi, Curayja, Inder-jauschiren, Palla-patta, Kiam, Kachri, Dudkuri, Tiwajs, Lissan-el-asafeer, Caraja, Cutaja, Amkudu-vittum, Dadhi-Ruar, Aukria, Kachii.