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ON ALGIN, A NEW SUBSTANCE OBTAINED FROM SOME OF THE COMMONER SPECIES OF MARINE ALGÆ.

By E. C. C. STANFORD.

The main object of the present paper is to introduce a new seaweed industry, the present uses for this substance being very limited, and in some cases a great loss of useful material occurs in the preparation of the products for commercial purposes. In the process recommended by the author, the seaweed is first macerated with cold water by washing in a number of vats in turn, by which means about one-third of the weight of the sea-weed is removed. The weed is now bleached with chlorinated lime-water, treated with acid, and washed. To extract the algin, it is acted on with one-tenth of its weight of sodium carbonate for 24 hours in the cold, and is then carefully heated, filtered, and evaporated: the residue on the filter is cellulose, and can be used in the manufacture of paper. The result of this treatment of laminaria is the separation of the sea-weed into the following parts: Moisture 20, extracted by water 30, extracted by acid 5, extracted by sodium carbonate (algin) 35, and cellulose 10 per cent.

When evaporated to dryness the aqueous extract forms a viscid mass, consisting of the salts mixed with a saccharine matter resembling mannite in appearance; this precipitates Fehling's solution to the extent of 15 per cent. glucose; it does not ferment, and would hence be very useful, but as yet there is no process for separating it from the salts. The whole mass is therefore carbonized and treated in the usual manner for separating the iodine and salts. Analysis of mixed samples of the salts yielded the following results:

	Fucus vesiculosus.	Laminaria stenophylla.
Calcium sulphate	1·69	4·33
Potassium sulphate	11·29	23·62
Potassium chloride	19·90	13·71
Sodium chloride	60·96	58·20
Magnesiun chloride	4·35	.....
Sodium carbonate	0·53	.....
Sodium iodide	1·26	0·12
	99·98	99·98

From experiments, it is demonstrated that the extraction is practically complete after four macerations.

The *sodium carbonate* extract is evaporated, and the residue (the *algin*, combined with soda) when dry resembles gum in appearance, but can be obtained in thin transparent flexible sheets. The solution is slightly alkaline; any great excess of sodium carbonate apparently destroys the algin, whilst excess of acid gelatinizes it so that a solution of only 2 per cent. become semi-solid when acidified. A solution can be neutralized without the algin being precipitated. The solution gives the following reactions with various reagents. Dilute mineral acids generally coagulate it. Boracic acid, however, has no effect; and it is not affected by acetic, formic, citric, tartaric, or benzoic acids. Barium, calcium, strontium, copper, zinc, aluminium, tin, antimony, cobalt, and nickel salts all precipitate it. Ferric chloride gives a dark brown coagulum; mercurous nitrate forms a white precipitate, but mercuric chloride and silver nitrate have no effect. Both basic and normal lead acetates give white precipitates. It is unaffected by magnesium salts; by potassium silicate, dichromate, ferrocyanide, and permanganate; and by sodium borate, tungstate, stannate and succinate, and by tannin. Concentrated sulphuric acid dissolves it; concentrated nitric oxidizes it, oxalic acid being amongst the products. From these reactions it will be seen that it differs from all similar substances: thus, from albumin, by not being coagulated when heated, and by not precipitating silver nitrate; from gelose, by being soluble in dilute alkalis, but insoluble in boiling water, gelose is just the reverse; from gelatin, by giving no reaction with tannin; from starch, by not reacting with iodine; from dextrin, etc., by being insoluble in dilute alcohol and dilute mineral acids. The purest form of algin is the precipitate produced by a mineral acid. It dries to a hard horny substance.

The composition of this substance is still obscure, for although the compounds with calcium, aluminium, barium, and lead have been investigated, no uniform results have been obtained. The sodium carbonate appears to be unaltered in its compound with algin; the carbonic acid is, however, only given off by treating with excess of hydrochloric acid, and beating. When a solution of algin is precipitated by acid, redissolved in alkali, and this treatment repeated, decomposition seems to go on continually. The author then suggests various uses for algin, founded on the properties above described; mixed with starch it could be used as a stiffener for fabrics, or alone as a dressing material, or as a mordant. It would also form a useful food. It can be used to prevent boiler incrustations, for fining wines and spirits, for insulating electrical appliances, etc. It can also be used to replace horn for the manufacture of various moulded articles.—*Jour. Chem. Soc.*, 1883, p. 943; *Chem. News*, xlvii, p, 254 and 267.

THE TREES YIELDING BENZOIN.

By E. M. HOLMES, F.L.S.

The benzoin which enters into English commerce includes four varieties named respectively Sumatra, Palembang, Penang and Siam benzoin. These exhibit certain characteristic appearances by which they are easily recognized, and three of them, namely, Sumatra, Penang and Siam benzoin, are probably derived from three distinct plants. The botanical source of Sumatra benzoin was determined by Dryander, and an account and figure of the plant were published by him in the *Philosophical*

Transactions, for the year 1787, lxxvii., p. 303, but the trees which yield the other varieties have as yet never been identified with certainty. The Penang benzoin is similar in appearance to the Sumatra kind, but it has an odor which is quite distinct and resembles that of storax. It is in all probability not produced by Styrax benzoin; but we have as yet no accurate information concerning the botanical source of Penang benzoin. The authors of "Pharmacographia" point out that it may perhaps be the produce of *Styrax subdenticulata*, Miq., since this tree, which occurs in West Sumatra, has the same name, "Kajoe Kéminjan," as *S. benzoin*, and Miquel remarks of it *an etiam benzoiferum*? That these two species should receive the same native name in Sumatra is not surprising since the leaves are very similar in shape and appearance and the fruit of *S. subdenticulata* apparently only differs from that of *S. benzoin* in being obovate instead of globular and depressed.

Palembang benzoin resembles the Sumatra sort in odor and differs from it chiefly in its much greater transparency and in yielding, as I am informed, a larger percentage of benzoic acid. It frequently contains moisture and if recently imported specimens are placed in a bottle they soon become mouldy. Concerning the tree which yields Siam benzoin, nothing definite has hitherto been ascertained, although as long ago as 1859, Mr. D. Hanbury wrote to Sir R. H. Schomburgh, asking him to investigate the origin of the resin, and to find out whether the tree which yielded it was really *Styrax benzoin*. Nor have subsequent inquiries been more successful. The only account extant of the mode of collection of Siam benzoin is that given by Sir R. H. Scbomburgh, who was British Consul for some years at Bangkok. He, however, never visited the region producing benzoin and could therefore only give information at second-hand. He represents that the bark is gashed all over and that the resin which exudes collects and hardens between it and the wood, the former of which is then stripped off. The authors of "Pharmacographia," remark that it is evident that all Siam benzoin is not thus obtained. Schomburgh adds that the resin is much injured and broken during its conveyance in small baskets on bullocks' heads to the navigable parts of the Menam river, whence it is brought down to Bangkok.

The state of our knowledge of Siam benzoin being thus imperfect, it occurred to me to write to Mr. R. Jamie, of Singapore, to ask him for information on the subject. This gentleman takes great interest in all that relates to pharmacy, and has, I believe, been a liberal contributor to the Museum of the North British Branch. A few weeks ago I received from him a box of specimens for the Museum of the Pharmaceutical Society, containing amongst other interesting and valuable donations some sections of the trunk of the Siam benzoin tree, and herbarium specimens of the leaves, but unfortunately neither flowers nor fruit; also specimens of the Sumatra benzoin tree with leaves, flowers and fruit. In addition to these specimens be has contributed some interesting information, which I have taken this early opportunity of laying before you. With regard to the Siam benzoin plants Mr. Jamie writes:

"My friend, Captain Hicks, of Bangkok, kindly procured them after very great difficulty from his friend living in the district where the gum benzoin trees are found, and he writes as follows:— 'According to your request I had fifteen gum benjamin plants brought over from Suang Rabang, one of the northern Laos states tributary to the King of Siam, but after a deal of shifting and removing baggage on bullocks, twelve of them withered up; however, I have succeeded in getting three of them

brought to Chung-mai; these I now send you. The one in the flower pot seems to be thriving remarkably well, but the other two in bamboo joints I have my doubts about. I also send you some sections of wood with the bark attached, and here and there you will find the gum sticking on the wounds and incisions made by the natives. The flowers, I am sorry to say, I could not get, as the trees have already flowered. From reliable information the tree is indigenous, in all the northern Laos states, but grows luxuriantly in Suang Rabang and all along the belt of mountains in this province.'

"In the months of April and May the leaves begin to wither and fall off, and the natives then make incisions in the bark, and after a short time a lot of milky substance exudes and soon hardens; the gum then dries on the incisions and falls to the ground, which is swept daily and watched so that no earthy matter gets mixed up with it.

"The tree attains from 3 to 6 feet in circumference, and has a long trunk throwing out branches on the top; after six years' growth it can be bled. The flowers are attached to the small branches close to the leaves and begin to flower in June. The tree throws out shoots from the roots, and can be propagated by cuttings. The natives also say that after the flowers fall off, in a short time a lot of young plants spring up.[1] The gum is a considerable article of traffic, in fact a monopoly, fetching a good price in the Bangkok market. It is used generally for fumigating sick rooms and making scented water. Large quantities generally find their way to Bangkok, being brought overland on oxen to Sawaryaloke, Pitchal, and other Siamese provinces, and are exported to Europe by several mercantile firms."

Of the three young plants above mentioned, one was given by Mr. Jamie to the Curator of the Singapore Botanical Gardens to forward to Kew, a second was planted in Mr. Jamie's own garden, and the third died.

The twig which I now exhibit was taken by Mr. Jamie from the young plant in his garden. The specimen sent to Kew is still living and seemed to be in a healthy state when I saw it a fortnight since. Judging from the appearance of the plant at Kew and from the leaves sent by Mr. Jamie the Siamese benzoin tree is probably a distinct species, although nearly allied to *S. benzoin*, Dry. The leaves are rather thinner, the lateral veins are fewer in number and the veinlets more prominent beneath, but it is necessary to wait until flowers and fruit are obtained before the exact species to which it belongs can be ascertained. Mr. Jamie has now the two growing together in his garden, and remarks in his letter, "Judging from what I have seen of the two kinds growing together, they are different."

I have compared the specimens of the Styrax benzoin tree from Mr. Jamie's garden, With Dryander's original specimen in the British Museum, and they correspond exactly.

Concerning this tree Mr. Jamie writes:—"The Singapore grown tree is thought to be from Palembang,[2] it is about 30 feet in height, and the branches are all at the top.

1 This evidently means that the seeds quickly germinate as is the case with those of the Sumatra benzoin tree.

2 If so, then, it supports my supposition that Palembang and Sumatra benzoin are produced by the same tree.

The circumference of the trunk is from 14 to 16 inches. It flowers in March and the fruit does not take long to mature, then it falls off, producing seedlings in abundance at the foot of the tree. How old this tree may be is rather difficult to determine, but it must be over thirty years at the least."

The tolerable certainty that in a short time flowers and fruit of the Siam benzoin tree will be obtainable, and that the source of the drug can then be definitely set at rest, must be my excuse for bringing incomplete information before you. I need none for bringing the admirable specimens presented by Mr. Jamie under your notice.

OLEUM RUSCI.[3]

BY PETER MACEWAN.

During the past two or three years a demand has sprung up for oleum rusci, and considerable doubt has been expressed as to its nature and quality, articles of different characters having been supplied.

It would appear from the name that the article has some relation to butcher's broom (*Ruscus aculeatus*), but we learn from various sources that it is merely one of the synonyms of the empyreumatic oil of common birch (*Betula alba*). Thus the Danish Pharmacopoeia, 1805, has the oil under these names, "Oleum betulinum, oleum rusci, oleum brusci," the latter being another name for the butcher's broom. These names are quoted in the Norwegian Pharmacopoeia of 1854 under "Pix epidermidis betulæ albæ;" more recently we find that Hager uses the synonym for the birch tar oil, and the Dutch Society for the Advancement of Pharmacy have it as "Oleum betulæ rectificatum, oleum rusci."[4]

I can find no explanation of the association of the words "Ruscus" and "Bruscus" with this birch product, and can offer none, unless "Brzoza" (Polish for birch) may have been corrupted into "Bruscus" and thence into "Ruscus." At all events it is beyond dispute that oleum rusci is birch tar oil.

The oil has been long known as that used in currying Russia leather, to which it imparts the peculiar odor and lasting properties that are so much admired; it is chiefly made in Russia and Poland. The bark, and sometimes the rootlets and twigs, are subjected to dry distillation, the retort being of clay and connected by wooden pipes to a receiver placed in the earth. Hager states that this oil is a thickish liquid of a reddish-brown or brown-black color, peculiar empyreumatic odor, and sparingly soluble in water, but soluble in alcohol and ether to a great extent. The re-distilled oil of the Dutch Society is said to be a red-brown volatile oil, sp. gr. 0.800-0.987, soluble in an equal weight of alcohol and imparting an acid reaction to water. Birch bark has a mildly fragrant odor, and by gentle heating yields a sublimate of birch camphor or betulin ($C_{36}H_{60}O_3$). This body, as obtained from the bark by exhaustion with alcohol, is odorless and tasteless, but when subjected to a high temperature (about 258ºC.) it gives off vapors smelling strongly like Russia leather. This change will very probably

3 The greater portion of this paper was read before the Edinburgh Chemists' Assistants and Apprentices' Association, November 7,1883.

4 *Pharm. Journ.* [3], xiii, 10.

be effected in the distillation of the empyreumatic oil from the bark, thereby accounting for its distinctive odor. Independently of its use in currying, the oil is held in high esteem by the Russian peasantry as a household remedy for all diseases, as well as by the medical practitioners in the treatment of skin diseases, rheumatism and the like; it is similarly used in Germany, whence it is exported. Its reputation has traveled to this country, but I am afraid that the remedy has not accompanied the reputation.

Through the kindness of Mr. Holmes, Curator of the Museum of the Pharmaceutical Society, I have received a small portion of a veritable specimen brought from Russia by Mr. Greenish, of which Mr. Holmes gives me the following particulars:

"Specimen 511 b" (Museum Catalogue) "is a black empyreumatic fluid resembling in odor the liquid known as 'essence of smoke,' used for curing hams; after a mere trace of it has been rubbed on the band an odor like Russia leather is perceptible. The fluid, when caused to cover the side of the bottle in thin layer, is black with a brown tinge. . . I believe the pyroligneous oil of birch is sometimes prescribed under the name of 'ol. rusci.' . . . Dr. Symes tells me that there is a brown oil of birch which he believes is only the dark oil redistilled."

There is no doubt whatever that oil similar to Mr. Greenish's is extremely rare in this country, although the oil mentioned by Dr. Symes is readily procurable; but there are others which can only be called substitutions and sophistications, and of these I append particulars I have only had small samples given me, and of these only No. 1 seems favorable for further investigation.

No. 1. Red-brown "re-distilled oil," sp. gr. 0.941. Exposed for fifteen minutes on a water bath it was reduced to half its original bulk. Residue resembled Mr. Greenish's specimen; betulin odor intensified, but more pyroligneous than the veritable specimen.

No. 2. Red-brown "re-distilled oil," sp. gr. .876. (This oil is more fragrant than the genuine or No. 1, and suggests "doctoring.") On a water bath, the greater part volatilized within ten minutes, leaving a small residue of an oily nature and strong pyroligneous odor.

No. 3. A thick tar, black and bituminous. Odor somewhat like *huile de cade*. This was not examined, Hager stating that very thick varieties should be rejected.

No. 4. An amber-colored oil, sp. gr. 0.891. Odor like that of common spirit of tar (ol. picis rect.). On the water bath a small quantity was vaporized within ten minutes, leaving a mere trace of resinous matter destitute of betulin odor.

Owing to my portion of Mr. Greenish's sample being extremely small, I have only been able to take its sp. gr. roughly and found it to be 0.943; this, however, requires verification. On the water bath it leaves a thick and tenacious black residue having the betulin odor. The only specimen which compares favorably with it is No. 1, which answers the description of the re-distilled oil of the Dutch Society. It is much thinner than the genuine oil, and the pyroligneous odor is stronger; but a trace of it, treated as

directed by Mr. Holmes, gives a powerful betulin odor in the course of fifteen minutes. This variety is readily obtainable. From the behavior of No. 2 1 am inclined to think that it is a “made-up” oil, since the fragrance entirely disappears on the water bath. No. 4 is the “ol. rusci” which has been so largely supplied to pharmacists, and several eminent dermatologists have formed their opinions of the value of the remedy from their experience with this variety. It is not surprising, therefore, that they have reverted in some cases to old-fashioned remedies such as *huile de cade*. This is to be regretted, for ol. rusci has been found useful in the hands of continental practitioners, and if a demand were here made for the genuine oil, means would not be wanting for obtaining it.

I cannot conclude without expressing my thanks to Mr. Holmes for his assistance, and to Messrs. Crowden and Hill for specimens.—*Phar. Jour. and Trans*., Nov. 17, 1883.