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Botanical Medicine Monographs and Sundry

SORGHUM SUGAR.

BY OSCAR HOUCK, PH.G.
From an Inaugural Essay.

The different kinds of sorghum (*Sorghum saccharatum*), now under cultivation in the United States, are varieties and hybrids from two main groups; the one the Chinese sugar cane, or sorgho, or sorghe, from China and India, and the second the African sugar cane, or imphee from the south of Africa. As varieties of the first group, we have the regular sorghum, Honduras cane, honey top, sprangle top, etc. Of the second group the most important are, the Liberian imphees, white African, white mammoth, Iowa red top and wolf's tail. As hybrids, the early amber is the most common, early orange and a number of others. These hybrids need, as also their names indicate, a shorter time to attain maturity, and are therefore especially adapted for the more northern range, Wisconsin, Minnesota, etc., where the season is rather short; while the countries further south, with a longer season, have the advantage, that they can utilize both the early and late varieties, and thus be able to supply the mills for a longer time; besides that they also can utilize the other qualities, desirable in good cane, as saccharine richness, large percentage of juice, and large stalks. A rather sandy loam is said to be the most favorable soil for its cultivation.

The first seeds of the new sugar cane were brought to America in 1854. from France, where they had been imported from China only. a few years previous. Not long afterwards also seeds of the African variety found their way over here. And now sorghum is to be found cultivated almost in all parts of the United States, where the climate is favorable to its growth; and it is said that where maize will thrive, sorghum also will.

Its principal use has, until lately, been confined to the mere production of' syrup, as a very sweet, and to most persons, agreeable article of this kind may be prepared by means of quite inexpensive machinery. But the production of a cheap, marketable sugar from it, has, until the last

three years, met with no success. Sugar has of course been produced from it long before this, but on account of inferior machinery and limited means it would not pay. It is also said that a fatty substance is contained in the juice of sorghum, which hindered the crystallization of the sugar, and necessitated another process than that used for the common sugar cane. The first sugar reported obtained from sorghum, was made by a farmer in Wisconsin (according to Prof. Carl Mohr). In 1858, J. S. Levering, a chemist of Philadelphia, received the gold medal from the United States Agricultural Society, as an acknowledgment for his successful and meritorious experiments in sugar making from sorghum ("Amer. Jour. Phar.," 1855. p. 182; 1858, p. 105). In spite of the publication of his process, no attempt was made to utilize it. Later, through the Commissioner of the Department of Agriculture at Washington, G. W. Le Due, a great deal was done in order to arouse the interest for it, that new experiments should be undertaken. Steward, a Pennsylvania chemist, also treated the subject, and showed at the Centennial Exhibition, in 1876, samples of sugar which he had obtained by his experiments. With still greater energy Dr. Collier, chemist of the Agricultural Department at Washington, took up the work, and of the results of his thorough investigations, he has given a minute account in his several reports, which has thrown much light on the subject.

At the same time, Prof. Swenson, of the University of Wisconsin, was occupied with investigations of the same kind, and when the United States government, through the Agricultural Department at Washington, offered a prize of $1,200 for the best method of treating sorghum cane, it was awarded to him.

Some New York capitalists, after having corresponded with Prof. Swenson and secured his service, determined to establish a sugar mill in some portion of the country, where the cane could be grown successfully and cheaply. The Arkansas river valley was decided upon, and in 1882 the mill was built at Hutchinson, Kansas. As an experiment some sugar was successfully made, already late, the same season. Last fall (1883), they made as an average 40 barrels of sugar and about 200 gallons of syrup a day. This was the first undertaking on a large scale, and as it proved a success, others have followed their example, and many more are likely to follow.

The process used in the above named mill I have not seen myself, but

will give it as it has been described. The cane, having been examined by the chemist and found in the desirable ripe condition (when it contains most saccharose and least glucose), is cut, topped and hauled to the mill without stripping. Arrived there it is placed on a long endless belt, which acts as an elevator to carry it to the crusher, which consists of huge iron rollers. The cane is passed through this crusher at the rate of 25 tons per hour. The juice, as it runs from the rollers, passes into a large tank, from which it is pumped into the defecating room. Here it is run into six defecating pans, capable of holding three tons of juice each. In these are coils of copper tubing, through which steam is passed to heat the juice. To the lukewarm juice is then added milk of lime, until slightly alkaline, in order to neutralize the acids, which are always contained in it, and to coagulate the albuminous matter present. It is then heated as rapidly as possible to the boiling point, and the steam is shut off when the thick scum, which rises to the surface, begins to swell and break. After a few minutes the juice is skimmed, and it is again heated, this time to a quiet ebullition and again skimmed. This is repeated a few times, and the result is a very clear juice, almost free from sediment. From the defecating room the juice, containing 84 parts of water and 16 parts of sugar, passes to the evaporating pans, where it is boiled down to 54 parts of water and 46 parts of sugar, when it is called “semi-syrup.” This passes into a small vacuum pan, and from there into the bone-black filters. These are six in number, and are each cylindrical in shape, four feet in diameter and 20 feet high. Here the syrup is decolorized and deodorized, after which it is pumped into the large vacuum pan. This is ovoid in shape, made of boiler iron, and looks like a huge retort. It is seven feet in diameter, nine feet high, and will hold more than 1,000 gallons. In this the semi-syrup boils at 70°C. under diminished pressure, instead of 110°C. in free air. This is a great advantage, as it is a well-established fact that high heat and much exposure to the air quickens the conversion of sacharose into invert sugar. From the vacuum pan the syrup is put into large iron wagons, which hold about 250 gallons each, and in them is run into the crystallizing room. This room is kept at a temperature of 55° C., and in it the syrup is allowed to stand for several days until it crystallizes. The “melado” as the syrup at this stage is called, is then run into the mixer. This is a long bar with fingers attached, the whole revolving in an iron box. In this the melado is thoroughly mixed and made ready for the last process. From the mixer the melado is run into the centrifugals. These, four in number, are tubular vessels about three feet in length and two feet high, open above and closed below. Each is lined with fine copper sieve, a space of

perhaps two or three inches intervening between the sieve and the outer wall of the centrifugal. The centrifugals are set in motion at the rate of 2,000 revolutions per minute, and the melado is run into them, falling upon a revolving disk in the centre. From this the melado is thrown with great force against the side of the vessel, striking upon the copper sieve, which is also in rapid revolution. The force of the projection throws the syrup through the sieve, while the crystallized sugar remains behind, whitening the longer it "spins," as the process is called. It is generally allowed to spin about fifteen minutes, after which the raw sugar is taken out and put into barrels, and the process is completed. Each centrifugal is capable of spinning 200 lbs. of sugar in those fifteen minutes. Besides these details, the process has, of course, its secrets, which are also kept as such.

From the above-named factory I obtained a sample of sugar, of which I made an analysis, which shortly will be explained. In appearance the sugar looks very much like the common raw sugar of commerce. But in odor and taste it differs somewhat, as it has retained some of that peculiar sorghum flavor, which is not disagreeable, and in which place in common raw sugar is found a taste and smell of burnt sugar.

In my analysis of the sorghum sugar I found the following constituents:

Saccharose	92·00 per cent.
Glucose	4·50 per cent.
Moisture	1·50 per cent.
Ash	1·10 per cent.
Impurities	0·90 per cent.
	100·00

The amount of saccharose was ascertained by the use of the Wilde polariscope, which as an average showed 92°. With the same instrument I examined samples of different sugars with the following results (The strength of the solutions was 10 grammes of sugar and water sufficient to make 100 cc.):

White rock candy polarized	100°
Yellow rock candy polarized	93°
Best granulated sugar polarized	99°
White A sugar polarized	94°
Common raw sugar polarized	84°
Sorghum sugar (4 experiments)	90°, 92°, 93°, 92°

Common raw sugar was also subjected to analysis for comparison:

Saccharose	84·00 per cent.
Glucose	11·80 per cent.
Moisture	2·50 per cent.
Ash	0·70 per cent.
Impurities	1·00 per cent.
	100·00

The moisture and ash of granulated sugar was also ascertained and found to be respectively 0.55 and 0.44 per cent. This shows in reference to the moisture, that the more glucose contained in the sugar, the more moisture is absorbed. As to the sorghum sugar the comparison is very satisfactory, as it contains eight per cent. more saccharose than the common raw sugar, and only two per cent. less than the A sugar, which has gone through a refining process. This very satisfactory result is due to the improved machinery of which the vacuum pan and the centrifugals are the most important, and without which the idea of sugar making, from sorghum, at the present sugar prices, might be given up as almost hopeless. But as it is, sorghum sugar can compete with other sugars, both in price and quality.

THE ALKALOIDS OF COPTIS TRIFOLIA.[1]

BY JOHN J. SCHULTZ.

A Thesis Presented to the Cincinnati College of Pharmacy, Session 1883-84,

To find the proportion of alkaloids in Coptis trifolia, five pounds of carefully selected coptis, in moderately coarse powder, were moistened with officinal alcohol and packed firmly in a properly prepared cylindrical percolator. Officinal alcohol was then added in successive portions of two gallons each. The last portion was acidulated with four ounces of acetic acid. After each addition, maceration was conducted for twenty-four hours, and percolation was continued until the percolate finally passed almost colorless and devoid of any bitter taste.

Five gallons and five pints of percolate of a yellowish brown color and decidedly bitter taste were obtained. The dregs after having been removed from the percolator and dried at a temperature of 110°F.,

1 These experiments were carried on in the laboratory of Professor J. U. Lloyd, upon authentic specimens furnished by him. We take this opportunity to thank him for the attention shown us.

weighed four pounds and eight ounces, showing a loss of eight ounces.

To four and one-half pints of this percolate, representing eight ounces of drug, an excess of sulphuric acid was added and the mixture set aside in a cool place.

To one pint and two ounces of percolate, representing two ounces of drug, an excess of hydrochloric acid was added and the mixture set aside with the foregoing.

After standing forty-eight hours a precipitate had formed in each, that of the sulphuric acid being light yellow, while that of the hydrochloric acid was yellowish brown.

The supernatant liquids in each case were bitter and retained a decided yellow color, characteristic of berberine, showing that the precipitation of the berberine had been incomplete.

Two pints and four ounces of the original percolate, representing four ounces of drug, were then subjected to distillation, until the residue was of a syrupy consistence. The retort was then rinsed with eight ounces of water, the result placed in an evaporating dish, and the last traces of alcohol vaporized. A dark greenish fixed oil and a lighter colored resin began to separate as the alcohol evaporated, and these were completely precipitated by allowing the liquid to stand in a cool place for twenty-four hours. The contents of the dish were then thoroughly agitated with water and filtered. The filtrate was now evaporated to a syrupy consistence and eight ounces of alcohol added. This was divided into two equal portions, and one was strongly acidulated with sulphuric, the other with hydrochloric acid, and both set aside in a cool place.

After standing twenty-four hours, the portion acidulated with sulphuric acid had formed a considerable amount of a brownish yellow precipitate, but the supernatant liquid was still bitter and retained its yellow color. The portion acidulated with hydrochloric acid showed only a slight cloudiness, and did not precipitate even after standing for two weeks.

The foregoing processes are the ones usually employed for the separation of berberine, and neither, in these instances, gave a satisfactory result.

Through the courtesy of Professor J. U. Lloyd, we were enabled next to employ his scheme for the determination of berberine, as stated in the manuscript of his work upon “Drugs and Medicines of North America,” and which is based upon the insolubility of picrate of berberine in most menstruums.

The first step was to separate the second alkaloid, discovered by Mr. E. Z. Gross, as follows: Of the remainder of the percolate, four gallons and one pint, representing four pounds of drug, were subjected to distillation, and the oil and resin separated in the manner heretofore described. To the resulting nitrate, officinal water of ammonia was added until slightly in excess. This produced a dark brown flocculent precipitate, which was collected on a filter and thoroughly washed with water. The filtrate, after having been slightly acidulated with sulphuric acid, and allowed to stand for several hours, was brought to an alkaline reaction by the addition of water of ammonia, when a second precipitation took place similar in appearance to the first. This and the foregoing precipitate after having been mixed and dried spontaneously, was treated with successive portions of chloroform. The chloroform was then distilled, and the residue exhausted with dilute sulphuric acid. The resulting solution when filtered and made alkaline by addition of ammonia water, gave a precipitate which when dried spontaneously, weighed 3.42 grains.

A portion of this precipitate when dissolved in water acidulated with acetic acid, gave precipitates with the following reagents for alkaloids: Platinic chloride, molybdate of ammonium, solution of iodine in iodide of potassium, and test solution of iodide of mercury and potassium.

A chloroformic solution of the remainder of this precipitate when evaporated on a slide formed microscopic crystals, but the quantity obtained was too small to admit of further investigation. (This was the second alkaloid as found by Mr. Gross.)

To a portion of the filtrate, from the foregoing precipitates, solution of carbonate of sodium was added without producing any precipitate, and it was positively shown that there was no more of this second alkaloid present.

To the entire filtrate and washings thus obtained from the second alkaloid, and which were of alkaline reaction, a solution of carbazotate

of ammonium was now added. This produced a bulky yellow precipitate of carbazotate of berberine, which when collected on a filter and dried spontaneously, weighed 292.8 grains, corresponding to 228.03 grains of sulphate of berberine.

In order to test the filtrate for any remaining alkaloids, a portion was evaporated nearly to dryness on a water bath, and agitated successively with ether, chloroform, benzol and carbon disulphide.

The several solutions were evaporated, the residue dissolved in water and portions of it separately tested with test solution of iodide of mercury and potassium, molybdate of ammonium, and chloride of platinum, without producing any precipitate, thus showing the previous complete separation of all the alkaloids.

Recapitulation.—The foregoing experiments show, that Coptis tri-folia yields to officinal alcohol, slightly acidulated with acetic acid, 10 per cent. of its weight of extractive matter. That it contains two alkaloids, as previously shown by the investigations of Mr. E. Z. Gross ("Am. Jour. Pharm.," 1873). That the berberine of Coptis trifolia is only partially separated by the processes usually employed for the determination of berberine. That it contains of berberine an amount equivalent to 0.8 per cent. of sulphate of berberine, or 57 grains of sulphate of berberine to the avoirdupois pound. That the amount of the second alkaloid is very small, 0.012 per cent., or only 0.855 grain to the avoirdupois pound having been obtained.

OLEUM GAULTHERIÆ.

BY ISAAC EDWARD LEONARD, PH.G.

Abstract from a Thesis.

Oil of wintergreen was first made in Luzerne county, Pa., in 1863, from which time it has been distilled in great quantities, with the exception of last year, when the yield was not so plentiful, owing to the destruction of the shrubberies by the fire which passed over our mountains.

In distilling, the entire overground portion of the plant is employed, which has its greatest yield during the months of July and August.

The still is generally a wooden box, about eight feet long, four feet wide, four feet high, with a copper bottom and staid with bolts. The head of the still is copper, and connecting with this is a square or circular worm of the same material or of tin, placed in a barrel. The still being filled with wintergreen to within about twelve inches of the top, a sufficient quantity of water is added, and this is allowed to macerate from ten to twelve hours. The fire being started, the distillation commences and continues for about eight hours; but during the first two or three hours, ninety per cent. of the oil has passed over. For collecting the distillate, most of the stillers use a wide mouth bottle or fruit jar, fitted with a large cork having two holes. A small tin or glass funnel is put into one of the holes, so that the beak of the funnel is below the shoulder of the receiving vessel, and connected with the other hole is a suitable pipe forming an egress. The distillate passes into the receiving vessel through the funnel. It is here that the oil and the water separates, the oil going to the bottom, and the water being lighter and in excess passes through the egress pipe into a larger receptacle, where it is reserved for a subsequent operation (cohobation).

Occasionally the oil is very highly colored. I have found several samples to contain traces of iron, which is due to the oxidation of the tin worm or can with which the oil conies in contact. Tin worms are used on account of their cheapness, but will only last about two weeks, before they undergo oxidation.

The wholesale dealers that handle the oil in large quantities have three ways of “cleaning” it, re-distillation, filtration, and decolorization. The first two processes are easily understood, while the decolorization seems a difficult one, but is much easier than either of the others. The oil to be decolorized is put into a bottle and crystals of citric acid are added, the whole allowed to stand, agitating occasionally, until the oil is colorless, or nearly so.

On experimenting with nine quarts of wintergreen fruit, I found it contained one and one-half drachms of oil. The chief uses of the oil, are for flavoring and in printing fine calicoes.

In experimental distillation, I found that the lower specific gravity is due to the separating of the oil from the water too quickly, and that the higher specific gravity is obtained by letting the distillate stand from twenty-four to forty-eight hours before separating the oil from the

water.

A case of poisoning occurred in 3883, at one of the grocery stores in White Haven, Pa. A man mistaking the oil for the milky water, drank about two ounces; he was taken to his home in Easton, Pa., and died in about five hours.

Parties have tried to export the oil, but did not succeed.

ACONITE ROOT.

BY E. R. SQUIBB, M.D.

The description of the Pharmacopoeia applies very well indeed to some parcels of Aconite root, but there are few drugs which, while retaining a general form, vary more in size, color and thickness of bark, in different parcels met with in the markets. The roots in the same parcel vary very much also in size, surface, and internal structure. Many roots in every parcel will not be over 1 to $1^{1}/_{2}$ inches in length, and while a large proportion are very much wrinkled longitudinally, a few are quite smooth. These smooth roots are absent entirely from some parcels, and are not very numerous in any. They break with a solid, starchy fracture, and commonly have a very thin bark. The wrinkled roots are more spongy internally, and some are very light and porous, doubtless from having been in a very succulent condition when gathered. All these varieties may be very strong or very feeble to the taste, for the appearance bears very little relation to the activity of the root. Some parcels are much more stalky than others; that is, have more of the comparatively inert stalk cut off with the root, and in this are of course objectionable, yet many parcels that are quite stalky are to be preferred to those which are better trimmed, on account of superior activity. The greatest difference, however, in different bales is in the taste, or rather in the aconite impression upon the tongue and lips, and upon this the writer has long relied in selecting for purchase. Some years ago he published the method of testing by taste, and at that time stated that, with care in selection, parcels could be had which when each root of a handful sample was broken in the middle, and a very small piece from the point of fracture was chewed between the front teeth in contact with the tip of the tongue for a few moments, and was then discharged, eight out of ten of the roots would give the characteristic aconite tingling in

some degree within ten or fifteen minutes. He can now state that parcels are easily had, though at a higher price, every root of which will give a strong sensation from a very small particle. This has made him revise the test within the past two years. As it comes from shipboard, or from storehouses, it is commonly tough enough to be cut across with a sharp knife without going to dust as it does when dry. A very thin slice cut across from the middle of the root will weigh about a centigramme, or a little over one-sixth of a grain. This, if cut in ten pieces of nearly equal size, each will weigh about a milligramme, or the sixty-fifth of a grain. One of such pieces, taken between the front teeth and chewed in contact with the tip of the tongue with saliva enough to wet it, for about one minute, should give the aconite impression, not strongly, and not amounting to tingling, but yet a distinct impression which, when realized a few times, will always be recognized. There is no need of this cutting and weighing more than once, and that only to see how small a piece to take for the test, and there is a great advantage in taking so very small a piece, because the impression from it is so faint that it soon passes away, and admits of another root being tested in the same way in half an hour or so. If the piece be larger and the impression strong, it will last for two hours or more, and thus only a very few pieces can be tested in a day. At best it is a slow process, but well worth applying in the interest of accurate medication by a drug so important. Few pharmacists or physicians ever see the root, but only get the powdered root. The powder should be tested in the same way, taking about the same quantity on the tip of the tongue, and bruising and softening it with the teeth so as to get out the active principle.

Aconite root is not sweetish as described by the Pharmacopoeia, but is distinctly bitterish, but the taste proper is always faint. Some roots are tasteless, or so nearly so that no very distinct taste is recognized, and yet such roots may in a few minutes give a very decided impression.—*Ephemeris*, March, 1884, p. 502.

VARIETIES.

A CAUTION ABOUT JEQUIRITY.—After reporting a case of sloughing of the cornea after the use of jequirity, in the “Weekly Medical Review,” February 23, 1884, Dr. S. Pollak formulates as follows :

1. Jequirity is by far the best remedy which has been hitherto used for trachoma and pannus.

2. It does all, and more speedily, that has ever been claimed for purulent inoculation, minus the repulsiveness of the last remedy.

3. The infusion of jequirity must be used only when perfectly fresh. After four or five days it swarms with bacteria, when the danger of their entering the tissue and causing a septic state is very great.

4. Sterilizing the infusion requires much care and labor, and may not always be practicable. It will doubtless retard the decomposition, but it will not prevent it entirely.

5.The full therapeutic utility of jequirity will only be attained when chemistry shall have succeeded in preparing an alkaloid of it, which will keep, and the strength of it is properly known.—*Med. and Surg. Rep.*, March 22.

TURPENTINE AS A PROPHYLACTIC IN INFECTIOUS DISEASES.—The "Medical Record" tells us that H. Vilandt writes in the "Ugeskrift for Laeger," vol. viii, No. 8, 1883, concerning the value of the oil of turpentine in the treatment and prophylaxis of diphtheria and the exanthematous diseases. He states that he has never seen any of these diseases spread from a sick child to other members of the family when this remedy was employed. In many of his cases no isolation could be attempted, as the mother was the only female in the family, and was obliged to take care of both the sick and the well, continually passing back and forth from one to the other. His method was to pour from twenty to forty drops of a mixture of equal parts of turpentine and carbolic acid into a kettle of water, which was kept simmering over a slow fire, so that the air of the sickroom was kept constantly impregnated with the odor of these two substances. He claims also that by this means a favorable influence is exerted upon the exudation in diphtheria, although it ia by no means curative of the disease, and should never be relied upon to the exclusion of other remedies.—*Med. and Surg. Sep.*, March 29, 1884.

CONVALLARIA MAJALIS is not as perfectly safe as some have believed. Dr. George Hersehell relates in the "Lancet" the case of a man, apparently healthy, who had an irregular pulse following worry and

overwork two years ago. The patient had been taking digitalis, but this was discontinued, and, after an interval of a month or two, tincture of convallaria was ordered in five minim doses three times a day. After a few doses he was obliged to stop its use on account of its remarkable effects. Almost immediately after taking a dose the pulse became nearly imperceptible at the wrist, and there was a sense of oppression over the sternum, nausea, void feet, vertigo, flatulence, and a feeling of utter prostration. These symptoms lasted two hours, but came on again at each repetition of the dose.— *Weekly Med. Review*, Dec. 1, 1883.

RAPIDLY DRYING VARNISH.—W. Dauner recommends the following: Mix intimately colophony with thick milk of lime; after 24 hours dry by heat and powder. This powder is used for preparing varnishes from soft resins as follows: Melt 100 parts of pine resin, add with constant stirring 10 to 15 parts of the above powder, continue to heat for 30 minutes, remove from the fire and add linseed oil 25 to 50 parts and oil of turpentine 35 to 90 parts, according to the thickness desired.—*Hoffm. Papierzeitung.*