

AMERICAN JOURNAL OF PHARMACY
Volume 60, #12, December, 1888

Botanical Medicine Monographs and Sundry

SOME INDIAN FOOD PLANTS.

A contribution from the Chemical Laboratory of the Philadelphia College of Pharmacy.

1. SHEPHERDIA ARGENTEA, NUTTALL.
BY HENRY TRIMBLE.

Read at the Pharmaceutical Meeting, November 20th.

In September of this year I was furnished with some fruit of the above plant by Dr. V. Havard, United States Army Surgeon at Fort Abraham Lincoln, Dakota, who also forwarded the following description:

“*Shepherdia argentea*, Nuttall, (Buffalo berry, Bullberry, the *grains de boeuf* of the Canadians) of the order *Eleagnaceae*. Branching, spiny shrub generally 5 to 8 feet high but in favorable localities, along streams, becoming arborescent with a stem six inches in diameter and reaching an altitude of 16 or more feet. Rare east of the Missouri River, abundant on this river and thence extending westward to the Sierra Nevada, being common in Oregon, Nevada and Utah. From the Saskatchewan in the British Possessions, it extends southward through Montana, Wyoming and Colorado to New Mexico. Its most congenial habitat is probably the upper Missouri and tributaries through Nebraska, Dakota and Montana. Sometimes it lines the banks of this river for miles together, forming impassable hedges. The leaves are opposite, entire, mostly oblong, 1 to 2 inches long, silvery on both sides and slightly dotted with ferruginous scales; the bluish white foliage contrasting singularly with that of other shrubs. The flowers are dioecious; the male bushes becoming covered with a profusion of small yellow blossoms in April; these have a four-parted perianth and eight stamens alternating with as many lobes of a thick disk. The female bushes put out their inconspicuous flowers one or two weeks later. The fruit is a red, pellucid berry, three lines in diameter, with a smooth, shining seed; it begins to turn scarlet in July, but is not edible before September, and remains on the bushes until shrivelled by frost.

“The berries grow in such profusion as to cover the stems and twigs to which they are attached by a very short stalk, contrasting charmingly with the silvery foliage, the whole shrub, at this time, being highly ornamental. They are very acid, and hardly palatable until they have been touched by one or two frosts in the early days of October, when they are sweetened and acquire a very pleasant flavor, unlike that of any other fruit.

“Until recently, they constituted one of the staple foods of the Indians, the Utes of Utah, as well as the Sioux of Dakota, or the Blackfeet of the Saskatchewan, who consumed them raw and stewed, or mixed with other native esculents. They still eat

enormous quantities of them. The whites are likewise fond of these berries, but use them mostly in the making of an excellent jelly, which is to be found in every household along the Upper Missouri and Yellowstone.

"This jelly has an excellent acidulous flavor sui generis. Berries and jelly are very wholesome, and can be freely eaten without the least inconvenience or discomfort.

"Besides being an ornamental shrub of great value the Buffalo berry, with its diffused thorny branches, makes also an excellent hedge plant. It is hardy, stands transportation with great immunity, grows rapidly during the first few years, and is susceptible of any shape by pruning, so that, if female plants only be used, a hedge is obtained of great beauty, strength and durability."

These berries have been mentioned by Dr. Edward Palmer,¹ and by Dr. J. S. Newberry,² but no analysis has been found, and it was thought that a determination of the more important constituents of the fruit might be of interest, particularly for comparison with currants, which they resemble very much. As the composition varies with the ripeness of the fruit, it may be noted that in this sample the berries had become ripe, although they had not been touched by frost, and were therefore quite acid.

Petroleum ether extracted from the nearly dry berries a small quantity of fat, with a considerable amount of red coloring matter, which color was further almost completely extracted by ether and alcohol, the latter solvent taking out some acid. As the fat, doubtless, comes from the seeds, it probably exerts but little influence on the value of the berries as a food. The acidity was found to be due to citric and malic acids. The amount of acid was estimated by expressing 10 grams of the fruit, and neutralizing the juice with normal sodium hydrate solution. Whether calculated for citric or malic acid, the results would differ very slightly, so the percentage as malic acid was found to be 2.45.

Moisture and ash were determined in the usual way, and found to be for the former, 71.28 per cent., and the latter, .45 per cent. Nitrogen was determined by combustion with soda lime, which indicated .14 per cent. of albumenoids.

Sugar was determined, both before and after boiling with acid, by the gravimetric method with Fehling's solution, and there was found 2.45 per cent. cane sugar and 3.02 per cent. grape sugar.

The aqueous solution of the berries precipitated by alcohol indicated .42 per cent. mucilage and pectin.

A pleasant acidulous jelly was also made which, in almost every particular, resembled that from currants.

A comparison of the following results with the constituents of currants, as given by Blythe (*Composition and Analysis of Foods*, page 133), may be of interest:

¹ Plants used by the Indians of the United States.—*Amer. Jour. Phar.*, 1878, page 543.

² *Popular Science Monthly*, xxxii., page 45.

	Buffalo Berries.	Currants.
Water.....	71·28	84·77
Nitrogenous Substances.....	·14	0·51
Free Acid.....	2·45	2·15
Total Sugar.....	5·47	6·38
Other Non-nitrogenous substances (Pectin, etc.).....	·42	0·90
Undetermined.....	19·79	4·57
Ash.....	·45	0·72
	100·00	100·00

PHARMACEUTICAL NOTES.

Abstracts from Theses.

Abstractum Rhamni Purshianae is a new preparation. Made into compressed pills it is one of the most agreeable forms for administering this drug, without the unpleasant taste, which is difficult to disguise. The dose is from three to fifteen grains. Harry Lippen, Ph. G., gives the following process for making this abstract:

Mix alcohol 15 fluidounces with water 1 fluidounce, and moisten with 2 fluidounces of the menstruum four Ounces of the bark in No. 60 powder, pack in a percolator, and by maceration and displacement exhaust the powder, reserving the first 3.1 fluidounces of the percolate. Distill off the alcohol from the remainder, mix the residue with the reserved portion, place the mixture in an evaporating dish, and having added one ounce of milk sugar, set aside in a warm place to dry ; then add enough milk sugar to make the mixture weigh two ounces, reduce to a fine uniform powder, and keep it in a well-stopped bottle.

Fluid Extract of Staphisagria.—J. Walton Travis, Ph. G., experimented on stavesacre seeds with menstruums of different alcoholic strength, containing to one part of water, respectively, eight, three, two and one part of alcohol. The fluid extracts prepared with these liquids contained the fixed oil of the seed, which could be separated by means of a separating funnel after keeping the fluid extract for some time at a temperature of 40°F. The ground seeds were then exhausted with petroleum benzin to which they yielded 24 per cent. of fixed oil, which was not further examined; the powder, thus exhausted, was used for the preparation, by the pharmacopoeial method, of a fluid extract, the menstruum consisting of two parts of alcohol and one of water. The preparation was of handsome appearance, and upon standing for several months contained no precipitate.

Preparations of Calendula.—Frank G. Mumma, Ph. G., suggests as an antiseptic dressing

Calendulized lint.—Calendula in coarse powder, 12 parts, is percolated with dilute alcohol until 82 parts of tincture are obtained; add to this 6 parts of glycerin, saturate with the mixture 1 part of lint, and expose to the air until the alcohol and water have

evaporated.

Tincture of Calendula, prepared with diluted alcohol, from either the leaves or the flowers does not differ much in color or taste, but that of the flowers is more aromatic. When, however, strong alcohol is used, the flowers yield a golden yellow, and the leaves a dark green tincture, the latter being also very unlike the former both in taste and odor.

Glycerite of Calendula.—Moisten half a troy ounce of calendula, in coarse powder, with a menstruum composed of 3 measures of alcohol, one of water and two of glycerin; then percolate to obtain 3 fluidounces of tincture; by means of a gentle heat evaporate the alcohol and water, add enough glycerin to make 3 fluidounces, heat for a few minutes and strain through fine muslin. It is not perfectly transparent. A glycerite of the leaves is very unlike that of the flowers.

Healing oil.—Ira L. Bond, Ph. G., states that this name is given near Tamaqua, Pennsylvania, to a mixture composed of fluid extract of calendula, 30 parts, and olive oil, 70 parts. It has been extensively used, and with good results, as a healing application to incised and lacerated wounds.

Preparations of Pycnanthemum linifolium, Pursh.—Howard T. Painter, Ph. G., found the fresh herb to lose on drying from 50 to 60 per cent. of weight, and the air-dry herb to yield 6 to 7 per cent. of ash. The herb is known in some localities as dysentery weed and is used for dyspepsia and in bowel complaints, and in hot infusion as a diaphoretic. The following preparations are suggested:

Fluid extract of pycnanthemum.—The menstruum used is a mixture of alcohol 1 part and water 3 parts. The fluid extract is of a deep red brown color, has the characteristic odor and taste of the drug, and on standing for some weeks deposits a slight precipitate. The addition of 5 per cent. of glycerin to the menstruum does not prevent the precipitate.

Syrup of pycnanthemum, prepared from the fluid extract 25 parts, and simple syrup 75 parts, affords a pleasant form for administration.

GLEANINGS FROM THE GERMAN JOURNALS.

By FRANK X. MOERK, PH. G.

Helleborein, the glucoside of *Helleborus niger* and *Helleborus viride*, has been used as a substitute for digitalis. Victorio and Ehridia have discovered that it is an efficient local anaesthetic; when used in one per cent. aqueous solution, three or four drops placed in the eye of a dog or rabbit produce anesthesia of the cornea, lasting about 30 minutes, without producing disagreeable secondary effects.—*Apoth. Ztg.*, 1888,793.

Oleum Theobromae has been re-investigated by Paul Graf, who finds it to contain small quantities of free fatty acids and cholesterin. The liberated fatty acids on distillation gave evidence of formic, acetic and butyric acids; oleic acid is present, and

after its separation, arachic, stearic and lauric acids were isolated by fractional precipitations with magnesium and barium acetates. The determinations of glycerin gave as a mean 9.59 per cent. Melting-point determinations, made in an open tube, gave for specimens of various sources figures varying from 29.4 to 33.4° C., while those made in a closed tube gave, with one exception, a uniform melting point at 34.3°.—*Arch. der Pharm.*, 1888, 830.

Eseridine an alkaloid of the Calabar bean and closely related to physostigmine is convertible into the latter by warming with dilute acids, consequently its solutions in dilute acid should always be made in the cold. Its action on the system is to cause certain diarrhea with little or no action on the central organs; its toxic dose is six times greater than that of physostigmine. Used in 1% solution made by adding one drop dilute sulphuric acid for every 0.1 gm. eseridine, which solution keeps unchanged for long periods.—*Rdsch.*, 1888, 841.

Lactucarium.—Kremel. has found in various specimens an adulteration with bread crumbs. *Lactucarium* extracted with a mixture of 3 parts alcohol and one part chloroform should yield from 55 to 60 per cent. extract (chiefly lactucon). The percentage of moisture and ash is also affected by an addition of bread crumbs. No. 1, was a pure specimen; 2 and 3 were adulterated, starch could be detected in these by the microscope as well as the iodine test in an aqueous decoction.

	Moisture.	Ash	Chloroform-Alcohol Extract.
1	5.80 per cent.	6.50 per cent.	57.46 per cent.
2	5.88 “	4.51 “	40.00 “
3	10.84 “	1.61 “	11.54 “

—*Pharm. Centralhalle*, 1888, 512.

CHEMISTRY OF BUCHU LEAVES.³

By Y. SHIMOYAMA.

Flückiger obtained from the oil of buchu leaves a peculiar compound, described under the name of diosphenol; it forms colorless crystals belonging to the monoclinic system, which can be obtained several centimetres long by sublimation. It is easily soluble in alcohol, less so in ether, and scarcely at all in water. Its solutions are neutral. Diosphenol dissolves in concentrated sulphuric acid; on saturating the solution with barium carbonate and evaporating the filtrate, a little amorphous barium salt is obtained. According to Spica, diosphenol is an oxycamphor of the composition $C_{10}H_{16}O_2$; the author's results confirm this. Methyldiosphenol, obtained by the action of potassium hydroxide and methyl iodide on diosphenol, is a colorless liquid, which boils at 232-235°, and has a sp. gr. of 0.985 at 15°. It is easily soluble in alcohol and ether, but not in water. Its composition is $C_{10}H_{15}O_2Me$. The corresponding ethyl-compound is also a colorless liquid insoluble in water, easily soluble in alcohol and ether, of sp. gr. 0.967 at 15°. Boiling point 270-272°. Acetyldiosphenol is obtained by mixing diosphenol with anhydrous sodium acetate and excess of acetic anhydride, and heating at 145° in a closed tube. The rectified product

3 *Arch. Pharm.* [3], xxvi., 4-03-417; reprinted from *Jour. Chem. Soc.*, Nov., p. 1205.

is a colorless, odorless liquid, which boils at 269-270°, although not without decomposition. Sp. gr. 1.032 at 20°; easily soluble in alcohol and ether, but not in water. The compound is neutral, but after rectification has an acid reaction.

Long digestion of diosphenol with alcoholic potash partly converts it into diolic acid; this is separated from the liquid residue in the retort by the addition of hydrochloric acid dissolved in ammonium carbonate, treated with animal charcoal, and precipitated with acid. Diolic acid forms white, crystalline needles; its aqueous solution has an acid reaction; it neutralizes strong bases and liberates carbonic anhydride from carbonates. It melts at 96-97°, volatilizes slowly on the water-bath, and decomposes when heated strongly, evolving a menthol-like odor. It is soluble in 122.7 parts of water at 18°, and 82 parts at 100°; easily soluble in alcohol, ether, chloroform, benzene and carbon bisulphide. Its composition is $C_{10}H_{18}O_3 + H_2O$. The barium salt, $(C_{10}H_{17}O_3)_2Ba + 5H_2O$, is soluble in 67.89 parts water at 17.5° and 19.7 parts at 100°, and also in alcohol. Over sulphuric acid it gradually loses its water of crystallization. The white, amorphous silver salt, $C_{10}H_{17}O_3Ag$, rapidly blackens on exposure to the light. It is scarcely soluble in water even at 100°. The sodium and ammonium salts are amorphous. The calcium and magnesium salts are white, amorphous powders, insoluble in water, whilst the strontium salt is easily soluble. The copper salt is light-brown, the iron salt redbrown; both are only slightly soluble in water. Diosphenol, when fused with potassium hydroxide yielded an acid agreeing in every particular with diolic acid, but melting at 86°, that is 10° lower; attempts to raise the melting point of the new acid by recrystallization were unsuccessful.

Reduction of diosphenol in alcoholic solution by means of sodium amalgam gave an oily substance, which was dissolved in aqueous ether and treated with sodium to reduce the diosphenol still remaining unacted on. The solution was then allowed to evaporate, when an oily liquid permeated with crystals was left. The crystals, prismatic in form, melt at 159°, are odorless, sparingly soluble in alcohol and ether, and the alcoholic solution does not give the dirty-green coloration with ferric chloride solution which diosphenol does. Its composition is $C_{10}H_{18}O_3$, and must be considered as the diol alcohol. The oily compound occurring with these crystals is probably $C_{10}H_{18}O$, the principal component of buchu oil, according to Flückiger, and described by Spica under the name of diosmeleoptene. Diosphenol dissolved in carbon bisulphide and treated with bromine gives fine yellow crystals of the composition $C_{10}H_{14}BrO_2$; these melt at 43°, and are soluble in alcohol and ether, but not in water.

KAURI GUM INDUSTRY.

By RALPH ROBINSON.

It was a fine summer morning in March when our little party of two ladies and one gentleman set off on a trip to the west coast of the North Island. There being no railway or other conveyance to Karè Karè we had to do what others do under similar circumstances, namely, walk or ride (we preferred the former) the greatest portion of the way, carrying with us some provisions, tin cans for boiling and cooking, tin pannikins and plates, a few other articles and as few clothes as possible, the whole

fastened up lightly in rugs or blankets and slung on the shoulders knapsack fashion. Having gone as far as we could by rail we alighted, and after adjusting our swags, as this kind of luggage is usually called, we commenced our journey over the lofty ranges separating the east coast from the west. The first two miles was through cleared and partly cultivated lands, apples and other fruits growing to great perfection on this clayey soil. Then a mile or so of ti-tree scrub, *Leptospermum scoparium* (Captain Cook's tea tree), bearing a large quantity of rosaceous white blossoms, even when only a few inches high. It grows quickly and attains a height of twenty feet or more, and is principally used as fuel. Here and there may be seen a settler's wooden house, comfortable enough in summer, but misery in wet weather; fortunately there is no snow so far north, and no frost to speak of. On reaching the bush proper (primeval forest) a scene presents itself which gives the impression of even nature having gone wild. An undergrowth of almost impenetrable thickness, interlaced here and there with the supplejack ropes, *Rhipogonum scandens* (Maori name—*Kariao*), the root of which is not very unlike sarsaparilla, and is sometimes substituted for it by herbalists. Then there is the *Corynocarpus laevigata* (Maori name—*Karaka*), with its glossy green leaves and yellow berries; the seeds are an irritant poison, producing convulsions and contortions of the limbs. When any of the Maori children had eaten any of these seeds, their parents used frequently to cure them by administering emetics and burying them up to the neck in earth, to prevent contortions. After being steeped in water several weeks the seeds form a portion of the Maori diet. We also noticed several tall specimens of *Dacrydium cupressinum* (Maori name—*Rimu*), with its fern-like foliage. The tree yields an astringent gum, and the bark is used by the natives as a styptic. In many cases the trees are encircled to the very top with the *Metrosideros robusta* (Maori name—*Rata*). In several cases the tree had succumbed and decayed, leaving a large hollow shell of interlaced rata. Here and there was left a noble kauri, the *Dammara australis*, one of which measured upward of 32 feet in circumference. The largest known specimen in the colony measures about 72 feet in circumference, reaches a height of 80 feet without a single branch, and is estimated to have taken about two thousand years to grow.

There were many other trees in an advanced state of decay, covered with parasites, which gave them a very weird appearance. Hillsides covered with tree ferns, *Cyathaea medullaris* (Maori name—*Punga*), hundreds or perhaps even thousands standing close together, with here and there a nikau palm with its pinkish flowers or red berries attached to the base of the leaves. The umbrella and scented ferns were also in abundance. The first half of our journey being completed at a place known as Big Muddy Creek, but on this occasion a small stream of very clear water, we halted and soon had a supply of hot tea and a fair supply of solids as lunch. The other half of the journey was very like the first half, until we reached the west coast with its rocks and boiling surf as far as the eye could see. It is common here on such excursions either to sleep out in the open air or to make use of an uninhabited gumdigger's hut, or disused wharè, not always the most desirable abode, as in many cases you are brought in contact with too many bed-fellows in the shape of fleas. But Karè Karè has its idle saw mill and workmen's empty butts, in one of which we took up our abode. The furniture consisted of a rough kind of table, a form, and one or two boxes. Our beds were made on the floor of the wiry climber, *Lygodium articulatum* (Maori name *Mangè mangè*), a few ti-tree twigs and rugs. Our cooking utensils were of the simplest description, tin cans (billies) and a few preserved meat tins playing a very important

part. It was here we met with a camp of gumdiggers and had the opportunity of gaining most of the little information here given relative to the Kauri gum industry. They go out in parties of three or more, carrying with them their spades, spears, and baggs, or they may have left their spades in the bush the night before. They usually went to their work between seven and eight o'clock in the morning, returning again about four o'clock in the afternoon, bringing with them what gum they had got. Friday was usually clearing up day, that is, they sorted and scraped their gum and bartered it in return for stores to the caretaker of the sawmill, drawing the balance in cash or cheque before going to town. The storekeeper in his turn sold it to the gum merchant.

There are two kinds of gum fields, the summer and the winter. It is usual to work on the ridges, that is, the higher ground, during the winter months, because then the rain softens the hard clayey ground and makes the labor much lighter; but in summer, when the ridges become too hard and the low-lying swamps sufficiently dry, they transfer their operations to them. The gum is found much nearer the surface on the ranges than in the swamps, being only a few inches below the surface, and sometimes even projecting above, whilst in the swamps it may be found to a depth of several feet, the soil of the higher ground having been washed away with the heavy rains and deposited in the swamps, burying the gum deeper each successive year. The spear is a sharp pointed steel rod with a wooden handle, and this is thrust down into the earth to ascertain if gum is present. If gum is proved to be present, then digging commences and the whole spot dug over until they suppose they have got all the gum out. It usually occurs in very irregular, rough pieces, about the size of a hen's egg, looking like a piece of very rough clay. This, when the outside is scraped off with a pocket-knife, is the Kauri gum usually met with in commerce, and worth about 35s. per cwt. on the spot. The smaller pieces are only washed and dried and do not bring nearly such a good price. As a rule the scrapings are not saved, not being worth more than 20s. for a large sackful. They are used for lighting fires and making fire lighters. The gum fusing and burning soon sets the sticks and logs on fire, the gum giving off a white smoke and aromatic smell. Sometimes very large pieces, a cwt. or more, of transparent and almost colorless gum are found near the decayed root of a tree, probably the gum of the original tree. This brings a very much higher price, and is used for making personal ornaments. It is easily worked with a knife into any shape, and polished with a soft rag and kerosine oil. At times large masses of the gum may be found exuding from the living tree, but this gum is not so good for varnish-making as the fossil gum. Three or four thousand men are usually engaged in digging and can earn in districts where the gum is fairly plentiful 30s. to 40s. a week, and, as the cost of living is very small, they could easily save money; but, being cut off from all civilization whilst at work, they speedily spend and waste all their savings when they go to town.

The gum is also found in considerable quantities, but of dark color, in the coal deposits, showing the antiquity of the Kauri forests. There were 4920 tons of gum exported from Auckland in 1886, the value of which was £257,653, being at the rate of rather less than £2 12s. 0d. per cwt. The gum was dearer then than now, and there is the cost of packing, sorting, warehousing, carriage from the gum fields, and other expenses to be added to the first cost. The Kauri gum industry is confined to the North Island, as it is only in the north that the Kauri pine grows; thus the unemployed of Auckland are not so badly off as those in the south, always having the gum fields to fall back upon as a last resource; a last one on account of the hardships

to be gone through, especially when there is a wife and family, and because an inexperienced digger may be a long time before he finds gum enough to find him with food. A very large portion of the Kauri forest having passed into the hands of a syndicate, it is very probable the gum digging will be regulated, and in all likelihood the price of the gum will advance. AUCKLAND, New Zealand.—*Phar. Jour. and Trans.*, Oct. 20) 1886, p. 306.

MARGOSA OIL.

By C. J. H. WARDEN,
Chemical Examiner to the Bengal Government.

Margosa oil is the oil extracted from the almonds of the *Melia Azadirachta*, natural order *Meliaceae*, a tree common in India, and known under the name of "Nim." The bark, leaves, fruit, and oil are held in high esteem by native and many European practitioners as remedial agents of value, a tincture and a decoction of the bark and a poultice of the fresh leaves being officinal in the Pharmacopoeia of India. Preparations of the bark are considered effectual as antiperiodics, chiefly in the milder forms of periodical fever, and as tonics in convalescence after febrile and inflammatory affections.⁴ The poultice of "nim" leaves is a common domestic remedy with natives, and is used as a stimulant application to indolent and ill-conditioned ulcers. The oil is used as an external application in rheumatism and as an anthelmintic, and is reported by Dr. A. Hunter to be an insecticide.⁵

Margosa bark was examined by Cornish in 1857,⁶ who isolated an alkaloid, which he described under the name of "margosin." The later researches of Broughton,⁷ however, indicate that Cornish's bitter alkaloid is probably an amorphous resin. From the bitter oil of the seeds Cornish extracted an acid which he termed "margosic acid," but which he doubted to be capable of affording crystallizable salts.⁸ Lepine,⁹ who examined the oil, found it to have a specific gravity of .921, and he describes it as possessing a bitter taste and a garlic-like odor, to congeal at + 7°C., and to yield by saponification 35 per cent. of fatty acids, melting at 30°C., and 65 per cent., melting at 44°C. Subsequent writers on Indian materia medica have quoted Lepine's results, but as far as I am aware no additions to Lepine's results have been published.

The margosa oil used in the investigation described in this communication was obtained by expression in my laboratory; there can therefore be no doubt regarding the genuineness of the sample. The fruit was washed to separate pulp, the stones dried, cracked, and the almonds exposed to a gentle heat for some time to remove moisture. The dried almonds were then crushed, placed in a cloth bag, and the oil expressed. It was found very necessary to first dry the almonds before subjecting them to pressure; without adopting this precaution a white creamy fluid was obtained, instead of clear oil, from which it was subsequently impossible to separate

4 Appendix to Pharmacopoeia of India.

5 Ibid.

6 "Indian Annals of Medical Science," iv.; AMERICAN JOURNAL PHARMACY, 1858, p. 126.

7 *Pharm. Journ.*, June 14, 1873.

8 "Pharmacographia."

9 Gmelin's 'Handbook of Chemistry,' vol. xvii., p. 94.

the oil, except by ether or other solvent.

The oil thus obtained was filtered through filter paper before it was examined. Directly after filtration the oil, when viewed in bulk, had a slight greenish coloration by transmitted light, owing to some of the almonds not having been quite ripe, and to solution of traces of chlorophyll in the oil. Viewed in a thin stratum the color of the oil was yellowish. The oil possessed a powerful garlic-like odor, and was very bitter. The specific gravity at 15.5°C. was 9235; at about 10°-7° C. the oil congeals, without losing its transparency. After standing for about thirty-six hours the recently expressed oil deposited a white sediment, which examined microscopically was found to be amorphous.

The color reactions of margosa oil were not characteristic. With concentrated sulphuric acid a rich brown color was yielded, and a strong garlic odor evolved. By Massie's test with nitric acid the oil became almost immediately of a reddish color; after standing about one hour and thirty minutes the color was pale yellow. The elaidin reaction conducted according to Pontet's directions yielded a solid firm yellowish product after eighteen hours, the temperature in the laboratory varying between 89° and 93°F. Exposed in a thin layer on a glass plate to a temperature of 100°C. for some days the oil did not dry or become tacky. The oil was easily soluble in ether, chloroform, carbon bisulphide, benzol, etc. Absolute alcohol agitated with it was colored greenish; on separating the alcohol, and evaporating off the spirit, an extract was obtained which consisted of oil, from which a small residue, whitish in color, separated on standing. The alcoholic extract was very bitter, and possessed in a marked degree the peculiar odor of the oil. The whitish residue deposited from the oil, separated by alcohol and examined microscopically, did not appear crystalline. Margosa oil after repeated agitation with alcohol was found to have lost its bitterness and almost wholly its alliaceous odor.

A known weight of the oil was saponified with alcoholic potash, the alcohol completely evaporated off, and the soap dissolved in water. On agitating the aqueous solution of the soap with ether, 1.60 per cent. of ether extract was obtained of an orange-yellow color and bitter. This extract treated with 60 per cent. alcohol, left a small amount of white residue, which had the character of a wax. The aqueous solution of the soap, after separation of the ether, was heated for some time to remove dissolved ether, the solution was then mixed with dilute sulphuric acid in excess, and the insoluble separated from the soluble fatty acids in the manner recommended by Allen.¹⁰ The soluble fatty acids amounted to 3.519 per cent., the insoluble to 89.128 per cent. The volatile acids consisted of butyric and a trace of valeric acid. During the distillation to separate the fluid from the volatile fatty acids, a small amount of a snow white fatty acid passed over; this acid had a melting point of 43.6°C., which corresponds with the fusing point of lauric acid. A weighed portion of the insoluble fatty acids, from which the lauric acid had not been separated, was dissolved in alcohol, and titrated with normal standard soda, using phenolphthalein as an indicator, .288 gram of the acids required 1 cc. of caustic soda for neutralization. No attempt at separating the fixed fatty acids was made; they probably consisted of a mixture of stearic and oleic acids, with a small amount of lauric acid.

¹⁰ 'Commercial Organic Analysis.'

Examined by Reichert's distillation process, 2.5 grams of the oil gave a distillate which after separation of the lauric acid, which had distilled over, required 4.6 cc. of decinormal soda for neutralization, phenolphthalein being used as an indicator.

The saponification equivalent of the oil was determined by Koettstorfer's method, and was equal to 284, the percentage of caustic potash required to saponify the oil being 19.72.

A preliminary examination of the oil having indicated the presence of sulphur, a quantitative estimation of the amount present was made and found equal to .427 per cent. The oil after repeated agitation with alcohol was found to contain only .109 per cent. of sulphur.

The extract obtained by agitating the oil with absolute alcohol has already been referred to; it was examined in the following manner: The oily extract was treated with .60 per cent. spirit, allowed to stand, and the clear yellow alcoholic solution decanted from the insoluble oil; the alcoholic solution thus obtained was evaporated to dryness, mixed with ammonia, and agitated with ether. The ether solution was marked A. The aqueous solution, after separation of the ether, was mixed with dilute hydrochloric acid, and again agitated with ether. The ether separated of a yellow color, and below it some flocks of a dirty yellow hue, which refused to dissolve after prolonged agitation. The ether solution was marked B. From the aqueous solution the insoluble flocks were separated by filtration and marked C. The filtrate was not further examined.

Examination of ether solution A.—The solution was agitated with dilute hydrochloric acid, to remove any principles of an alkaloidal nature. The ether was then separated and evaporated; the resulting extract was pale amber in color, viscid at first, very bitter, and had a marked odor of the oil. It contained sulphur. It was easily soluble in 60 per cent. alcohol, ether, chloroform, etc., but insoluble in acids, or in caustic alkaline solutions. It had the properties of a neutral resin.

The hydrochloric acid solution was of a yellow color; it was mixed with ammonia, which occasioned a white precipitate, and agitated with ether. The ethereal solution on evaporation left a yellow residue, not readily soluble in dilute acids. The dilute sulphuric acid solution was bitter, and yielded a precipitate with alkaline carbonates and hydrates, phosphomolybdic, and picric acids, potassio-mercuric iodide, chloride of gold and perchloride of platinum. This principle had therefore the properties of an alkaloid.

Ether solution B.—On evaporating the ether solution B, a dark reddish bitter extract was obtained, soluble in alkaline solutions, and re-precipitated in yellowish flocks by dilute acids. It had the properties of an acid resin.

Precipitate C.—The precipitate was well washed, and dissolved in alcohol; on evaporation a brittle darkish residue was obtained, soluble in alkaline solutions, reprecipitated in yellowish flocks by acids, soluble with very great difficulty in ether, easily soluble in chloroform. This principle thus also had the properties of an acid resin.

In addition to the principles above described as being present in the oil, an examination of the cake left after expression of the oil, indicated the presence of another neutral principle, insoluble in ether or alkaline solutions, but dissolving in chloroform.

Medical College, Calcutta.

—*Phar. Jour. and Trans.*, October 27, 1888, p. 325.

HYDRASTINE AND DERIVATIVES.¹¹

By E. SCHMIDT AND F. WILHELM.

Hydrastine. By Wilhelm.—The extract obtained by treating the coarsely powdered root of *Hydrastis canadensis* with water acidified with acetic acid at 100°, is evaporated to a syrup and excess of dilute sulphuric acid added, when berberine sulphate separates. The filtrate neutralized with ammonia gives a precipitate containing much hydrastine; this is separated, and on adding ammonia in excess to the filtrate a further precipitate is produced, which contains canadine. Both precipitates, boiled with ethyl acetate, give solutions which on cooling deposit hydrastine in large crystals, somewhat colored, but rendered pure by recrystallization. The crystals from the second ammonia precipitate are much purer than those from the first; by slow evaporation of the ethyl acetate solution they can be obtained as large as walnuts.

Hydrastine picrate $C_{21}H_{21}NO_6 \cdot C_6H_2(NO_2)_3 \cdot OH + 4H_2O$, is thrown down as an amorphous, yellow precipitate, which is deposited from its boiling alcoholic solution in splendid yellow needles. By the action of ethyl iodide on hydrastine under pressure, a well crystallized ethiodide



can be obtained of the form $P \cdot \infty P \cdot \bar{P} \cdot (P \cdot \bar{P} \cdot \infty)$, melting at 205°-206°. The corresponding chloride could only be obtained in a gummy mass; its solution was therefore precipitated with platinum and gold chlorides respectively, and the corresponding double salts were obtained and analyzed. Both are amorphous, the platinumchloride being light red, melting at 207°, and having the composition



and the aurochloride being yellow, melting at about 110°, and having the composition $C_{21}H_{21}NO_6EtCl \cdot AuCl_3$. *Hydrastine-ethylammonium hydroxide*, obtained by exactly precipitating the iodine from hydrastine ethiodide by means of silver oxide, concentrating the filtrate, and allowing to remain over sulphuric acid, appears as compact, slightly colored crystals, which are purified by recrystallization from hot water. Their composition is $C_{21}H_{21}NO_6Et \cdot OH$, Showing that the hydrastine has the character of a tertiary base, and does not, as Power supposed, belong to the imido-bases. The attempts to obtain a hydro-compound by the action of nascent hydrogen

¹¹ *Arch. Phar.* [3], xxvi., 329-365; reprinted from *Jour. Chem. Soc.*, Nov., p. 1212.

on hydrastine, both in acid and alkaline solution were unsuccessful. The evidence as to the existence of a third alkaloid, canadine, was doubtful.

Action of Oxidizing Agents on Hydrastine. By E. Schmidt and F. Wilhelm.—Hydrastine, when treated with manganese dioxide and sulphuric acid, yields *opianic acid* and *hydrastinine*. Oxidation with platonic chloride gives the same products. Potassium permanganate in alkaline solution produces *hemipinic* and *nicotinic acids*; in acid solution opianic acid is produced, as one of the authors had ascertained when Freund and Will's publication of the same fact first appeared. The base formed simultaneously was not isolated, but by employing barium permanganate hydrastinine in small quantity was obtained along with opianic acid. Chromic acid yielded the same two products.

Comparing *narcotine* and *hydrastine*, E. Schmidt considers that the former contains three methoxyl-groups, thus: $C_{19}H_{15}(OMe)_3NO_4$, whilst the latter contains only two, thus: $C_{19}H_{15}(OMe)_2NO_4$. Since the oxidation of narcotine with manganese dioxide and sulphuric acid yields opianic acid and cotarnine, and under the same conditions, hydrastinine gives opianic acid and hydrastinine; further, as opianic acid contains two methoxyl-groups, and cotarnine contains one of these groups, as shown by Wright, it follows that hydrastinine contains no methoxyl-group, and cotarnine may prove to be a methylated hydrastinine. The author hopes later to succeed in converting hydrastine into narcotine.