former was identified by chemical tests, glucose was produced by hydrolysis with sulphuric acid and the ready saponification of some of the fractions strongly suggested stearic or similar acids. If ipurolic acid could be separated and identified, the chemical similarity of the two resins would be established.

In their work on *Ipomoea purpurea* Power and Rogerson separated this acid as follows:

> The resin was hydrolyzed by heating in alcoholic solution, containing enough sulphuric acid to make a 5 percent acid solution, for four hours under a reflux condenser. The alcohol was then removed, and the hydrolyzed resin distilled with steam. When the liquid in the still had cooled, the acid separated in fine, interlaced crystals from the aqueous fluid and was collected by filtration. It was found to be readily soluble in a weak solution of sodium hydroxide, and after rendering this acid with acetic acid the crystalline body was extracted with chloroform. To further purify it, it was again crystallized from hot water, in which it is slightly soluble. The melting point was then found to be 101° C.

On applying this process to the resin of Brazilian jalap, an acid body separated in the still and was purified by dissolving in weak sodium hydroxide solution and extracting with chloroform after acidulating. On recrystallizing from hot water it was obtained in colorless condition and had a melting point of 83.5° C. Further purification showed no change in the melting point.

It combined readily with weak alkalies, and had a saponification value of 174, as found by direct titration in alcoholic solution with decinormal alcoholic potassium hydroxide. This is a lower saponification number as well as a lower melting point than that of ipurolic acid. It is therefore a different body, but it is obtained in the same way, and does not correspond to any of the commonly known organic acids.

The resin of Brazilian jalap is thus shown to be similar in chemical character to that of *Exogonium Purga*. It is a complex body of a glucosidal nature, and contains constituents of like character. This resin meets the U. S. P. requirements for resin of jalap except that of solubility in water and the acid number. The yield is three to four times as great, and the physiological action is similar.

LABORATORY OF PARKE, DAVIS & CO.,
DETROIT, MICH.

KARAYA GUM, A SUBSTITUTE FOR TRAGACANTH.*

BY CLARE OLIN EWING.

The commercial value of a gum depends largely upon the purpose for which it is best suited, the most valuable generally being those varieties suitable for sizing silks and for use in confectionery and pharmacy. For pharmaceutical use the desirable qualities are a fairly high viscosity, suitable adhesive power, and freedom from appreciable odor, color and acidity. One of the gums which admirably fulfills these requirements is gum tragacanth, which is highly prized by pharmacists and is official in most pharmacopoeias. It is defined by the United States Pharmacopoeia IX (1916) as "The spontaneously dried gummy exudation from the stems of *Astragalus gummifer* Labillardiere, or from other Asiatic species of *Astragalus* (fam. *Leguminosae*.") Gum tragacanth belongs to the class of gums

* Contribution from the Pharmacognosy Laboratory, Bureau of Chemistry, Department of Agriculture, Washington, D. C.

which swell in water and form jellies, and upon addition of more water, form thick, transparent mucilages.

Recent examination of samples of gum tragacanth offered for importation has disclosed that in some instances foreign gums have been substituted for the true material. The samples in question were not obtained from the official source, but were of the type obtained chiefly from *Sterculia urens* Roxburgh, and also from *Sterculia villosa* Roxb., *Sterculia tragacantha* Lindley, or from *Cochlospermum gossypium* DeCandolle, and other species of *Sterculia* or *Cochlospermum*. These gums have recently been imported under the names of Indian, Karaya, Kadaya and Maura gum. Owing to the large number of dialects spoken in India, they have been known by a wide variety of vernacular names. According to Dymock[1] and to an anonymous writer in the Scientific American[2] they have also been variously known by the names Bali, Gulu, Kahu, Kalru, Kalu, Kandul, Karai, Katila, Katira, Kavali, Kawali, Kutera, Kuteera, Kutira, Loli, Pandruk, Penari, Shiraz, Tabsu, and Velley-putali. The names most common in this country are Indian gum and Karaya gum. We consider the latter name preferable to Indian gum, especially in view of the fact that the term "Indian Gum" has been applied to a number of different gums. The Indian gum (*Gummi indicum*) of the British Pharmacopoeia is obtained from *Anogeissus latifolia* Wallroth, and belongs to the acacia series of gums.

Karaya gum belongs to the tragacanth series of gums, and in the powdered state may readily be mistaken for true gum tragacanth. It is reported to exude from the trunk in large quantities. In the whole state it occurs in irregular, rounded, translucent lumps of a pale buff color; it is said never to occur in the ribbon-like whitish or light brown bands characteristic of true tragacanth. It may be differentiated from tragacanth chemically and macroscopically by a number of tests given in the United States Pharmacopoeia IX,[3] where it is referred to as "Indian Gum" in the tests of purity of gum tragacanth, and also by its "volatile acidity"[4] which is about eight to ten times as great as that of tragacanth.

Although, according to Guibourt[5] the fresh gum is inodorous, when it is exposed to moist air it gives off an odor of acetic acid. Robinson[6] has shown that the volatile acidity of gum from *Cochlospermum gossypium*, when hydrolyzed with phosphoric acid and distilled, corresponds to about 14 or 15 percent of acetic acid. Emery[7] has examined 56 samples of gum tragacanth, some of them authentic specimens obtained from Turkey and Persia, and has shown that the volatile acidity corresponds to about two or three percent of acetic acid only, while the acidity of gum obtained from *Sterculia urens* (21 samples) corresponds to about 16 percent of acetic acid. The similarity in the results of Emery and Robinson are noteworthy and suggest the close similarity of *Cochlospermum gossypium* and

[1] Dymock, Warden and Hooper, *Pharmacographia Indica*, I, 228 (1889–90).

[2] "What is Karaya Gum," *Scientific American Supplement*, 2137, 82, 393 (1916).

[3] These tests are apparently based upon the work of Scoville, *Drug. Circ.*, 53, 116–7 (1909).

[4] "The Volatile Acidity of Gum Tragacanth Compared with that of Indian Gum;" U. S. Department of Agriculture, *Bureau of Chemistry, Circular* 94, 3 (1912).

[5] "Histoire Naturelle des Drogues Simples," 3, 454 (1876).

[6] "The Gum of Cochlospermum Gossypium," *Journal Chemical Society Transactions*, 89, 1496–1505(1906).

[7] *Loc. cit.*

Sterculia urens. Cooke[8] has indeed suggested that *Cochlospermum gossypium* has incorrectly been separated from the *Sterculiaceae*.

When moistened with water, karaya gum absorbs a large quantity and, like tragacanth, swells to several times its original size, forming a tasteless, nearly colorless mucilage. A 1 percent mucilage prepared by the writer from a good grade of karaya gum had a viscosity similar to that of a mucilage of tragacanth of about three-fourths the same concentration; a 1.5 percent mucilage of karaya was comparable to a 1 percent mucilage of tragacanth. The adhesiveness of a 1 percent mucilage of tragacanth was superior to that of a 1 percent mucilage of karaya gum.

Prebble[9] states that: "From some comparative experiments made with codliver and castor oils it appears to be about equal to tragacanth as an emulsifying agent." Flückiger,[10] speaking of a similar gum from the related African species, *Sterculia tragacantha*, states that "as a means of promoting the adhesiveness of pilular masses I find" it "as advantageous as ordinary tragacanth," and also that "the African *Sterculia tragacantha* may be used both in pharmacy and in the arts instead of the usual drug of Asia Minor."

Maiden states[11] that the "uses of the gum are very limited; * * * From time to time samples have been sent to Europe for valuation but hitherto no use has been found for it and consequently it has no appreciable value in the markets. The only purpose for which it has hitherto been considered valuable is as an adulterant of tragacanth, but hardly as a substitute."

On the other hand, Dymock[12] states "Karāi gond [Karaya gum] is used as a substitute for tragacanth and is issued from the [British] government stores."

Maiden did not appear to have a very good opinion regarding the possibility of karaya gum in the arts, but his work was done nearly thirty years ago at a time when even tragacanth was not as widely used in the arts as at the present time, and when the possibility of the use of karaya gum for technical uses had not been developed to any extent. Maiden, furthermore, refers to Cooke[13] who, he states, found it to be valueless as a result of his experiments. Reference to the original, however, shows that Cooke's "experiments" consisted in the submission of several samples to commission merchants, who based their statements as to its lack of value upon mere inspection, unsupported by any chemical data or practical experiments.

Karaya gum is used extensively in India as a substitute for tragacanth in the preparation of sweetmeats, and also locally as a demulcent in the treatment of throat affections. The poorer grades are used very extensively in this country by calico printers. As an emulsifying agent karaya gum appears to be of value as a substitute for tragacanth, although from one-third to one-half more should be used, but on account of the slight acidity of karaya gum its use in certain prepara-

[8] "Report on Gums and Resins of India," 31 (1874).

[9] *Loc. cit.*, 230.

[10] "On African Tragacanth," *Pharmaceutical Journal*, [2] 10, 641 (1869).

[11] "Sterculia Gum; Its Similarity and Dissimilarity to Tragacanth," *Pharmaceutical Journal*, [3] 20, 391–27 (1839).

[12] "Notes on India," *Pharmaceutical Journal*, [3] 8, 161 (1877).

[13] *Loc. cit.*

tions may be objectionable. In general, however, this characteristic should not militate against its use as an excipient for pills and troches.

As may be seen from the foregoing, although inferior to tragacanth, karaya gum does have valuable characteristics, and its use for legitimate purposes should be encouraged. It is now selling for one-fourth to one-fifth of the price of tragacanth, and on account of its cheapness it is now being used rather extensively in the arts as a substitute for tragacanth. Karaya gum is considered especially worthy of the attention of pharmacists at this time because solutions of tragacanth and other gums[14] are being recommended in quite a number of preparations as substitutes for glycerin, which is now in very large demand for war purposes.

CONSERVATION IN PHARMACY.*

BY A. R. L. DOHME.

These are abnormal times in which we are living, and standards of all kinds have been changed to meet the conditions set by a war which has no standard by which to measure it—exceeding in extent, intensity, destruction and influence on the entire world and everyone in it, that of all previous wars combined. The aim of the war now existing for about four years has been general and mutual destruction of all things. The magnitude of the operations and the world-wide nature of the same has taxed the resources of all nations to the limit. In money, the yard-stick is now billions—a figure previously only relegated to the imagination. In steel, ships, copper and explosives, the yard-stick is nation's entire output; in men, clothes, sugar, flour, cereals and foodstuffs, the yard-stick is the utmost capacity of the earth's productivity and the man power of the earth to supply and produce it. All laws are continually changing and freedom of action, thought or belief no longer exists anywhere on the earth. The press now rules the world and creates not only sentiment, position, influence and power, but holds in the palm of its hand the destinies of life of all peoples and individuals. Absolutism and terror now reign supreme all over the earth. It has become the solemn and serious duty of this great country of ours to step into the breach of the European cataclysm and holocaust and by the power of its manhood, the sacrifice of its people, the use of its vast resources in money and materials and the throwing into the balance of its determination, ingenuity and persistence, stay the onslaught of the Teuton columns and save the world from the rule of autocracy and might, thereby preserving for mankind the institutions of liberty, freedom and the pursuit of happiness. Without our intervention the cause of the Allies would have been lost. What a glorious opportunity for the land of the free and the home of the brave to come to the rescue of a tottering world about to fall a prey to Junkerism and the Divine right of kings. It hence becomes our duty, each and everyone of us, to do our share in every way we can by putting our shoulder to the wheels of the car of liberty and help it arrest the advance and eventually

[14] Anon. "War Emergency Formulas," *Lancet*, 193, 766 (1917). Smith, "War Emergency Formulas," *American Druggist*, 66, 51–3, 102–4, 145–9 (1918). Wimmer, "Emergency Substitutes for Sugar, Syrupand Glycerin," JOURNAL AMERICAN PHARMACEUTICAL ASSOCIATION, 7, 39–46 (1918).

* Read before Section on Commercial Interests, A. Ph. A., Chicago meeting, 1918.